?/?/ 1930
Late Summer

XP-13

Berliner-Joyce XP-13 Viper

Last revised June 7, 1998

The XP-13 Viper was the last fighter built by the Thomas-Morse Aircraft Corporation of Ithaca, New York. The Thomas-Morse Aircraft Corporation had started life in early 1917 when the Thomas Brothers Aeroplane Company merged with the Morse Chain Works. The Thomas-Morse outfit built the well-known S-4 fighter-trainer of World War 1, which never actually served in combat, but became a very popular participant at postwar air shows. They also designed and developed the MB-3, the first American fighter of indigenous design to enter service. However, under the bizarre military procurement policy of the early 1920s, Boeing actually obtained the bulk of the production contracts for the MB-3. During the 1920s, Thomas-Morse specialized in the construction of all-metal designs, observation planes, and racers, although a few unsuccessful fighter projects were attempted. Like lots of other companies, Thomas-Morse found that firm military orders were hard to come by.

The XP-13 (named "Viper" by the company) was created for the new 600 hp Curtiss H-1640-1 Chieftain twelve-cylinder 2-row air cooled engine. Thomas-Morse's experience with the manufacture of all-metal aircraft stood them in good stead in the design of the Viper. The fuselage had an all-metal structure covered by a corrugated aluminum-sheet skin. The wing was of wooden construction with fabric covering, but the ailerons were made of corrugated metal sheet. Tail surfaces were of metal and fabric, but the control surfaces were covered with corrugated sheet metal.

The Viper was delivered to the USAAC for evaluation in early 1929. The aircraft was tested at Wright Field in June 1929 as P-559, then purchased by the Army and designated XP-13. The serial number was 29-453. Performance was satisfactory, but the Chieftain suffered with insurmountable cooling problems. Similar problems had been encountered with Curtiss-built fighters powered by this engine. The XP-13 had an empty weight of 2262 lbs and a gross weight of 3256 lb. The maximum speed was 172.5 mph at sea level, 169.9 mph at 5000 feet. The XP-13 could climb to 5000 feet in 3 minutes, and the service ceiling was 20,800 feet. The XP-13 was not fitted with any armament.

Because of the insoluble overheating problems, the Chieftain engine was abandoned. The XP-13 prototype then had a new engine installed in September 1930, a 525 hp Pratt and Whitney SR-1340-C enclosed in a NACA cowling, along with a revised fin and rudder. The designation was changed to XP-13A. The change to a new engine resulted in even better performance. The XP-13A had an empty weight of 2224 lbs and a gross weight of 3194 lb. Maximum speed was 188.5 mph at 5000 feet. The XP-13A could climb to 5000 feet in 3.5 minutes, and service ceiling was 24,150 feet. A USAAC performance report of 1930 described the XP-13A as having a "comfortable feel" in all aerobatics and that it "makes a wonderfully smooth slow roll". However, by then the opportunity was lost. and the Army never ordered the aircraft into production. The Viper caught fire during its last test flight and was destroyed in the resulting crash.

A second Viper was to have been built by Curtiss under the designation XP-14. However, the failure of the Chieftain engine was to cause this project to be cancelled before any aircraft could be built.

The failure of the XP-13 to win a contract was catastrophic for the Thomas-Morse company. In August,

10/19/1931

Lockheed XP-24

P-24 10/19/31

The XP-900 was powered by a 600 hp Curtiss Conqueror V-1570C (the military designation was V-1570-23) liquid-cooled 12-cylinder vee engine driving a three-bladed propeller. The tunnel radiator and the oil cooler were housed beneath the engine just ahead of the wing. The crew of two (pilot and gunner) was housed back to back in enclosed cockpits. The aircraft was armed with two synchronized machine guns (one 0.30-in and one 0.50-in) mounted in the upper fuselage nose, plus one flexible 0.30-cal gun operated by the gunner firing upward and to the rear.

Brief manufacturer's trials were conducted in Detroit during the summer of 1931. The XP-900 was delivered to Wright Field on Sept 29, 1931. At that time, the plane was purchased by the USAAC and given the designation YP-24. It was assigned the USAAC serial number of 32-320. The YP-24 underwent testing as a potential replacement for the Berliner-Joyce P-16 two-seat pursuit. The speed of the YP-24 was impressive for its time--it was 40 mph faster than the P-16, but it was also 20 mph faster than the P-6E, at that time the fastest fighter in the USAAC inventory. Maximum speed was 235 mph. Initial climb was 1820 feet/minute. Service ceiling was 25,000 feet and range was 556 miles. Weights were 3010 lbs. empty, 4360 lbs. loaded.

As a result of the tests, the War Department ordered five Y1P-24 two-seat fighters and four Y1A-9 attack planes. The Y1A-9 attack version differed from the pursuit version in being powered by a V-1570-27 rated at a lower altitude and carried a heavier forward-firing armament plus bombs.

The YP-24 seemed to have a promising future ahead of it. However, on October 19, 1931 the YP-24 prototype was lost when its pilot was ordered to bale out rather than attempt a wheels-up landing after the undercarriage lever had broken off. This problem was, of course, easily correctable, but for reasons unrelated to the YP-24 accident, some rather harsh economic realities were about to overtake the Detroit Aircraft Corporation.

The timing of Detroit's acquisition of Lockheed had been particularly unfortunate, since it took place only three months before the stock market crash which was to plunge the USA into the Great Depression. As the Depression deepened, the Detroit Aircraft holding company found that it was in over its head. Rising losses from other operations drained it of any profit. On October 27, 1931, the Detroit Airctraft Corporation went into receivership.

The bankruptcy of the Detroit holding company meant that it could not undertake the manufacture of the Y1P-24s and Y1A-9s. The project was tentatively shelved. It did not revive until after Robert Woods had joined the Consolidated Aircraft Corporation, but that is another story!

It looked like the Depression had Lockheed on the ropes. The bankruptcy of its holding

02/07/31

The deletion of the lower wing increased the top speed of the XP-15 over that of the P-12B, but the rate of climb, the maneuverability, and the landing speed all suffered from the decrease in wing area. Consequently, the design was not accepted for production by the military, and the Army never actually purchased the XP-15 prototype. Therefore, it was never assigned a USAAC serial number.

The XF5B-1 was an almost identical duplicate of the Model 202 that had been ordered for the US Navy. It differed mainly in being fitted for operation from aircraft carriers as a fighter-bomber. An arrester hook was fitted. The engine was a supercharged Pratt and Whitney SR-1340C offering 480 hp at sea level. The company designation for this aircraft was Model 205. The Model 205 was delivered to the Navy in February 1930. Like the Model 202, it was originally tested by the Navy under a bailment contract and bore the civil registration X-271V. By the time that test flights were terminated at the beginning of 1932, it had been decided that the monoplane still did not have the reliability needed for a successful carrier-based airplane. Although the Navy did not accept the aircraft as a production type, they nevertheless purchased the airplane and the designation XF5B-1 became official. The serial number was A-8640. After three years of testing, the airframe was static tested to destruction.

After return to the factory from Wright Field, the XP-15 was used for further test and development work, in the vain hope that it might eventually be granted an Army contract. However, all such hopes were dashed on February 7, 1931, when the XP-15 crashed near Seattle after a propeller blade failed during a vertical climb following a high speed run. The resulting vibration shook the engine out of the airframe. The program was abandoned shortly thereafter. Although the aerodynamic design was not accepted by the Army, many of the structural features of the XP-15 were incorporated into later models of the P-12/F4B series then in production.

Sources:

1. Boeing Aircraft since 1916, Peter M. Bowers, Naval Institute Press, 1989.
2. "Boeing F4B-4", Peter M. Bowers, in "Aircraft in Profile", Doubleday, 1969.
3. United States Military Aircraft Since 1909, Gordon Swanborough and Peter Bowers, Smithsonian Institution Press, 1989.
4. The American Fighter, Enzo Angellucci and Peter Bowers, Orion Books, 1987.

June 7, 1931

Martin
Bombers

≈6/31

Martin 118, 124, 125, and 129

XT6M-1, Export General Purpose Bomber, BM-1 & 2 Dive Bombers

Besides building flying boats, the Martin Company sought to keep its hand in the single-engine bomber market. The specifications for the XT5M-1 in 1928 had included torpedo capability, and in 1930 Martin won a Navy contract for a single experimental two-man monocoque-fuselage torpedo bomber. The XT6M-1, Martin Model 118, failed to attract a Navy production order. Martin looked for export sales for an updated version of the T4M-1. The Martin Model 124 was offered as a "general purpose bomber," with shipping prices noted for a number of Latin American countries. Equipped with a ring cowl, it was advertised as being 6-8 mph faster than the original, at an attractive price - $40,000 equipped with engine and instruments. Again, no orders came.

In April 1931 Martin finally received the fruits of the dive-bomber competition the previous year in the shape of a production order from the Navy. The quantity, however, was a stingy Depression-era seventeen planes. Now designated as bombers, BM-1, they differed only slightly from the prototype XT5M-1. The initial BM-1 sported a ring cowl around its radial engine and streamlined "pants" over its wheels - though these racy extravagances seem to have been discarded in service use. After the first two planes crashed during flight testing, a sample was taken from the middle of the production run, designated XBM-1, and sent for further study to the National Advisory Committee on Aeronautics. Wings were strengthened, and some of the plane's lines altered slightly to improve safety. The crashes did not interfere with a second order for another seventeen BM-2's, Martin Model number 129, later in 1931.

The BM-1's and later BM-2's went straight to Navy Torpedo Squadron One aboard the carrier Lexington, then flying T4M's. After receiving the new dive bombers, the squadron was retitled Bombing One. In 1935, VB-1 transferred to the new USS Ranger, from which BM-1's and 2's operated until replaced by Douglas SBD's in 1937. A few lingered ashore in reserve units until 1940.

Complete Model Specifications [redacted]

07/23/1934

BOEING 247

ACCIDENT DETAILS	
Date:	February 23, 1934 first flight 2-8-33
Time:	c 02:00
Location:	Near Salt Lake City, Utah
Airline/Op:	Boeing Aircraft Company
Flight #:	?
Route:	Salt Lake City - Cheyenne
AC Type:	Boeing 247
Registration:	NC13357
cn / ln:	1739
Aboard:	8 (passengers:? crew:?)
Fatalities:	8 (passengers:? crew:?)
Ground:	0
Summary:	Crashed into a mountain shortly after takeoff during a snowstorm while en route.

Return to Home Page

ACCIDENT DETAILS	
Date:	January 31, 1957
Time:	11:18
Location:	Near Sunland, California
Airline/Op:	Douglas Aircraft
Flight #:	?
Route:	Santa Monica - Santa Monica
AC Type:	Douglas DC-7B / U.S. Air Force F-89J
Registration:	N8210H/52-1870A
cn / ln:	45192 / 4447
Aboard:	6 (passengers:0 crew:6)
Fatalities:	5 (passengers:0 crew:5)
Ground:	3
Summary:	Midair collision between a DC-7 and F-89J Air Force fighter. The DC-7 crashed into a playground of a school killing 3 junior high school children 3 miles northwest of Sunland. The F-89 crashed into the mountains. Four crew members on the DC-7 were killed. One crew member aboard the F-89 was killed and the other ejected to safety. The high rate of near head-on closure at high altitude, which together with physiological limitations, resulted in a minimum avoidance opportunity during which the pilots didn't see each other's aircraft. It was the first test flight of the DC-7B.

Return to Home Page

9/18/1935

1/20/1933
1/13/1933

A-11 (P-30)

1/13/33
1/20/33
9/18/1935

Consolidated A-11 - *Chapter 1*

Attack Version of P-30

Last revised: 29 May 1998

Consolidated A-11
Consolidated A-11 - Sources

When the Detroit Aircraft Corporation, went into receivership in 1931, it was unable to fulfill its contract to manufacture YP-24 fighters and Y1A-9 attack planes for the USAAC. In addition, Detroit Aircraft's chief engineer Robert J. Woods was now out of a job.

However, Woods was soon recruited by the Consolidated Aircraft Corporation of Buffalo, New York, and he continued to work on his YP-24 design after he went over to Consolidated. Despite the failure of the Detroit company, the USAAC was still interested in the YP-24 design. The Army ordered a single prototype of Wood's basic design from Consolidated under the designation Y1P-25. The serial number was 32-321.

At first glance, Consolidated's Y1P-25 looked much the same as did the Detroit YP-24. It was a two-seat, low wing monoplane with fully-retractable main landing gear. However, there were significant differences. The Y1P-25 had an all-metal wing in place of the wood-frame, plywood-covered wing of the YP-24. In addition, the tail of the Y1P-25 was larger, and metal was substituted for the fabric covering on the tail control surfaces. The engine was a 600 hp Curtiss V-1570-27 Conqueror, 12-cylinder liquid-cooled engine with turbosupercharger mounted on the port side (the YP-24 had no supercharger). The armament was two fixed, forward-firing machine guns mounted in the upper fuselage, plus one flexible machine gun operated by the gunner in the rear cockpit.

A second prototype of the basic Consolidated design was ordered as a ground attack aircraft. Designated Y1A-11, the aircraft differed from the Y1P-25 primarily in having a Conqueror engine without a supercharger. In addition, the Y1A-11 had two more guns in the nose and racks for up to 400 pounds of bombs. The serial number of the Y1A-11 was 32-322.

The flight tests with the Y1P-25 and its Y1A-11 attack counterpart went quite well. However, the Y1P-25 crashed on January 13, 1933, and was so badly damaged that it was a write-off. The Y1A-11 crashed a week later.

In spite of the two crashes, the USAAC did not feel that there was any intrinsic flaw in the basic design, and later that month a contract for four production examples of the pursuit version was issued under the designation P-30 (Ser Nos 33-204/207). The P-30 differed from the Y1P-25 by having a 675 hp Curtiss V-1570-57 with twin-blade constant-speed prop, simplified undercarriage, and revised cockpit canopy. Four similar A-11 (33-308/311) attack versions were also ordered with unsupercharged V-1570-59 engines.

The A-11 had a performance far in advance over its contemporaries when deliveries began in August of 1934. However, its liquid-cooled engine blocked its wider acceptance, since the Army preferred air-cooled radial engines for its attack planes because of their lower cost and reduced vulnerability to enemy fire. Its

Consolidated Y1P-25

01/13/1933
01/28/1933

Last revised June 10, 1999

When Lockheed's holding company, the Detroit Aircraft Corporation, went into receivership in 1931, they were unable to fulfill their contract to manufacture YP-24 fighters for the USAAC. In addition, Detroit Aircraft's chief engineer Robert J. Woods was now out of a job. However, Woods was soon recruited by the Consolidated Aircraft Corporation of Buffalo, New York.

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The Y1P-25 was delivered to the Army on December 9, 1932. First tests were very encouraging. Thanks to the turbosupercharger, the Y1P-25 could achieve 247 mph at 15,000 feet in spite of 700 lbs more weight as compared to the YP-24. The maximum speed was 205 mph at sea level. The Y1P-25 could climb to 10,000 feet in 6.7 minutes. Weights were 3887 lbs empty, 5110 lbs gross.

The flight tests with the Y1P-25 and its Y1A-11 attack counterpart went quite well. However, the Y1P-25 crashed on January 13, 1933, and was so badly damaged that it was a writeoff. The Y1A-11 crashed a week later.

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Plans for the construction of two Y1P-25s with Pratt and Whitney radial engines which were allocated the designations YP-27 and YP-28 did not materialize.

Sources:

10/30/1935

Boe Mode 299
B-17 Prototype

The Boeing Model 299 Crash

(15 November 1935)
"Cause of crash of the Boeing bomber"
The findings of the Board of Officers convened at Wright Field, Dayton, Ohio, to investigate the cause of the crash on October 30, 1935, of the Boeing Aircraft Company Bombardment plane, model 299, were to the effect that the accident was not due to structural failure, or to the malfunctioning or failure of any of the four engines, the airplane control surfaces or the automatic pilot, but to the locked condition of the rudder and elevator surface controls (primarily the latter), which made it impossible for the pilot to control the airplane.

These findings were based on the locked condition of the controls after the crash; the testimony of Lieut. Donald Putt, co-pilot; of Mr. Leslie R. Tower, Boeing Aircraft Company test pilot, as to the behavior of the airplane in the air, and the testimony of eyewitnesses as to the behavior of the airplane on take off and flight.

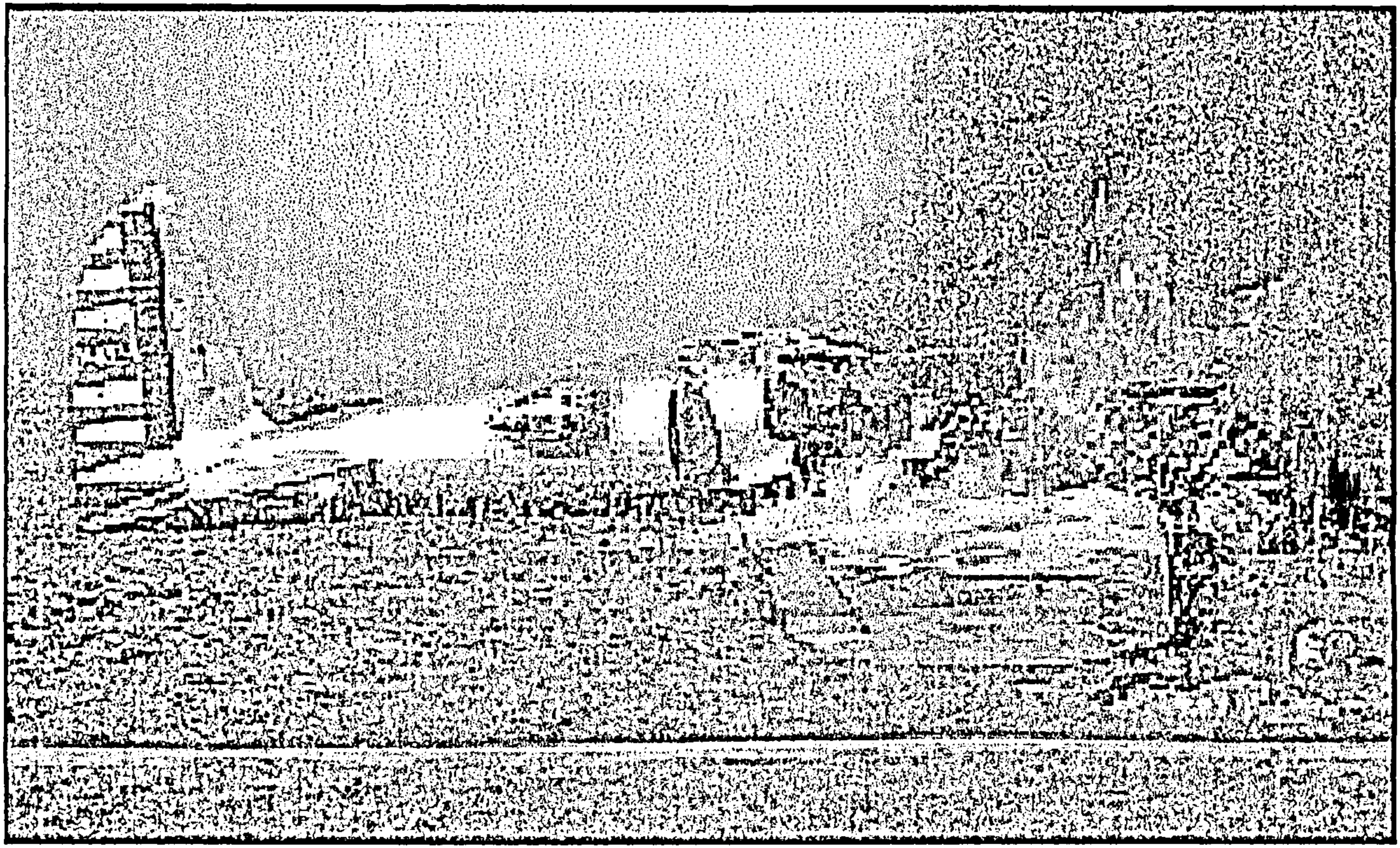
From the evidence submitted the Board reached the conclusion that the elevator was locked in the first hole of the quadrant on the "up elevator" side when the airplane took off, for had the elevator been in either of the "down elevator" holes on the quadrant or the extreme "up elevator" hole, it would have been impossible for the airplane to be taken off in the former case, and in the latter case the pilot could not have gotten into the seat without first releasing the controls. With the elevator in this position they are inclined at an angle of 12.5 degrees.

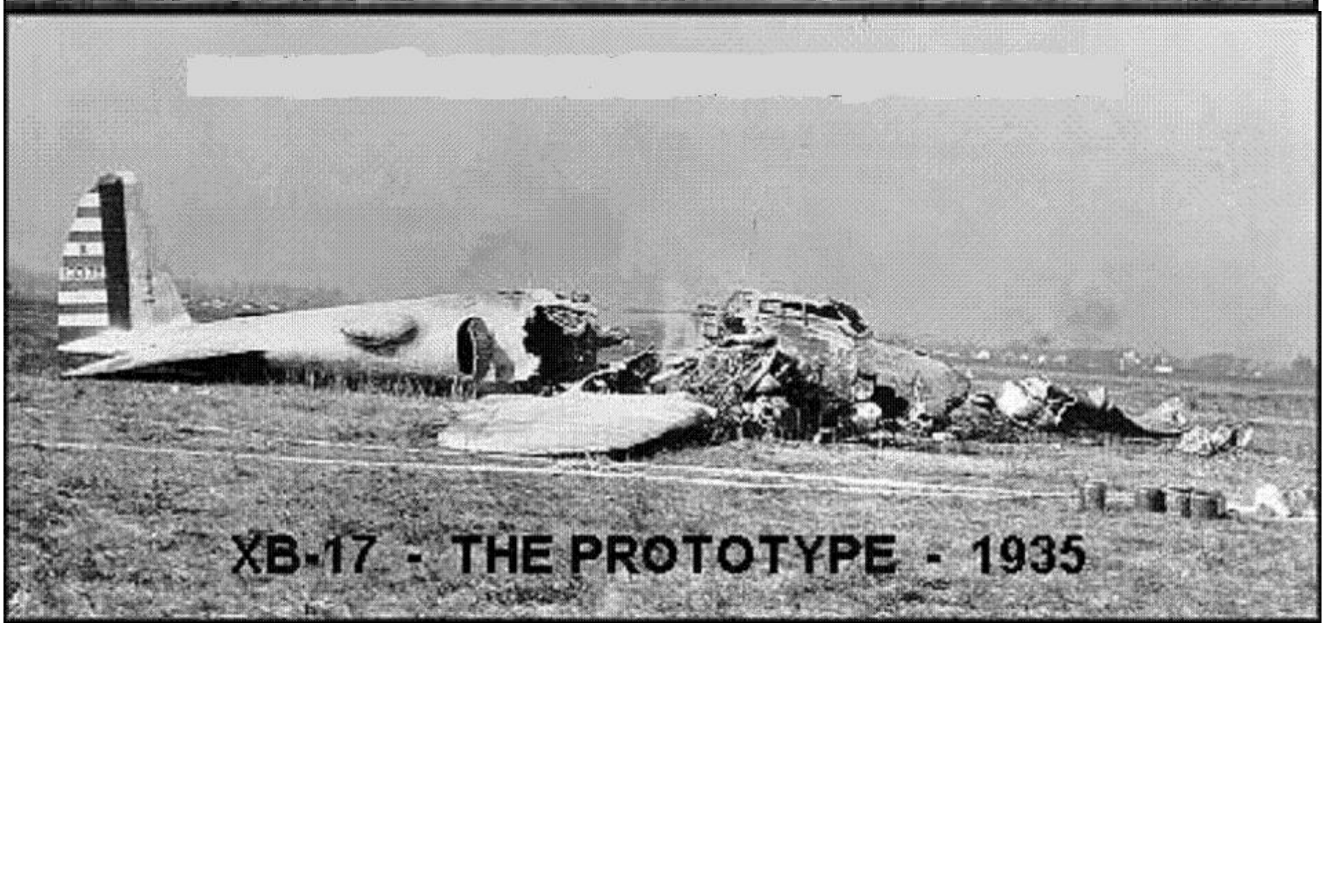
During the take-off run the airplane could not assume an angle of attack greater than the landing angle of the airplane (7.5 degrees) plus the angle of incidence of the monoplane wing to the fuselage (3 degrees) or a total angle of 10.5 degrees. This would not be particularly noticeable to the pilot during the ground run.

However, as soon as the airplane left the ground, which several witnesses testified was in a tail low attitude, the elevators, with increasing power, varying as the square of the air speed (approximately 74 miles per hour at take-off), tended constantly to increase the angle of attack, until the stall was reached. The trim tab on the elevator also tended to aggravate this extreme tail heavy position, since with locked elevators, and the pilot pushing forward on the control column, the trim tabs were up, and themselves acted as small elevators on the fixed elevator proper.

Due to the size of the airplane and the inherent design of the control system, it is improbable that a pilot, taking off under these conditions, would discover that the controls were locked until too late to prevent a crash.

The locked condition of the controls was due either to the possibility that no effort was made to unlock the controls prior to take-off, and as a result the controls were fully locked; the possibility that the pilot only partially depressed the locking handle and as a result the locking pin was only partially withdrawn from its hole in the face of the locking quadrant; or the possibility that the locking handle was fully depressed prior to take-off and, due to the malfunctioning of the system, did not fully disengage the locking pin. There is no evidence to show that the system had ever malfunctioned, but due to the inherent design it must be





XB-17 - THE PROTOTYPE - 1935


See Back Cover!
NOVEMBER 25c
POPULAR AVIATION
WORLD PLANES with Addresses

5A

4 copies of Bd.Proc.
All copies to Gen.
Files 1-30-36.

Prev. acc. 2-5-26 10-16-32

AIRCRAFT ACCIDENT ANALYSIS

Pilot HILL, Ployer P. Rating RMA (7-30-18) AP (10-16-19)

Passengers
*1st Lt.Donald L.Putt,AC,Co-Pilot
*Mr.Leslie M.Tower,Boeing Co-Plt.
*Mr.Mark H.Koogler,Airplane Mech.
*Mr.Jno.B.Cutting,Jr.,Aero,Engr.

Date 10-30-35 Time 9:11AM

Air. Sta. Wright Field, Ohio

Air. Org. Flying Branch

Air. Type Boeing Bomb. No. 299

Eng. Type S1E-G1690 No. 4 Commercial

No.

No.

Place of Acc. Wright Field,Ohio

Duration this flight :01

Mission Symbol 31-T

Total Eng. Hrs 9:05 36:45 36:45

Eng. Hrs. Since Overhaul New(3)

Hrs. Since Oil Change 9:05 10:40 10:40

RANK
Reg. Army Major
Reserve Corps-1 yr. Duty
" " -14 day Duty
" " -Inactive
Student
Nat. Guard
Other

Total Pilot Hours 3337:10

Total No. of Accidents 2 Prev. 1 Boeing Bomber

Rate per 1000 Hrs.

Hours per Month 30:25
Past 3 Months

Hours 178:Bombers
this type aircraft
Boeing 299: 5:50

NATURE OF ACCIDENT	
Collision-other aircraft A	
Collision-other objects B	
Spin fol. eng. failure C	
Spin w/o eng. failure D	X
Forced Landing E	
Landing F	
Take-off G	
Taxying H	
Fire in the air I	
Structural--In air N	
Misc. X	
Indeterminate \	
Parachute	

RESULTS TO PERSONNEL

Class	Pilot	Pass.
Death A	1	*1(Tower)
Major Injury B		*2-Co-Plts *1-Civ.Mech
Minor Injury C		*1-Civ.Engr
No Injury D		

RESULTS TO MATERIEL

Complete Wreck A	Pl & Engs.
Major Overhaul B	
Major Replacement C	
Minor Damage D	
No Damage E	

CAUSES

Flight control system (locking device) (design-arrngmt)	100 25
Other personnel	25
Carelessness	50

Account: Pilot's statement: Pilot fatal.
A.C.C. state't: At approximately 9:10 AM, Oct. 30th, at Wright Field, Dayton, Ohio, the Boeing Aircraft Co. 4 engine Bombardment type airplane, Model No. 299, while being flown on a duly authorized test flight, took off at Wright Field, into the wind; immediately upon leaving the ground the airplane assumed an abnormally steep climbing attitude, continued in this attitude until it stalled at approximately 300 ft. altitude, fell off to the left in a partial spin and then crashed power on, near the center of Wright Field and immediately burst into flames.

(For additional statements and recommendations, see General Files)

IN REPLY REFER TO

REF. NO.

DEPARTMENT OF COMMERCE
BUREAU OF AIR COMMERCE
WASHINGTON

November 21, 1935.

Brigadier General O. Westover, A. C.,
Acting Chief of the Air Corps,
War Department,
Washington, D. C.

Dear General Westover:

We are in receipt of your letter of November 18, 1935 relative to obtaining the loan of, or a copy of the report covering the accident to the Boeing Bomber at Dayton, Ohio.

We appreciate your willingness to cooperate with this Bureau, and in order to expedite matters and to assure you that the matter will be kept in strict confidence, I can detail our Chief of Air Line Inspection Service, R. W. Schroeder, to go to your office and make a study of the cause with a view to taking such precautionary measures as may be necessary in our air line regulations to minimize the possibility of another accident from a similar cause.

Schroeder, as you may recall, is a Major in the Air Corps Reserve, and was formerly in charge of the Test Flight Section at Dayton, Ohio.

Very truly yours,

J. Carroll Cone,
Assistant Director of Air Commerce,
(Air Regulations).

P. S. If this arrangement is satisfactory we would like to send a representative of our Engineering Section with Mr. Schroeder.

J. C. C.

BOARD PROCEEDINGS

INVESTIGATION

of

CRASH OF BOEING BOMBARDMENT AIRPLANE

MODEL 299

on

OCTOBER 30, 1935.

WRIGHT FIELD DAYTON, OHIO.

CONFIDENTIAL

BOARD PROCEEDINGS

Proceedings of a Board of Officers which convened at Wright Field, Dayton, Ohio, pursuant to the following orders:

HEADQUARTERS
WRIGHT FIELD
DAYTON, OHIO

October 30, 1935.

SPECIAL ORDERS)
NO. 227)

EXTRACT

* * *

1. Under the provisions of Army Regulations 600-630 a Board of Officers is appointed to meet at this station at the call of the President thereof for the purpose of investigating, determining the cause and reporting upon all circumstances attending the accident of the Boeing Model 299 Bombardment Airplane, submitted to the Government as part of their bid on Circular Proposal 35-26, which occurred at Wright Field, Dayton, Ohio at about 9:10 A. M., October 30, 1935, piloted by Major Ployer P. Hill, Air Corps and which resulted in the death of Major Ployer P. Hill, Air Corps, and injuries to First Lieutenant Donald L. Putt, Air Corps, Airplane Mechanic Mark H. Koogler, Junior Aeronautical Engineer John B. Cutting (employees of the Materiel Division), and Mr. Lester R. Tower, employee of The Boeing Company, Seattle, Washington.

Detail for the Board:

Lieutenant Colonel Frank D. Lackland, Air Corps,
Captain Howard Z. Bogert, Air Corps,
Captain James M. Gillespie, Air Corps,
Captain Laurence C. Craigie, Air Corps,
Captain Cecil W. Dingman, Medical Corps.

* * *

By order of Colonel Martin:

ROBT. S. HEALD,
Captain, Air Corps,
Acting Adjutant.

OFFICIAL:
ROBT. S. HEALD,
Captain, Air Corps,
Acting Adjutant.

Copies:
Lt. Col. Lackland
Capt. Bogert
Capt. Gillespie
Capt. Craigie
Capt. Dingman
Files

WRIGHT FIELD
DAYTON, OHIO

October 30, 1935.

The Board, pursuant to the foregoing order, were informed at the scene of the crash and shortly thereafter, October 30, 1935, that they had been so appointed.

Present:

Lieutenant Colonel Frank D. Lackland, Air Corps
Captain Howard Z. Bogert, Air Corps
Captain James M. Gillespie, Air Corps
Captain Laurence C. Craigie, Air Corps

The Board first interviewed Mr. John B. Cutting, the Flight Test Observer in the Boeing Bomber, Model 299, on this particular flight, just prior to his being taken to the Miami Valley Hospital. (Exhibit "A", page 1).

The Board then made a detailed examination of the wreck of the airplane. (Exhibit "F").

The Board then interviewed the following witnesses:

(Exhibit "A" - Pages 1 & 2)	- Mr. William E. Hatcher, Armament Mechanic, Wright Field, eye witness.
" " - Pages 2, 3, 4 & 5)	- Mr. Lambert Wells, Project Engineer, Boeing Aircraft Company, assigned to Boeing Bomber Model 299.
" " - Page 7)	- Mr. Marvin D. McDaniels, Flight Test Observer, Wright Field, eye witness.
" " - Pages 5 & 6)	- Captain Frank G. Irvin, Air Corps, Test Pilot, Flying Branch, Wright Field, eye witness.
" " - Pages 6 & 7)	- Captain Sam R. Harris, Jr., Air Corps, Test Pilot, Flying Branch, Wright Field, eye witness.
" " - Page 8)	- Mr. Fred W. Heckert, Power Plant Branch, Wright Field, eye witness.
" " - Pages 9 & 10)	- Mr. Henry K. Igo, Service Representative, Pratt & Whitney Engine Company, eye witness.
" " - Pages 11 & 12)	- Mr. H. D. West, Jr., Mechanic, Boeing Aircraft Company, eye witness.
" " - Pages 10 & 11)	- Mr. C. W. Benton, Jr., Mechanic, Boeing Aircraft Company, eye witness.

The Board adjourned at 5:45 P. M. and met again on October 31, 1935 at 9:00 A. M.

Present:

Lieutenant Colonel Frank D. Lackland, Air Corps
Captain Howard Z. Bogert, Air Corps
Captain James M. Gillespie, Air Corps
Captain Laurence C. Craigie, Air Corps

The Board interviewed the following-named witnesses:

(Exhibit "B" - Pages 1, 2 & 3)	- Mr. Roy O. Grooms, Airplane Mechanic, Wright Field, Crew Chief of Boeing Bomber Model 299.
" " -, Pages 3 & 4)	- Captain Frank G. Irvin, Air Corps (Recalled)
" " - Page 4)	- Mr. George Holland, Hangar Superintendent, Wright Field.
" " - Pages 4 & 5)	- Mr. Allen J. Bowman, Airplane Mechanic, Wright Field, eye witness.
" " - Pages 5, 6 & 7)	- Mr. M. G. Cassell, Aircraft Liaison Engineer, Wright Field.
" " - Pages 8 & 9)	- Mr. Edward L. Pratt, Flight Test Unit, Wright Field.
" " - Pages 9 & 10)	- Captain Howard H. Couch, Air Corps, Propeller Unit, Wright Field.
" " - Page 10)	- Mr. M. G. Cassell, (recalled)
" " - Page 11)	- Mr. Donald B. Weaver, Project Engineer on Automatic Pilots, Wright Field.

The Board adjourned at 5:45 P. M. and met again on November 1, 1935 at 9:00 A. M.

Present:

Lieutenant Colonel Frank D. Lackland, Air Corps
Captain Howard Z. Bogert, Air Corps
Captain James M. Gillespie, Air Corps
Captain Laurence C. Craigie, Air Corps

The Board interviewed the following-named witnesses:

(Exhibit "C" - Pages 1 & 2)	- Mr. Roy O. Grooms. (Recalled)
" " - Pages 2 & 3)	- Mr. Joseph Harriman, Chief Inspector, Flying Branch, Wright Field.
" " - Pages 4 & 5)	- Mr. C. W. Benton, Jr. (Recalled)
" " - Page 6)	- Mr. H. D. West, Jr. (Recalled)
" " - Pages 6, 7 & 8)	- Mr. Lambert Wells. (Recalled)

The Board adjourned at 6:00 P. M. and met again on November 2, 1935 at 9:00 A. M.

Present:

Lieutenant Colonel Frank D. Lackland, Air Corps
Captain Howard Z. Bogert, Air Corps
Captain James M. Gillespie, Air Corps
Captain Laurence C. Craigie, Air Corps

The Board interviewed the following-named witnesses:

(Exhibit "D" - Pages 1 & 2)	- Captain Cecil W. Dingman, Air Corps, Post Surgeon, Wright Field.
" " - Pages 2 & 3)	- Mr. John B. Cutting. (Recalled)

The Board adjourned at 12:00 Noon and met again November 4, 1935 at 9:00 A. M.

Present:

Lieutenant Colonel Frank D. Lackland, Air Corps
Captain Howard Z. Bogert, Air Corps
Captain Cecil W. Dingman, Medical Corps
Captain Laurence C. Craigie, Air Corps

The Board proceeded to Miami Valley Hospital, Dayton, Ohio and interviewed the following-named witnesses:

(Exhibit "E" - Pages 1, 2, 3, 4 & 5)	- First Lieutenant Donald L. Putt, Air Corps, Test Pilot, Wright Field.
" " - Pages 5 & 6)	- Mr. Leslie R. Tower, Test Pilot of Boeing Aircraft Company.
" " - Pages 6 & 7)	- Mr. Mark H. Koogler, Airplane Mechanic, Wright Field.
" " - Pages 7 & 8)	- First Lieutenant Robert K. Giovannoli, Air Corps, Power Plant Branch, Wright Field.

The Board returned to Wright Field and interviewed the following-named witnesses:

(Exhibit "E" - Pages 8 & 9)	- First Lieutenant Leonard F. Harman, Air Corps, Project Officer on Bombardment Airplanes, Wright Field.
" " - Pages 9 & 10)	- Captain Dudley W. Watkins, Air Corps, Power Plant Branch, Wright Field.

The Board then proceeded to review all evidence, testimony and records pertaining to the accident and arrived at the following findings, after which it adjourned, sine die.

FINDINGS

After careful and due consideration of the facts brought out in its investigation the Board finds:

1. That at approximately 9:10 A.M. on October 30, 1935 at Wright Field, Dayton, Ohio, the Boeing Aircraft Company Bombardment Airplane Model 299, while being flown on a duly authorized test flight, took off, immediately assumed an abnormally steep climbing attitude, continuing in this attitude until it stalled at approximately 300 feet altitude and then crashed, power on, on the airdrome, and immediately caught fire.

2. That on this flight the airplane was manned by the following crew:

Pilot	Major Ployer P. Hill, Air Corps
Co-pilot	1st Lieut. Donald L. Putt, Air Corps
Contractor's Representative	Mr. Leslie R. Tower, Chief Pilot of the Boeing Aircraft Company.
Flight Test Observer	Mr. John B. Cutting, Junior Aeronautical Engineer in employ of the Material Division.
Mechanic	Mr. Mark H. Koogler, employee of the Material Division.

3. That the crash and accompanying fire resulted in the total destruction of the airplane.

4. That Major Ployer P. Hill, Air Corps, O-11474, stationed at Wright Field, Dayton, Ohio, was on an authorized test flight at Wright Field, and that at approximately 9:10 A.M. on October 30, 1935, crashed and was thereby injured and burned as a result of the crash. The injuries were as follows: (1) Cerebral lacerations, multiple, severe, generalized. (2) Shock, surgical, severe. (3) Fracture, compound, comminuted, beginning at the supra orbital notch, right, extending centrally along the roof, medial wall and floor of orbit, right, through the optic foramen, cribriform plate and base of skull, involving foramen magnum. (4) Evulsion of eye and all of orbital contents, right. (5) Burns, 1st and 2nd degree, generalized, involving the entire body. (6) Lacerated wound, 3 cm long, transverse, approximately 2 cm above insertion of tendo achilles on os calcis, partially severing tendo achilles, right. (7) Wounds, lacerated, scalp, multiple, severe.

5. That Major Ployer P. Hill died at Miami Valley Hospital, Dayton, Ohio, at 12:45 P.M. on October 30, 1935. The immediate cause of death being: (1) Cerebral lacerations, multiple, severe, generalized. (2) Shock, surgical, severe.

6. That at the time of the crash Major Ployer P. Hill was not under the influence of alcohol or narcotic drugs.

7. That the death of Major Ployer P. Hill occurred in line of duty and not as a result of his own misconduct.

8. That First Lieutenant Donald L. Putt, Air Corps, O-17875, stationed at Wright Field, Dayton, Ohio, was on an authorized test flight at Wright Field and that at approximately 9:10 A.M. on October 30, 1935, crashed and was thereby injured and burned as a result of the crash. The injuries were as follows: (1) Lacerated wound, 12 cm long, extending to the bone, beginning in the left eyebrow, above the supra-orbital notch, extending in a crescentric manner posteriorly over the temporal area, left, and ending near the lambdoidal suture line, approximately 5 cm to left of the mid saggital line. (2) Contusion, moderately severe, inner surface, ankle, right. (3) Contusion, moderately severe, posterior surface, lower third, arm, right, 4 cm diameter. (4) Burns, 1st and 2nd degree, on face, ear and scalp, right.

9. That First Lieutenant Donald L. Putt was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M. on October 30, 1935, where proper treatment was administered.

10. That at the time of the crash First Lieutenant Donald L. Putt was not under the influence of alcohol or narcotic drugs.

11. That the injuries suffered by First Lieutenant Donald L. Putt were incurred in line of duty and were not the result of his own misconduct, and are not likely to result in permanent, partial or complete disability.

12. That Leslie R. Tower, test pilot employed by the Boeing Aircraft Company, was on a test flight at Wright Field at the request of Major Ployer P. Hill, Chief, Flying Branch. At approximately 9:10 A.M. on October 30, 1935 the airplane, piloted by Major Ployer P. Hill, crashed and burned thereby causing the following injuries to be inflicted upon Leslie R. Tower: (1) Multiple areas of 2nd degree burns, over face, hands, arms and legs. (2) Contused and lacerated wounds, multiple, severe, over the vertex of the skull, extending to the bone. (3) Fracture, simple, linear, transverse, through parietal bone.

13. That Leslie R. Tower was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M. of October 30, 1935, where proper treatment was administered.

14. That Leslie R. Tower was not under the influence of alcohol or narcotic drugs.

15. That the injuries suffered by Leslie R. Tower were incurred as a result of an airplane crash as above described and are not the result of any misconduct on his part. It is undetermined as to whether or not any disability will result.

16. That John B. Cutting, government civilian employee, employed at Wright Field, Dayton, Ohio, in the capacity of Junior Aeronautical Engineer, was on an authorized test flight at Wright Field, Dayton, Ohio, October 30, 1935, and at approximately 9:10 A.M., the airplane, piloted by Major Ployer P. Hill, Air Corps, crashed and burned thereby causing the following injuries to be inflicted upon John B. Cutting: (1) Burns, 1st and 2nd degree, face, all surfaces.

17. That John B. Cutting was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M., October 30, 1935, where proper treatment was administered.

18. That John B. Cutting was not under the influence of alcohol or narcotic drugs.

19. That the injuries suffered by John B. Cutting were incurred in line of duty and were not the result of his own misconduct, and are not likely to result in permanent, partial or complete disability.

20. That Mark H. Koogler, government civilian employee, employed at Wright Field, Dayton, Ohio, in the capacity of Airplane Mechanic, was on an authorized test flight at Wright Field, Dayton, Ohio, October 30, 1935, and at approximately 9:10 A.M. the airplane, piloted by Major Ployer P. Hill, Air Corps, crashed and burned thereby causing the following injuries to be inflicted upon Mark H. Koogler; Burns, 1st and 2nd degree, face, all surfaces.

21. That Mark H. Koogler was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M., October 30, 1935, where proper treatment was administered.

22. That Mark H. Koogler was not under the influence of alcohol or narcotic drugs.

23. That the injuries suffered by Mark H. Koogler were incurred in line of duty and were not the result of his own misconduct and are not likely to result in permanent, partial or complete disability.

24. That the direct cause of the crash was the locked condition of the rudder and elevator surface controls (primarily the latter) which made it impossible for the pilot to control the airplane. This finding is based on the following:

(a) The locked condition of the controls after the crash.

(b) The testimony of First Lieutenant Donald B. Putt, Air Corps, Co-pilot, and of Mr. Leslie R. Tower, the Boeing Aircraft Company's Test Pilot, as to the behavior of the airplane in the air.

(c) The testimony of eye witnesses as to the behavior of the airplane on the take-off and in flight.

From the evidence submitted the Board believes that the elevator was locked in the first hole of the quadrant on the "up elevator" side, when the airplane took off. Had the elevator been in either of the "down elevator" holes on the quadrant or the extreme "up elevator" hole, it would have been impossible for the airplane to be taken off in the former case, and in the latter case the pilot could not have gotten into the seat without first releasing the controls. With the elevators in this position they are inclined at an angle of 12-1/2 degrees to the stabilizer. This checks the position in which Mr. Igo testified he locked the elevators to run up the engines.

During the take-off run the airplane could not assume an angle of attack greater than the landing angle of the airplane (7-1/2 degrees) plus the angle of incidence of the monoplane wing to the fuselage (3 degrees) or a total angle of 10-1/2 degrees.

This would not be particularly noticeable to the pilot during the ground run. However, as soon as the airplane left the ground, which several witnesses testified was in a tail low attitude, the elevators, with increasing power, varying as the square of the air speed (approximately 74 miles per hour at take-off), tended constantly to increase the angle of attack, until the stall was reached. The servo tab on the elevator also tended to aggravate this extreme tail heavy condition, since with locked elevators, and the pilot pushing forward on the control column, the servo tabs were up, and themselves acted as small elevators on the fixed elevator proper.

25. That due to the size of the airplane and the inherent design of the control system it is improbable that a pilot, taking off under these conditions, would discover that the controls were locked until too late to prevent a crash. This finding is based upon the following facts:

(a) The rudder forces are high and it is customary to maintain directional control during the take-off run by manipulation of the throttles.

(b) The elevator forces are high and it is customary to set the elevator trim tab at such a position that the airplane flies itself off the ground when flying speed is attained.

(c) With the controls locked there is approximately four inches of fore and aft travel of the control wheel and a lesser degree of travel of the rudder pedals. This movement actuates the servo control tabs and is opposed by springs which are incorporated into the control system. This movement is more than would be required to take-off the airplane under normal conditions.

26. That the locked condition of the controls was due either to:

(a) The possibility that no effort was made to unlock the controls prior to take-off and as a result the controls were fully locked. Due to the death of the pilot this possibility cannot be definitely determined; or

(b) The possibility that the pilot only partially depressed the locking handle and as a result the locking pin was only partially withdrawn from its hole in the face of the locking quadrant; or

(c) The possibility that the locking handle was fully depressed prior to take-off and due to malfunctioning of the system did not fully disengage the locking pin. There was no evidence to show that the system had ever malfunctioned but due to the inherent design it must be considered as a possibility.

27. That the crash was not due to any faulty structural or aerodynamic design of this airplane nor to any undesirable or adverse flying or handling qualities of the airplane.

28. That the crash was not due to structural failure.

29. That there is no evidence of sabotage or attempt at sabotage.

30. That there is no evidence of failure or malfunctioning of any of the flight controls or control surfaces.

31. That there is no evidence of any malfunctioning or failure of any of the four engines or propellers.

32. That the automatic pilot was not in operation and could not in any way have been responsible for the crash.

33. That the distribution of the load in the airplane was the same as that used on previous flights and that this load was all properly secured.

34. That the accident was not the result of faulty maintenance.

35. That no adverse comments on the control locking mechanism of the Boeing Model 299 were made on the 689 Inspection Report by any of the branches of the Engineering Section.

36. That First Lieutenant Donald L. Putt, Air Corps, Mr. John B. Cutting and Mr. Mark H. Koogler escaped from the wrecked and burning airplane unaided, and that Major Ployer P. Hill and Mr. Leslie R. Tower due to their injuries were unable to escape from the pilot's cockpit without assistance. First Lieutenant Robert K. Giovannoli, Air Corps, assisted Mr. Leslie R. Tower from the airplane, and then, at great risk to himself, got inside the burning cockpit, extricated Major Ployer P. Hill and passed him out of a window. Meantime, First Lieutenant Leonard F. Harman, Air Corps, also at considerable personal risk, protected First Lieutenant Robert K. Giovannoli with a fireproof blanket, received Major Ployer P. Hill as he was pushed out of the wreck, and passed him to personnel on the ground.

37. That First Lieutenant Robert K. Giovannoli, Air Corps, O-18002, stationed at Wright Field, Dayton, Ohio, in the course of rescue of the occupants of the disabled airplane, suffered the following injuries: (1) Burns, 1st and 2nd degree, both hands, all surfaces. (2) Burns, 1st and 2nd degree, irregular in outline, approximately 10 by 40 cm over back, on right scapular region. (3) Burns, 1st degree, face, all surfaces.

38. That First Lieutenant Robert K. Giovannoli was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M., October 30, 1935, where proper treatment was administered.

39. That First Lieutenant Robert K. Giovannoli was not under the influence of alcohol or narcotic drugs.

40. That the injuries suffered by First Lieutenant Robert K. Giovannoli were incurred in line of duty and were not the result of his own misconduct and are not likely to result in permanent, partial or complete disability.

41. That First Lieutenant Leonard F. Harman, Air Corps, O-17479, stationed at Wright Field, Dayton, Ohio, in the course of rescue of the occupants of the disabled airplane suffered the following injuries: Burns, 1st and 2nd degree, palmar surfaces, all fingers, both hands.

42. That First Lieutenant Leonard F. Harman was transported by ambulance to Miami Valley Hospital, Dayton, Ohio, arriving there at about 10:00 A.M., October 30, 1935, where proper treatment was administered.

43. That First Lieutenant Leonard F. Harman was not under the influence of alcohol or narcotic drugs.

44. That the injuries suffered by First Lieutenant Leonard F. Harman were incurred in line of duty and were not the result of his own misconduct and are not likely to result in permanent, partial or complete disability.

45. The Board finds that the locking device as incorporated in this airplane is faulty in the following respects:

(1) The condition of the controls, that is, whether locked or unlocked, is not directly apparent to the pilot.

(a) No warning device is incorporated on the instrument board which would prevent an attempt to take-off with the controls locked.

(b) The location of the locking handle is such that it is out of the pilot's normal range of vision.

(c) The inherent flexibility of the flight control system, due to the springs which oppose movement of the servo tabs, is such that the pilot could make an apparently normal take-off without being aware that the controls were locked.

(2) The relative motions of the control locking handle in the cockpit and the locking pins in the elevator and rudder quadrants are such that the main portion of the control handle travel moves the locking pins from a fully locked to a partially locked condition, and less than one-half inch of the final travel of the handle moves the pin from a partially locked to a completely unlocked position. This relationship does not leave sufficient margin to cover possible slackening of the eighty feet or more of 3/32 inch cable.

(3) The control handle travel is limited on the upward (locking) range by the cam follower reaching the end of the cam slot at the elevator itself, but on the downward (unlocking) range the control handle is stopped at the floor of the cockpit before the cam follower at the elevator necessarily reaches the end of the cam slot. Thus the pilot cannot be certain that the pins in the locking quadrants are fully disengaged when the control handle in the cockpit has been fully depressed to the limit of its travel. There should be some over-travel incorporated in the unlocking range of the locking handle.

(4) It would be practically impossible for the pilot to release the elevator locking mechanism with an air load on the elevators equal to that incurred at take-off speed with a 12-1/2 degree up-elevator setting, the one in which the elevators are normally locked while running up the engines. This was determined by making a set-up of a portion of the elevator torque tube, with the locking quadrant and locking pin assembly mounted in their proper relative positions, and connecting the control handle and its bellcrank to this assembly by a short length of 3/32 inch cable. (See Photograph No. 52843, Exhibit N). Known loads were then applied to a platform, attached to the torque tube of the elevators, at an 18 inch lever arm, and the static force, at the control handle, to release the locking pin, was determined. The Board is satisfied that with a take-off speed of 74 miles per hour (the take-off speed of the Boeing Model 299), and with the mechanical advantage of 2.475 to 1 which exists in the locking mechanism, it would be practically impossible for the pilot to release the elevator locking pin in flight.

RECOMMENDATIONS

The Board recommends that:

1. On all large multi-engined airplanes, where more than one pilot is required in order properly to operate the multiplicity of controls, that specific duties be prescribed for the pilot, co-pilot and for each member of the crew; to the end that the pilot may be relieved of the burden of detailed supervision of all the valves, controls and indicators which adorn the control cockpit of a modern multi-engined airplane.

2. All control surfaces be so designed that no surface control locks are necessary.

3. The releasing mechanism of surface control locks, when employed, be so constructed that it will be impossible for the pilot to taxi the ~~airplane with the controls locked. It should be impossible~~ for the pilot to be able to fully open the throttles, for example, with the controls locked.

4. The detail design of any control lock release mechanism should be such that it is positive and instantaneous in unlocking the controls, and not dependent on springs or spring loaded cables. Inspection doors should be such that inspection of the complete locking mechanism and controls can readily be made.

FRANK D. LACKLAND,
Lt. Col., Air Corps,
President.

HOWARD Z. BOG[illegible],
Captain, Air Corps,
Member.

LAURENCE C. CRAIGIE,
Captain, Air Corps,
Recorder.

JAMES M. GILLESPIE,
Captain, Air Corps,
Member.

CECIL J. H[illegible],
Captain, Medical Corps,
Member.

approved - Nov 11, 1935
H. M. Martin
Col. Air Corps
Commanding

LIST OF EXHIBITS

A	Testimony of Witnesses	Taken October 30, 1935	12 pages
B	" " "	" " 31 "	11 "
C	" " "	" November 1 "	8 "
D	" " "	" " 2 "	3 "
E	" " "	" " 4 "	10 "
F	Report of Board's Examination of Wreck		1 "
G	Report of Equipment Branch on Automatic Pilot		3 "
H	Copy of Letter re "Flight Test Procedure"		2 "
I	Copy of Sub-Order dated Oct. 7, 1935, E.O. 3743-10		2 "
J	Copy of Last Completed Form 1 on Boeing Bomber 299		1 "
K	Photographs Referred to in Exhibit "F"		5 photos.
L	Photographs Taken During Fire		7 "
M	Photographs Taken After Fire Was Extinguished		7 "
N	Photographs of Elevator Lock Test Set-Up		1 "

LIST OF WITNESSES

1	Mr. John B. Cutting	Exhibit A	Page 1
		" D	" 2 & 3
2	Mr. William E. Hatcher	" A	" 1 & 2
		" A	" 2, 3, 4 & 5
3	Mr. Lambert Wells	" C	" 6, 7 & 8
4	Captain Frank G. Irvin, A. C.	" A	" 5 & 6
		" B	" 3 & 4
5	Captain Sam R. Harris, A. C.	" A	" 6 & 7
6	Mr. Marvin D. McDaniels	" A	" 7
7	Mr. Fred W. Heckert	" A	" 8
8	Mr. Henry N. Igo	" A	" 9 & 10
9	Mr. H. D. West, Jr.	" A	" 11 & 12
		" C	" 6
10	Mr. C. W. Benton, Jr.	" A	" 10 & 11
		" C	" 4 & 5
11	Mr. Roy O. Crooms	" B	" 1, 2 & 3
		" C	" 1 & 2
12	Mr. George Holland	" B	" 4
13	Mr. Allen J. Bowman	" B	" 4 & 5
14	Mr. M. O. Cassell	" B	" 5, 6, 7 & 10
15	Mr. Edward L. Pratt	" B	" 8 & 9
16	Captain Howard E. Couch, A. C.	" B	" 9 & 10
17	Mr. Donald B. Weaver	" B	" 11
18	Mr. Joseph Harriman	" C	" 2 & 3
19	Captain Cecil W. Dingman, M. C.	" D	" 1 & 2
20	First Lieut. Donald L. Putt, A. C.	" E	" 1, 2, 3, 4 & 5
21	Mr. Leslie R. Tower	" E	" 5 & 6
22	Mr. Mark H. Koogler	" E	" 6 & 7
23	First Lieut. Robert K. Giovannoli, A. C.	" E	" 7 & 8
24	First Lieut. Leonard F. Harman, A. C.	" E	" 8 & 9
25	Captain Dudley W. Watkins, A. C.	" E	" 9 & 10

The following testimony was submitted in connection with the accident of the Boeing Aircraft Company Bombardment Airplane Model No. 299.

John B. Cutting   Wednesday, October 30, 1935.

Mr. John B. Cutting, after being duly sworn, testified as follows:

Q. Your occupation?
A. Junior Aeronautical Engineer, Flying Branch, Wright Field, Dayton, Ohio, assigned to this flight as test observer.

Q. What are your ideas of the crash of the Boeing 299?
A. I was right behind the pilot on the left side. We got off the ground, we nosed up and then the left wing described a circle. As far as I can remember the motors were O.K. We were going to do a climbing test.

Q. Motors were functioning O.K.?
A. As far as I know. I hadn't received any idea that they weren't.

Q. Anything go wrong?
A. I don't know. Anything I could say would only be a guess.

Q. Was there any sudden change in the attitude of the airplane?
A. It immediately nosed way up right after the take-off. At first I thought he was trying spectacular flying. I was surprised at first because I didn't think he would do spectacular flying.

Q. Who was piloting the airplane?
A. Major Hill was at the controls. Lieutenant Putt was in the co-pilot's seat. Mr. Tower was standing in the aisle. I was sitting in the navigator's seat directly behind Major Hill.

Q. When did you first realize that something was wrong?
A. Right after we went into the very steep climb.

William E. Hatcher   Wednesday, October 30, 1935.

Mr. William E. Hatcher, after being duly sworn, testified as follows:

Q. Your occupation?
A. Armament Mechanic, Armament Laboratory, Wright Field, Dayton, Ohio, assemble and disassemble armament on airplanes.

Q. Did you witness the take-off and the crash of the Boeing 299?
A. Yes.

Q. Will you state in your own words what you observed from the starting of the take-off to the crash?
A. I observed that the tail wheel never left the ground until the landing wheels were off the ground. When it got up to about sixty or seventy feet it started in a very acute climb and, of course, went into a stall and went over sideways and came down on the left wing.

Q. Have you observed the take-off of this ship before?
A. No. This was the first time. The tail wheel was still on the ground when the front wheels took off. The landing wheels raised first.

Q. Where were you standing with reference to the take-off?
A. I was to the left of the ship, down by the compass stand. I had a side view.

Q. That would be almost at right angles to the take-off, would it not?
A. Yes.

Q. Did you observe any motion of the elevator?
A. No, I did not.

Q. Were the motors functioning all right?
A. I would say they were putting out right up to the last.

Lambert Wells Wednesday, October 30, 1935.

Mr. Lambert Wells, after being duly sworn, testified as follows:

Q. Your occupation?
A. Project Engineer on the Boeing Bombardment Airplane Model No. 299, representing the Boeing Aircraft Company.

Q. Were you an eye witness to the crash of the Boeing 299?
A. I was.

Q. Will you give the Board a complete account of what you saw leading up to the crash?
A. The engines were warmed up by Henry Igo, the Pratt & Whitney Company Representative, after which Major Hill, Lieutenant Putt, Lesley Tower and two other men, I am not sure of their names, went aboard. The ship was taxied across the apron and turned into position, ready for take-off. The length of take-off seemed only slightly longer than normal but it was noticed that the tail was down for the full length of take-off and as a result of this the ship climbed steeply. After leaving the ground, apparently stalled in a steep climb, the left wing dropping, and crashed in a direction opposite to that of the take-off, the left wing striking the ground first. The ship burst into flames almost immediately. The landing angle of the airplane for centerline of the fuselage is around 7 degrees, also the thrust line.

Q. Could you say whether the main landing wheels left the ground before the tail wheel?
A. It appeared that they left at almost the same time.

Q. Was this take-off as you observed it, a normal take-off in your opinion?
A. It appeared to be normal at the start but it was abnormal in that the tail didn't rise during the full length of the take-off run.

Q. Mr. Wells, how long have you been assigned as Project Engineer on this airplane?
A. Since August 20th.

Q. Were you connected with the engineering on this airplane at the factory?
A. Yes.

Q. Are you familiar with all the engineering details?
A. Most of them, yes.

Q. Are you familiar with the mechanical locking devices for the controls?
A. Yes.

Q. Will you tell us in your own words how they function?
A. Both the elevator and rudder control locks are actuated by a closed cable system from a single handle in the cockpit. Raising of this handle tends to move locking pins at elevator and rudder into holes in quadrants on the respective torque tubes of the surfaces. The locking pin is spring loaded against an upward motion of the control handle. This spring load is applied at the lock pin and tends to hold the control unlocked except when the cockpit handle is moved to the locked position. The motion is imparted to the pin by means of an eccentric cam operated by the cable system.

Q. In what position is the lock handle in the pilot's cockpit when the controls are completely unlocked?
A. The handle in the cockpit should be flush with the floor to insure that the controls are completely unlocked.

Q. How far above the floor is the handle when the controls are completely locked?
A. An inch and a half to two inches.

Q. With the controls locked the handle in the cockpit is in the extreme "up" position from the floor?
A. That is right, for being fully locked.

Q. If a situation arose where the control handle is pushed down to within an inch of the floor, would that insure the unlocking of the controls?
A. No. It is possible that the pin might still be slightly in engagement.

Q. How close to the floor must this control handle be to insure a complete unlocking of the control surfaces?
A. It should be flush. There is some leeway there but it is not something which I have measured.

Q. Then to insure the complete unlocking of the control surfaces from the position of being fully locked, the control must be entirely to the floor?
A. That is the only sure position.

Q. Are you familiar with this part?
A. Yes. That is the elevator lock quadrant.

Q. Will you examine it, please, and tell us where you think the locking pin may have been at the time of the crash?
A. From inspecting this, it shows the three lower holes to be worn which would leave it in doubt as to what hole the pin might have been in.

Q. As Project Engineer you have undoubtedly timed a number of take-offs with full normal load, have you not?
A. The ones I remember most clearly are the ones that were made just the other day in the take-off test here at Wright Field. We checked those only roughly with an ordinary watch.

Q. What were those values?
A. They seemed to be from thirteen to fifteen seconds before leaving the ground. Those were, however, faster than normal take-offs that we had made previously to that time because I believe they were using full take-off power.

Q. Did the motors appear to be functioning satisfactorily?
A. Yes they did, and it was surprising that the ship was able to climb as far as it did; apparently it was being climbed mainly on the motors.

Q. Did you observe the angle of the airplane to increase immediately after it left the ground?
A. The airplane seemed to steadily increase its angle of attack up until the time the plane stalled and one wing dropped.

Q. At what altitude did it stall?
A. That is hard for me to estimate. I judge from the size of the airplane in comparison to the way it was, perhaps 300 feet at the most.

Q. This airplane had symmetrical air-foil section. What is the angle of maximum lift of this symmetrical section?
A. As I remember, it is somewhere between 16 and 20 degrees.

Q. Is the wing set at zero angle to the fuselage?
A. The cord line or zero lift line is at 3-1/2 degrees positive angle.

Q. So that the effective angle of attack during the take-off run would be the sum of this angle plus the running angle, a total angle of approximately 10 to 10-1/2 degrees?
A. Yes.

Q. From your experience with this airplane, does the airplane normally trim longitudinally tail heavy or nose heavy during the take-off?
A. I can't answer that. I don't believe the tab is used to any great extent on take-off but for normal flight the airplane is slightly nose heavy and the trim tab is normally set to correct this condition.

Q. Did you observe the position of the elevator trim tabs?
A. Yes, after the crash.

Q. Did you consider them normal for take-off?
A. No.

Q. In what way were they abnormal?
A. They were abnormal in that they were set to correct a tail heavy condition which is not normal for this airplane.

Q. To what extent were they displaced from neutral?
A. From one-half to two-thirds full travel.

Q. Was the trailing edge of the trim tab up or down?
A. It was up in relation to the trailing edge of the elevator.

Q. As a result of your inspection of the controls, made with members of the Board, what is your opinion as to whether the controls were locked or unlocked at that time?
A. My opinion is that the controls were partially locked.

Q. On what do you base that statement?
A. Based on the observation that the rudder was locked and that the cams for both rudder and elevator locks were in a partially locked position and that the control handle in the cockpit was also in a partially locked position.

Q. How do you explain that when you examined the tail surfaces with the members of the Board you found the rudder locked at the quadrant and found that the elevators were in a down (nose heavy) position and could be moved by grasping their trailing edge?
A. This may be explained by assuming that the impact of the crash was sufficient to move the elevator even though the pin partially engaged the quadrant. The impact may have been sufficient for the quadrant locking hole to have dislodged the pin since the pin since the pin may have been only in partial engagement.

Q. Could the controls be accidentally locked?
A. It is hardly conceivable that they could be. The only way would be for some article of clothing or equipment in the cockpit to become fouled in the cables.

Frank G. Irvin, Captain, Air Corps Wednesday, October 30, 1935

Captain Irvin, after being duly sworn, testified as follows:

Q. Your occupation?
A. Planes and Maintenance Officer, Flying Branch, Wright Field, Dayton, Ohio.

Q. Please state to the Board the observations you made pertaining to the accident of the Boeing 299.
A. At about 9:10 this morning I was taxiing the Douglas DB-1 Airplane from the line to the field, preparing to take-off. As I taxied the plane in a south westerly direction I looked in the air ahead of me and above the field and saw the Boeing Bomber 299 climbing at an angle I judged to have been 45 degrees, and was about 300 feet in the air. The Boeing fell towards the left and nosed down into a dive approximately 45 degrees, and struck on Wright Field. The four engines appeared to catch fire simultaneously upon impact of the plane with the ground. When I first saw the Boeing 299 in the air I was amazed at the flying attitude of the plane and immediately became alarmed, stopping the plane I was taxiing, and remarking to Captain Harris that the Boeing was about to spin in.

Q. Have you piloted the Boeing 299 Bomber?
A. I have acted as co-pilot for approximately three hours and have flown the plane at the controls for approximately one-half hour, making two or three landings.

Q. From your flying experience with this airplane was there any tendency toward nose heaviness or tail heaviness in the take-off condition?
A. The horizontal control of the airplane was easily controlled with the elevator and made even more easy by the use of the elevator trim tab control.

Q. Did you have any difficulty in getting the tail up at the beginning of the take-off run?
A. I experienced no difficulty in getting the tail up on take-offs which I have made with this airplane. I have made three take-offs.

Q. In observing this take-off of the Boeing 299, do you think this abnormal maneuver at the time of the take-off and the crash may have been caused by some control failure, engine failure, or what?
A. From the flying attitude of the plane the controls of the plane were out of control of the pilot.

Sam R. Harris, Jr., Captain, Air Corps Wednesday, October 30, 1935

Captain Harris, after being duly sworn, testified as follows:

Q. Were you an eye witness to the crash of the Boeing Bomber 299?
A. I was.

Q. Will you give us your observations from the time of the taxiing out, up to the time of the crash.
A. Captain Irvin and I were sitting in the pilot's cockpit of the Douglas DB-1, facing approximately east on the ramp. When we turned 90 degrees to the right to taxi out for the take-off I saw the Boeing Bomber to the right, engines running preparatory to taking off to the south. I did not pay particular attention to the airplane until after it had actually cleared the ground at which time I saw it pull up into a very steep climb at an angle which looked to be about 45 degrees or even more. It pulled up to an approximate altitude of 300 feet and fell off on the left wing, did an 180- degree turn, crashed into the ground and immediately caught fire. When the Boeing Bomber started burning I left the cockpit of the Douglas DB-1 and ran across the field to the burning ship. By the time I got there three members of the crew were outside of the ship. One member of the crew, Lt. Putt, though badly injured, said, "If possible, look at the control box." The rest of the time I spent around the burning airplane giving what assistance I could.

Q. Have you flown this airplane?
A. No.

Q. Do you know of any control box in the airplane?
A. I don't know of any control box in an airplane, that a pilot would normally refer to.

Q. Do you know if Lieutenant Putt was flying as pilot or co-pilot?
A. I do not.

Q. In your previous statement you said that the airplane after the take-off was in a 45 degree climb, approximately. What is your opinion as to what may have caused this?
A. I can answer that question best by saying that in my opinion, or to my absolute knowledge, no pilot would put that airplane in that position, and it is more than likely that no pilot is physically capable of putting that airplane in that position.

Q. What time did this crash occur?
A. At 9:10. I made a record of this on my flight test report.

Q. What were the weather conditions?
A. Ceiling unlimited; visibility unlimited; flying conditions excellent; condition of the field good.

Q. In what direction did the Boeing Bomber Model 299 take-off?
A. Approximately towards the south.

Q. In what direction was the prevailing wind?
A. Approximately from the south.

Marvin D. McDaniels Wednesday, October 30, 1935.

Mr. Marvin McDaniels, after being duly sworn, testified as follows:

Q. To what duties were you assigned this morning?
A. Starting out on a check climb on the Douglas DB-1.

Q. Will you tell the Board in your own words just what you witnessed of this accident to the Boeing Bomber Model 299?
A. We got in the Douglas DB-1 and taxied out from the flying line. Captain Harris said: "My God, look at that ship barrel roll." I looked up and I saw the Boeing 299 in what looked to me to be a stall. It immediately fell on the left wing and burst into flames immediately on hitting the ground.

Q. Did the motors all appear to be functioning?
A. As far as I could tell, they were. At the time that I saw him he was in a stall at approximately 150 to 200 feet.

Q. What was the direction of the take-off?
A. The direction of the take-off was thirty degrees west of south which was directly into the wind. The time was about 9:15.

Q. How long have you been on duty as a flight test observer with the Division?
A. Ten or eleven years; during the war and ever since.

Mr. Henry N. Igo   Wednesday, October 30, 1935

Mr. Igo, after being duly sworn, testified as follows:

Q. Were you an eye witness to the crash this morning?
A. Yes.

Q. Please state to the Board the observations you made pertaining to the accident of the Boeing Bomber 299.
A. It is my duty to check the engines prior to flight. I always check out each engine individually. Most of the time I do it alone, though some times with Mr. Roy Grooms. I always lock the controls because I am usually alone, and I have to use both hands in checking the engines. After I had made my check this morning and given permission for the plane to be flown, Lt. Putt came up and he and I sat and talked for awhile. I then got out of the plane and they taxied over to the right side of the field, checked the engines again and proceeded to take off. They ran about 1000 feet, maybe a little bit more, and the plane started to lift and as it did it just went almost straight up into the air. They tried to bring it out of the stall, made a left turn; the left wing tip hit the ground and brought the two left engines and the body in first, then the rest of the ship came in.

Q. Did you observe the take-off from the time the plane started to roll?
A. I didn't see the take-off until they had run about 500 feet.

Q. Did you notice anything unusual?
A. No. Possibly toward the end of the run it looked as though he was making his take-off a little longer than usual.

Q. Just how does the control lock operate from the pilot's seat?
A. You centralize your controls. That is, as I understand it there are three or four different positions, but I always centralize them with the elevator slightly up, then I centralize the rudder and pull up on the cockpit handle.

Q. How high is it necessary to raise the plunger to put it in the maximum position?
A. Two and one-half inches.

Q. What is the position of this lock when the controls are not locked?
A. It is down.

Q. What do you mean by down?
A. Down below the carpet, flush with the floor.

Q. Would it be possible for this to be accidentally lifted by individuals in the cockpit at that time?
A. Not accidentally lift it, no. They could accidentally release it, but not lock it.

Elevators were slightly raised above neutral, not fully back.

Q. You have observed this airplane take off on previous occasions?
A. Yes.

Q. Was the attitude of this particular take-off similar to those you have previously observed?
A. It was until they cleared, lifted and dropped down a little bit, then went up.

Q. Will you continue with your observations after the plane crashed.
A. After I reached the plane I found Lt. Putt running around trying to assist the other members of the crew, but realizing his condition I stopped him and he was very conscious and sane and I asked what happened and he said that he didn't know but they couldn't get the elevator down.

Q. Are you familiar with the engines on this ship?
A. Yes.

Q. Were those engines functioning all right when they left the ground?
A. Yes.

Q. Were they functioning all right did you hear from their running in the air?
A. Yes.

Q. Did you distinguish any malfunctioning in the air?
A. No.

Mr. C. W. Benton, Jr. Wednesday, October 30, 1935

Mr. Benton, after being duly sworn, testified as follows:

Q. Were you an eye witness to the crash of the Boeing Bomber 299 this morning?
A. Yes.

Q. Will you give the Board any observations you made which will be of value?
A. I was outside starting the motors. We took the cowl off and were going to adjust the idling jet when the pilots came over. We got the two right-hand jets adjusted and they wanted to fly it right away so we put the cowling back on. They got in and taxied out onto the field and took off. It looked like a normal run until they got about a third of the way through the run. The tail didn't come up for quite a while. It would come up and then drop down. It did this two or three times as far as I could judge, made one last bounce and started right up straight at a steep angle. It started winging over; the left wing hit first then left wheel; swung around about 180 degrees and the right outboard caught fire first.

Q. From observing this take-off, was there anything about it that appeared unusual to you as compared to other take-offs?
A. Yes, because Major Hill didn't run over 200 to 300 feet in previous flights before he would have the tail up. This time the tail stayed on the ground.

Q. Did you particularly notice when he left the ground just what the attitude was? What was your opinion when you observed this take-off?
A. Well, I didn't quite form an opinion until she started to go so steep and the first thing I thought of was the controls being locked.

Q. What was the position of the cam which operated the elevator lock when you first observed it after the crash?
A. It was a little off of being straight up and down.

Q. On examination of the rudder and elevator with members of the Board were the controls locked or unlocked?
A. The rudder was locked.

Q. Are you familiar with the locking and unlocking of the controls?
A. I have had occasion to lock them after a flight but never unlocked them.

Q. In what position is the handle when you lock the controls?
A. Up.

Q. About how high is the top of the handle above the floor?
A. About three inches.

Q. Did you see the position of the locking control after the crash in the examination which you made in conjunction with the Board?
A. Yes. The handle was about an inch from the floor.

Q. From your experience in locking this device in connection with your work would the position in which the locking handle was found indicate that the controls were locked?
A. Yes. Partially locked.

Q. Did the ailerons have a locking device also?
A. No sir.

Q. Do you think the elevators and rudder were fully locked?
A. No, I don't.

Q. You have flown in this airplane a number of times before?
A. Yes.

Q. And you did come in by air when the airplane was flown from Seattle to Dayton?
A. Yes sir.

Q. In all these previous flights had you ever observed any difficulty experienced by the pilot in getting the tail up?
A. None whatever.

Mr. N. D. West, Jr. Wednesday, October 30, 1935

Mr. West, after being duly sworn, testified as follows:

Q. Were you an eye witness to the crash of the Boeing Bomber 299?
A. Yes.

Q. Will you give the Board all of your observations?
A. We started the engines and there seemed to be considerable delaying before taxiing out to take off. (They were probably discussing just what they were going to do.) The run seemed to be perfectly normal until they approached flying speed. The wheels seemed to lift and settle two or three times as though the tail didn't want to lift. As soon as the wheels did lift the airplane immediately went into a steep climb. It climbed for some

time with motors wide out, banked to ~~the left and struck the ground~~ on the left wing first and seemed to settle in the upright position. As soon as it struck the motors came loose and seemed to catch fire immediately.

Q. Did you notice anything unusual in this take-off today?

A. Yes. I have never seen the ship perform in that manner before. It usually, except for rough fields, hugs the ground until it leaves and takes off very smoothly.

In this particular instance they seemed to have difficulty in getting the tail up; at least it never came up to its usual position. The main wheels seemed to try to rise, and settled back and when they did leave the ground for the last time the ship itself nosed up sharply and the tail seemed to still hug the ground.

Q. What was your impression of the take-off itself prior to actually getting in the air?

A. That is a little hard to say. There was so little time before they had left the ground. I was walking towards Operations with Major Hill's bicycle and I stopped and watched, then and immediately started back towards the field. Before they had left the ground I had the impression that something was wrong and I had started for the ship before it started to climb as it did.

Q. Did you assist in running up the engines this morning?

A. Not from the cockpit. I simply started the motors from the apron.

Mr. Roy O. Grooms October 31, 1935.

Mr. Roy O. Grooms was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am an Airplane Mechanic assigned to the Flying Branch. I was assigned as Crew Chief on the Boeing Bomber 299.

Q. How long have you been assigned as Crew Chief on this airplane?
A. Ever since the ship arrived here; approximately since August 20. I don't remember the exact date.

Q. Tell the Board in your own words exactly the sequence of events leading up to the flight test made yesterday which resulted in the crash.
A. I removed 190 pounds of shot from the radio control stand to counteract the weight for Mr. Towers who was going to accompany the flight yesterday morning. Mr. Igo ran the engines out himself and adjusted the idling jets of the carburetors on each individual engine. Major Hill and Lt. Putt entered the ship and Major Hill sat in the pilot's seat which was at the left side, and Lt. Putt sat on the right as co-pilot. Mr. Towers was standing in the aisle just behind the pilot and co-pilot. Just before they were ready to take off and were getting ready to taxi out on the field, I went up and turned on the oxygen bottles for them. Then I got out of the ship and they taxied out on the flying field. Mr. Cutting was Observer in the navigator's seat in the front cockpit. Mr. Koogler was in the radio compartment in the rear.

Q. When you left the ship were the controls locked?
A. I couldn't see because Mr. Towers was standing between me and the controls. The cockpit being rather small for four men I had to stand in the bomb compartment.

Q. Was the tail wheel locked or unlocked?
A. I would say that it was unlocked because you can't turn the ship at the angle they did turn it without it being unlocked.

Q. Was there any change in the distribution of weight from the loading used on previous flights, other than the 190 pounds mentioned?
A. No sir. There was no change outside of the 190 pounds of shot that was removed yesterday morning.

Q. Did you witness the take-off?
A. Yes.

Q. Will you continue with your observations?
A. They taxied out on the flying line and ran each engine up separately before take-off. The take-off seemed to be normal as far as I could see until it left the ground and then it went into a very steep climb and fell off on the left wing. The motors seemed to be running all right. I couldn't detect any trouble with the engines and they were running when it hit the ground. As quickly as it hit the ground, of course, it burst into flames.

Q. You have seen this ship take off before?
A. Yes.

Q. Was there anything at all in this take-off that was different?
A. Nothing that I could tell. It seemed to be a normal take-off.

Q. Where were you standing with reference to the take-off?
A. At a 60 degree angle to the take-off.

Q. Since the last previous flight was there to your knowledge any work done on the control cables?
A. No sir.

Q. Was it a possibility to have the controls switched? By that I mean, the elevator controls connected where pulling the stick back would push the nose over?
A. I would say that it was impossible in this case because the controls hadn't been changed to my knowledge.

Q. When did you last inspect the controls?
A. Well, we give them a visual inspection every day and they were inspected as far as the "daily" was concerned, yesterday morning.

Q. On the take-off could you tell whether the main landing wheels or tail wheel left the ground first?
A. That I couldn't be positive about, but I believe the tail wheel left the ground first.

Q. Have you ever checked the tension of either the flight control cables or of the 3/32 inch cable which connects the elevator and rudder control lock in the pilot's cockpit with the cams at the control surfaces?
A. Not with the tensiometer but by feeling them with my hands.

Q. Would you say they were rigged tightly or loosely from this check?
A. I would say they had the proper tension on the wire to take care of that control.

Q. Did you ever have occasion to move the wheel fore and aft while the controls were locked?
A. Yes, and I would say it would move approximately three inches.

Q. Are you familiar with the control locking device?
A. Yes.

Q. In what position is the control handle when locked?
A. The control handle is up when locked.

Q. Is it necessary to fully compress this control handle to the floor to unlock it?
A. That I have never measured but you compress that with your foot, and I couldn't say if you lift it up a quarter of an inch whether it would lock with you or whether it would unlock.

Q. Have you been in the airplane when the pilot has released the controls prior to take-off?
A. Well, the pilot would ordinarily set his foot on the control and force it down which should release them.

Q. There is another lock that the pilot takes care of before take-off, what is that lock?
A. The tail wheel lock. That would be released from the beginning of the taxiing out until the time of the actual take-off, at which time it would be locked again. The pilot would have to work this twice before he could take off.

Q. Is there a warning light or buzzer or any warning on the dash board visible to the pilot or the co-pilot that indicates whether the tail wheel is locked or unlocked?
A. Yes, there is.

Q. What is the indicator?
A. A red light that will be on when the tail wheel is not locked.

Q. Do you know if there is any warning light or any warning visible to the pilot or co-pilot indicating that the controls are locked or unlocked?
A. No sir.

Q. Nothing on there at all to indicate that the controls are locked or unlocked except the position of the control handle?
A. That's all..

Captain Frank G. Irvin, A.C. (Recalled) October 31, 1935.

At this point, Captain Irvin was recalled and reminded that he was still under oath, and testified as follows:

Q. Would you tell the Board the normal procedure that is usually followed in preparing for a take-off in this Boeing Airplane with reference to the tail wheel lock and the control lock.
A. When there is taxiing to be done to arrive at the position of take-off, the tail wheel is not locked in order that it may move around and make turns. The control lock may be left locked or unlocked. After a position has been reached from which the take-off is accomplished by moving straight ahead the tail wheel is locked. The tail wheel locked in the locked position turns off a red light signal on the instrument board. Usually at this point the engines are run up separately and the switches are tried. At this point the co-pilot is usually charged with the duty of holding the control column to the rear facilitating the keeping of the tail down. After the engines have been run up it is the duty of the pilot to check all controls and trim tab, adjusting them to a position which will make the take-off the easiest. He also checks at this time and assures himself that the control lock is in the unlocked position. There are no warning signals or lights apparent to any member of the crew denoting the position of the control lock. The pilot must assure himself by a visual inspection of the control lock itself that it is unlocked.

Q. Have you ever tried the controls with the controls locked?
A. Only indirectly so. I recall sliding in under the control column to the pilot's seat with the controls locked. To make this easier, I remember having assisted myself by taking hold of the control wheel. I have never made an investigation of the travel or play of the control column when they were in a locked position, but I am impressed that there is a certain amount of fore and aft movement with the controls locked.

Q. From your experience in taxiing this ship in your duties in the Flying Branch, is it normal to taxi this ship with the controls locked?
A. I have found it to be easier, with less commotion in the cockpit, to taxi the plane with the controls locked in a rear position.

Mr. George Holland October 31, 1935.

Mr. George Holland was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am a Hangar Superintendent. I have general supervision of the Flying Branch and all the mechanics assigned thereto.

Q. A previous witness, Mr. Heckert, has stated that he was standing near you during the take-off of the Boeing 299 yesterday morning. Were you an eye witness to the take-off?
A. I was witness to the crash.

Q. Will you tell us what happened?
A. When Mr. Heckert said, "Look there", that was the first indication that I had there was anything out of the ordinary. When I looked around I saw the plane going up into a very steep climb, fall off on the left wing. Engines were apparently wide open. The left wing hit the ground and it cart-wheeled around, as we call it, and immediately after it flattened on the ground fire burst out on both sides of the fuselage.

Q. In your opinion, were all four motors operating normally?
A. Yes. Apparently they were wide open.

Q. Who were assigned as Crew Chiefs?
A. Mr. Roy Croome and Mr. Mark Koogler.

Mr. Allen J. Bowman October 31, 1935.

Mr. Allen J. Bowman was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am an Airplane Mechanic in the Flying Branch.

Q. Were you an eye witness to the take-off and crash of the Boeing 299?
A. I was a witness to the take-off until just before it hit the ground.

Q. Have you seen any previous take-offs of this airplane?
A. Yes.

Q. Describe the take-off from the time you saw it.
A. The take-off seemed to be a normal one so far as the run is concerned. The only difference I could see was, instead of raising the tail he seemed to figure on making a three-point take-off. That was what it appeared to be. When he pulled into the air instead of the airplane going into a normal climb, it seemed to go into a very steep climb. It looked as if the ship stopped in mid-air, it then either banked to the left or fell off. It made about a 90 degree turn to the left, started downward. That was my last sight of it until after it hit the ground. After it hit the ground I saw it was in flames.

Q. Was this take-off different from any other you had witnessed?
A. On the other take-offs, they always raised the tail before they left the ground. This take-off seemed like a tail low take-off.

Q. Did the tail ever come up at all before the ship left the ground?
A. Not to my knowledge. The tail wheel seemed to continue to drag after the landing wheels had raised to a certain extent.

Q. From your experience how did the motors appear to be functioning?
A. They seemed to be functioning perfectly to the best of my knowledge. They seemed to be functioning as on normal take-offs.

Q. In your opinion the motors were wide open when the plane crashed?
A. They sounded as if they went in power on. Everything stopped with the impact.

Mr. W. C. Cassell October 31, 1935.

Mr. W. C. Cassell was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am an Aircraft Liaison Engineer in the Aircraft Branch.

Q. It is your duty at this station to run inspection on new aircraft?
A. As a rule, Mr. Bosler and myself make all the 633's on all new airplanes for the Aircraft Branch.

Q. What is the 689?
A. It is a form that we have for recording inspection data on all new aircraft. It covers the functioning of the different parts, movement of controls, how much play is in the controls, etc.

Q. Where do you make this inspection?
A. Either in the Assembly Building or the Flying Branch, but this particular airplane inspection was made in the Assembly Building.

Q. How do you make this inspection?
A. By a visual inspection of all parts of the airplane. This includes the structure of the airplane itself, the flight controls, the brakes, safety devices, locking devices, and in fact everything that has to do with the airplane itself. Where it is necessary to take off removable portions of the airplane to inspect a part, this is done.

Q. Did you have occasion to examine the control locking mechanism on the Boeing 299?
A. Yes, I did.

Q. Will you tell the Board in your own words how that functions?
A. When I inspected the airplane, Mr. Bosler and I inspected the control lock together. First, he tried it and then I tried it. It was operated by a push and pull control on the floor between the pilots' seats which to push up engaged the control lock and to push down so the top was flush with the floor released the control lock. At that time we were unable to find any play in the system by moving the control surfaces or the control quadrant. The functioning of the control at that time operated under normal conditions.

Q. Did the control handle have to be all the way down to unlock the controls?
A. As nearly as we determined, it did.

(The witness was shown the control handle which had been removed from the cockpit of the Boeing 299 Airplane.)

Q. With the control handle in the position about 1-1/2 inches from the bottom, would the controls be locked.
A. Yes, they would.

Q. Did you try the control columns with the controls in a locked position?
A. I did.

Q. How much travel did the control wheel have when in the locked position?
A. It was very noticeable.

Q. Do you have an official record of this movement in your detail inspection report?
A. I do.

Q. Is this record an official requirement of your position?
A. It is.

Q. Do you have a record of the travel with the control handle partially released?
A. No, but when the controls are fully unlocked the full fore and aft travel of the control wheel at the center line is 17 inches.

Q. In your opinion, what was the amount of movement of the control column fore and aft with the controls locked?
A. About 4 inches.

Q. What would be the corresponding travel of the rudder pedals with the rudder and quadrant locked?
A. The travel of the pedals in the cockpit with the rudder locked was negligible.

Q. Did you try the controls when the locking handle indicated that the control locking device was only partially locked?
A. No, I did not.

Q. Did you remove the locking handle bell crank and its mount from the cockpit of the wrecked airplane?
A. I assisted in removing it.

Q. State to the Board the condition in which you found the locking handle.
A. The control lock was raised approximately one inch. At the time we started to remove the assembly from the floor we operated the control and the cables worked freely on all parts of the control mechanism. After the removal of this assembly there were no parts or pieces to be found which could have caused an interference or malfunctioning of this mechanism.

Q. From an examination of this cam what is the total travel of the locking pin?
A. The total travel of the pin is 28/64 of an inch.

Q. What is the depth of the recess in which the locking pin seats?
A. 20/64 of an inch.

Q. When the pin is in the fully unlocked position what is the clearance between the end of the locking pin and the face of the quadrant?
A. 8/64 of an inch.

Q. From those figures, is the assumption correct that during almost the entire travel of the locking handle in the cockpit the controls are locked?
A. Yes.

Q. In your 689 report did you measure the load necessary to bring the elevators to a neutral position in the pilot's cockpit?
A. Yes. Approximately 25 pounds. This was measured with a spring scale.

Q. When you inspected the airplane in company with the Board did you measure the position of the elevator trim tab?
A. I did, and it measured 9-1/2 degrees. I measured it from paper. I cut the paper form which I later laid out on the drawing table.

Q. From your 689 report, what is the total up travel of the elevator trim tab?
A. Its travel is 22 degrees up and 22 degrees down.

Q. Assuming that the airplane was in an extreme tail-heavy condition, were the trim tabs in a position to tend to correct this tail heavy condition?
A. Yes.

NOTE: The Board from its examination of the wreckage determined that the controls were still intact and were properly connected.

Mr. Edward L. Pratt October 31, 1935.

Mr. Edward L. Pratt was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am in charge of the Flight Test Unit of the Flying Branch. I have general supervision over the airplanes undergoing performance test with respect to requirements of tests and computation of results.

Q. How long have you been on this work and with the Division?
A. Since the year 1919.

Q. In connection with the flight tests of airplanes, do all reports of difficulties encountered as a result of these flights come to you?
A. Not all of the reports of difficulties encountered. Minor difficulties would be entered in the Form I and it would come to the attention of the Planes and Maintenance Officer. Any difficulty in the airplane affecting the flying qualities of that airplane would be called to my attention and I would report it to the Chief Engineer's Office.

Q. In connection with your position, in following any or all flights made by the Boeing 299 have any reports ever been made that would indicate a tail-heavy condition of this ship on the take-off?
A. No sir.

Q. Have there been any unsatisfactory reports made on the flying qualities of this airplane?
A. No sir.

Q. If there had been unsatisfactory reports would they have come to you?
A. Sometimes those things are reported to me and sometimes Major Hill would report them directly to the Chief Engineer's Office.

Q. If there had been any unsatisfactory reports made on the Boeing 299 would you in your capacity have known of them?
A. I would not have known unless it had come back to me through the Chief Engineer. I have never heard of any peculiar or undesirable flying qualities as expressed by the pilot.

Q. Has any pilot's observation report been made on this airplane?
A. A pilot's observation form has been partially completed by Lt. Putt.

Q. (Captain Craigie shows Mr. Pratt report) Is this the partial report made by Lt. Putt?
A. Yes.

Q. Is there any reference in this report to controllability?
A. Yes, as follows: On Page 2 a notation under heading "Controls" - "Rudder is very heavy in flight and should be made lighter. Elevator is heavy on landing. Desirable that it be made lighter." And again on Page 3 under heading "Controllability" - "Effectiveness of the controls is satisfactory through entire range with little change in forces with change in speed. Rudder is spring loaded and should be lightened. Desirable that elevator force on landing be made lighter."

Q. Is there anything in this report as to the elevator trim tab setting for take-off?
A. On Page 3 under heading "Take-Off" - Item 5 - "Setting of the stabilizer or trim tabs is approximately ten degrees tail heavy."

Q. Would this mean that the trailing edge of the trim tab is 10 degrees above or 10 degrees below the trailing edge of the elevator?
A. It would mean 10 degrees below the trailing edge of the elevator.

Q. Then that would mean that the setting of the trim tab was such as to correct for a nose heavy condition on the take-off?
A. Yes. And in connection with this condition it was noted from the Aircraft Branch 689 Inspection Report, which includes the weight data, that the C.G. location was unusually well forward for a bombing type airplane; nearly 22.5 per cent of Mean Aerodynamic Chord (M.A.C.) with wheels down and 21.8 per cent M.A.C. with wheels up.

Q. Do you know who was in the airplane at the time of the crash?
A. Major Hill, Pilot
Lt. Putt, Co-Pilot
Mr. Tower, Boeing Test Pilot
John Cutting, Flight Test Observer
Mark Koogler, Radio Operator and Mechanic

The purpose of the flight was to obtain the first climb to approximately 20,000 feet at predetermined indicated climbing speeds, as required in Expenditure Order No. 8743-10, dated October 7, 1935, issued from the office of the Chief Engineer. It was intended to obtain the rate of climb at sea level, time to climb to 10,000 feet, and the service ceiling from the results of this climb. Major Hill's duties were those of pilot. Lt. Putt acted as co-pilot operating and adjusting the mixture controls, engine throttles, and reading and recording the R.P.M. and the air temperature. Mr. Tower was also acting as co-pilot adjusting the propellers, maintaining the proper R.P.M. during different stages of the climb and otherwise rendering such assistance as might be requested by Major Hill. Mr. Cutting was the Flight Test Observer assigned for this flight and made recordings of the manifold pressure readings at stated altitudes during the climb. Mr. Koogler was the airplane mechanic and radio operator assigned to the flight in accordance with the requirements contained in memorandum from the Commanding Officer to the Chief, Flying Branch, dated September 9, 1935, subject "Flight Test Procedure on Airplanes Submitted on Circular Proposal No. 35-26."

Captain Howard H. Couch — October 31, 1935.

Captain Howard H. Couch was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am in charge of the Propeller Section of the Aircraft Branch.

Q. On the examination of the wreck of the Boeing 299, did you find any indication of any motor or propeller failure?
A. No sir. The two left engine propellers were practically complete except for a few little nicked parts. On the right engines the blades had melted down and dropped off so that you couldn't tell whether tip was gone or not. A shank failure would probably have pulled the engine clear out of the ship. There was no indication of any shank failures as far as I could find.

Q. Did you observe the propeller setting after the crash?
A. I didn't check that.

Mr. M. G. Cassell (Recalled) October 31, 1935.

Mr. M. G. Cassell was recalled and reminded that he was still under oath, and testified as follows:

Q. In your statements this morning, you stated that as a result of your physical inspection of the airplane that the elevator lock handle partially up would lock the controls.
A. Yes.

Q. Have you any computations to verify that?
A. I have. We have measured that and find it has a ratio of 2-1/2 to 1. That is, the movement of the control handle in the cockpit is 2-1/2 times the movement of the locking pin in the quadrant. Assuming the control handle in the cockpit to have been up one inch, that would give 1/16 inch, approximately, of the pin still engaged in the lock.

Q. With the control handle in the cockpit up one inch from the floor show us approximately the position of the cam pin within the cam slot?
A. It is about half way engaged in the locked position.

(Mr. Cassell was shown the position of the cam operating the elevator lock as it was observed by the Board.)

Q. With the cam in this position how far would the locking pin be engaged in the hole of the quadrant?
A. 1/16 of an inch.

Mr. Roy O. Grooms (Recalled) November 1, 1935.

Mr. Roy O. Grooms was recalled by the Board and reminded that he was still under oath, and testified as follows:

Q. In making your inspections of the Boeing 299, did you ever make a visual inspection of the actual locking device on the rudder or elevators?
A. Only when we were running the 689 in the Assembly Hangar. I did make inspection as to the locking and unlocking of the controls to make sure that they worked properly from the front end of the pilot's cockpit, and to make sure they released. This was after the 689 was completed and before the flights.

Q. Have you made that inspection since the airplane has been turned over for the performance tests?
A. Yes. I made this inspection every day before and after flight by unlocking the controls, making sure that they had free movement, on the elevator and the rudder.

Q. Did you while making your inspection from the cockpit at any time notice any failure to unlock or partially unlock?
A. No sir.

Q. Did anyone assist you in making these inspections?
A. Mr. Koogler was my assistant on the job. I don't know positively whether he actually saw me make these checks or not.

Q. Would he have occasion to check them also?
A. Well, I would say yes, because he was assistant on the job.

Q. Did you check the tension on the 3/32 inch cable at any time?
A. Just by feeling it.

Q. How frequently?
A. Each morning before flight we make a visual inspection of all controls. The cables were in a position that they were very easily felt. This inspection was done each day.

Q. If there had been any undue slackening of the cables you certainly would have observed it, would you not?
A. Yes.

Q. In your inspections, is there any place along those control cables where any object can get in there and foul them?
A. It is possible but not probable. A rag possibly could get in between the cable and the pulley but it is not very likely to happen.

Q. Is there anything in the plane in the way of equipment or load that was carried that by any take-off jolt or jar could in any way jam or interfere with the operation of these controls?
A. I don't believe so. We were very careful that anything which might be lying around in the plane was secured and away from the controls. That is the last thing we do.

Q. In addition to your inspections, are inspections made by mechanics of the Boeing Company?
A. Yes sir.

Q. Are they made independent of yours or along with yours?
A. Some of them were with me and some were independent of me. I quit at 3:30, but I check with them the next morning as to the work they completed after I left the Field.

Q. What would be necessary to make a very thorough inspection of the locking device on the torque tubes of the elevator and the rudder?
A. You would have to remove that auxiliary end on the fuselage or crawl back through the fuselage which would be rather difficult to do, to actually get inside.

Q. Did the cockpit handle operate easily?
A. Without pressure on the controls, yes. With pressure on the controls, I would say that it would operate hard.

Q. Would it be possible for someone to exert enough force on the control column to prevent your unlocking the controls?
A. I have never tried it in that respect, but I believe it would be almost impossible to unlock it with a given amount of pressure on the controls.

Q. Why did you lift the controls when you unlocked them?
A. To keep the control column from falling forward due to the excess weight on the elevator.

Q. During your last inspection of this plane before flight, were all turn buckles in place and saftied?
A. As far as I could see from a visual inspection, they were.

Q. When you tried the control unlocking and locking mechanism and tried the movement of the control column fore and aft, did any one actually check as to the movement of the elevator?
A. No. I could look out the window and determine that myself. I could see that the controls would not move when they were locked and that they were free to move when unlocked.

Mr. Joseph Harriman November 1, 1935.

Mr. Joseph Harriman was called as a witness, was duly sworn and testified as follows:

Q. What are your duties?
A. I am Chief Inspector of the Flying Branch.

Q. How long have you been assigned to the job as Chief Inspector of the Flying Branch?
A. Since the year 1923.

Q. On receipt at Wright Field of a new type airplane when it is turned over to the Flying Branch for its performance test, what system of inspection before and after flight is ordered?

A. The Chief of the Flying Branch gives us instructions as to whether the airplane is to be flown before the 689 inspection or not. In case it has to be flown before the 689 inspection, we are ordered to run a pre-flight inspection on the airplane. This inspection consists of removing the cowling and checking the engine accessories and airplane controls to see that they are properly installed and in satisfactory working condition. After the airplane has made preliminary flights then the airplane is taken over to the Factory Branch for the 689 inspection by all Branches, including the Flying Branch.

Q. Was the Boeing 299 flown by Air Corps personnel prior to the 689 inspection being made?

A. I would say that it was not, to my knowledge.

Q. When the Boeing 299 was turned over for the Air Corps personnel to make performance tests, what inspections were prescribed to be made before and after flight other than those that are normal and are listed on the Form I?

A. A five-hour inspection.

Q. Were there any special inspections that you or higher authority in the inspection branch directed be made of any special installation or equipment on the Boeing 299?

A. No sir.

Q. Were any inspections ordered made of the control locking device?

A. Not other than what is mentioned on the Form I.
(The question on this Form I applies only to controls inspection.)

Q. Did you, as Chief Inspector, give any instructions with reference to the inspection of this control locking device?

A. No special instructions, no sir.

Q. Do you have a Form 41 on this airplane?

A. No sir. We would not keep this form until the airplane became Air Corps property.

Q. Are the daily inspections that you mentioned made by the Crew Chief of the airplane or by some member of your inspection organization?

A. The inspections are made by the Crew Chief.

Q. Has the trailing streamline cone of this airplane, and the underneath inspection plate at the rear of the fuselage been removed since this airplane has been delivered to the Inspection Branch by Air Corps personnel?

A. No sir.

Mr. Benton (Recalled) November 1, 1935.

Mr. Benton was recalled and reminded that he was still under oath, and testified as follows:

Q. Since the Boeing 299 has been undergoing performance test by the Air Corps flying personnel have you or any of the mechanics of the Boeing Company made a visual inspection of the locking device, that portion of it on the control surfaces?
A. Yes, two or three times.

Q. How do you make this inspection?
A. We crawl back through with a flashlight and look around to see if there is anything wrong there.

Q. Have you removed the trailing streamline cone and inspection plate at the rear of the fuselage?
A. We have removed the trailing streamline cone, yes.

Q. Since the airplane has been turned over to the Air Corps for test flight?
A. I don't remember. I think it was after the first flight.

Q. Do you maintain a log of inspection on this airplane?
A. No sir. None that I know of.

Q. Do you have any written records of inspections made?
A. That I couldn't say. The pilot would have it.

Q. Who assists in making these inspections?
A. Whenever the other man or I do any work we go and get the pilot and the engineer and the motor mechanic and we all check each other every time.

Q. In making your inspection of the control locking device have you ever checked, in any of these inspections, the clearances between the end of the locking pin and the face of the locking quadrant?
A. No sir.

Q. Can you see the face of the locking quadrant on the elevator from a visual inspection and determine whether or not there is a clearance there?
A. No, I can't.

Q. Is there any inspection hole where this can be seen?
A. Not entirely.

Q. In case any changes or adjustments of any sort are made on the Boeing 299 from whom do you get your instructions?
A. From Mr. Towers, the pilot.

Q. Do you make any changes or adjustments without definite instructions?
A. No sir.

Q. Have any adjustments been made in any part of the control locking device since the airplane has been turned over to the Air Corps for performance test?
A. No sir.

Q. If any had been made you would have known about it?
A. Yes.

Q. At whose orders did you remove the cone?
A. Mr. Tower's.

Q. Who else was present when the work was done?
A. Mr. Wells and myself were there.

Q. Did you happen to know why Mr. Towers and Mr. Wells had the cone removed?
A. He thought he felt a little jam in the rudder control tab and he wanted to take a look and see whether he was right or not.

Q. Have you ever had an occasion to lock or unlock the controls of the Boeing 299?
A. Yes sir, every night.

Q. How does that control function?
A. You put everything as near neutral as you want it and pull up on the control to lock it.

Q. Can you lock the elevator in a neutral position?
A. It is just a little above neutral.

Q. Did you ever have occasion to lock it below the neutral point?
A. Only when we were cleaning the back end of the airplane.

Q. Did you ever notice any binding of the cockpit handle?
A. No.

Q. Did you ever exert any pressure on the control column and then unlock it?
A. You couldn't.

Q. In connection with the locking or unlocking of the control locking device, is there any play in the control column fore and aft when locked?
A. Yes.

Q. About how much would you say?
A. Between three and four inches.

Q. Would it be possible to unlock the controls on the ground if considerable fore or aft pressure were being exerted on the control wheel?
A. I don't think you could unlock it.

Q. If there were a man sitting on the elevators in a locked position, would it be physically possible to release that control in the cockpit?
A. I don't think so.

Mr. West (Recalled) November 1, 1935.

Mr. West was recalled and reminded that he was still under oath, and testified as follows:

Q. Since the Boeing 299 has been undergoing performance test by the Air Corps flying personnel have you or any of the mechanics of the Boeing Company made a visual inspection of the locking device, that portion of it on the control surfaces?
A. No, not to my knowledge.

Q. Have you removed the trailing streamline cone and inspection plate at the rear of the fuselage?
A. No.

Q. Do you maintain a log of inspection on this airplane?
A. That, I believe, was done. I had nothing to do with it, however.

Q. Do you have any written records of inspections made?
A. No.

Q. In connection with your work as mechanic, is it necessary, or have you at any time locked or unlocked the control locking device?
A. Yes.

Q. Would it be possible to unlock the controls on the ground if considerable fore or aft pressure were being exerted on the control wheel?
A. I doubt it.

Q. If there were a man sitting on the elevators in a locked position would it be physically possible to release that control in the cockpit?
A. I couldn't say. But I believe if you were leaning on the column it would be hard to release the lock.

Q. Were you present when Mr. Towers and Mr. Wells had the trailing streamline cone removed from the rear of the fuselage?
A. No. I had no knowledge of that being removed.

Q. Have you made any inspection of the elevator locking devices from the inside of the fuselage since the Boeing 299 has been turned over to the Air Corps for test flight?
A. No, I have not.

Mr. Wells (Recalled) November 1, 1935.

Mr. Wells was recalled and reminded that he was still under oath, and testified as follows:

Q. What is your relationship as project engineer of the Boeing Company on this Boeing 299, with the pilot, Mr. Towers, and the two mechanics of the Boeing Company who were here?
A. I might say I act in an advisory capacity as far as any engineering items on the airplane are concerned or any changes that the Division or the pilot might want to make.

Q. Would any changes or adjustments on this airplane be made without your knowledge or without your having been called in?
A. I think not.

Q. At any time since the airplane has been here at the Division, both prior to its being turned over to the Air Corps for performance test and since that time, has a visual inspection been ordered made of the locking device on the rudder and on the elevators at the control surface end?
A. No.

Q. Do you know if Mr. Towers had the fuselage streamline cone removed at any time since the airplane has been here, for inspecting any part of the controls?
A. Yes, it was.

Q. Will you tell us just what this inspection was for?
A. The inspection was for the purpose of looking at the rudder servo control, checking up on the tightness of the bolts.

Q. Did Mr. Towers give any reason why?
A. At the time there seemed to be some difference between the motion of the rudder control tab from one side to the other. The cone was removed to check on any reason for that.

Q. How would a visual inspection be made of the locking mechanisms on the elevator surfaces?
A. That could be made probably most easily by going into the airplane from inside the body.

Q. Have you ever tried to make visual inspection of the elevator locking quadrant?
A. Not since the airplane left Seattle.

Q. Have you ever made one in which you could actually see the surface of the quadrant and the clearances between the pin and the quadrant when it is in the unlocked condition?
A. Not since the airplane has been in commission for flight.

Q. Do you think it possible to make a visual inspection of the quadrant on the elevators and determine the clearance between the pin and the surface of the quadrant?
A. I am not sure, but I believe it could be inspected through the bottom door.

Q. When the controls are locked how much fore and aft movement of the control wheel is possible?
A. About four inches.

Q. What is the reason for the four inches of movement?
A. This movement operates the servo tab against spring load at the tab.

Q. With the elevator control locked and with movement still possible in the control column, what would be the effect of pushing the control column forward.
A. It would raise the servo.

Q. This then would have the effect of increasing the tail heavy condition due to the locked elevators which is just the reverse of the effect sought?
A. It would increase the tail heaviness but only very slightly.

Captain Cecil W. Dingman, M. C. Saturday, November 2, 1935.

Captain Cecil W. Dingman, M. C., was called as a witness, was duly sworn, and testified as follows:

Q. What are your duties:
A. I am the Post Surgeon, Wright Field, Dayton, Ohio.

Q. Did you in your capacity as Post Surgeon have occasion to examine the personnel injured as a result of the crash of the Boeing Model 299 on October 30, 1935?
A. Yes. They were all brought directly to the Station Hospital, Wright Field where I examined them before sending them to Miami Valley Hospital in Dayton, Ohio.

I first saw Major Ployer P. Hill at approximately 9:20 A.M. and found him to be suffering from: (1) Cerebral lacerations, multiple, severe, generalized; (2) Shock, surgical, severe; (3) Fracture, compound, comminuted, beginning at the supra orbital notch, right, extending centrally along the roof, medial wall and floor of orbit, right, through the optic foramen, cribriform plate and base of skull, involving foramen magnum; (4) Avulsion of eye and all of orbital contents, right; (5) Burns, 1st and 2nd degree, generalized, involving the entire body; (6) Lacerated wound, 3 cm long, transverse, approximately 2 cm above insertion of tendo achilles on os calcis, partially severing tendo achilles, right; (7) Wounds, lacerated, scalp, multiple, severe.

Major Ployer P. Hill was removed by ambulance to Miami Valley Hospital immediately and died at 12:45 P.M. the same day from the causes mentioned above. At the time Major Ployer P. Hill was first seen he was not under the influence of alcohol or narcotic drugs.

First Lieutenant Donald L. Putt was first seen at approximately 9:15 A.M. and was found to be suffering from: (1) Lacerated wound, 12 cm long, extending to the bone, beginning in the left eyebrow, above the supra-orbital notch, extending in a crescentic manner posteriorly over the temporal area, left, and ending near the lambdoidal suture line, approximately 5 cm to left of the mid saggital line; (2) Contusion, moderately severe, inner surface, ankle, right; (3) Contusion, moderately severe, posterior surface, lower third, arm, right, 4 cm diameter; (4) Burns, 1st and 2nd degree, on face, ear and scalp, right.

First Lieutenant Donald L. Putt was removed by ambulance to Miami Valley Hospital immediately. It is my opinion that the injuries incurred by First Lieutenant Donald L. Putt will not result in permanent disability. At the time First Lieutenant Donald L. Putt was first seen he was not under the influence of alcohol or narcotic drugs.

I first saw Leslie R. Tower at approximately 9:20 A.M. and found him to be suffering from: (1) Multiple areas of 2nd degree burns, over face, hands, arms and legs; (2) Contused and lacerated wounds, multiple, severe, over the vertex of the skull, extending to the bone; (3) Fracture, simple, linear, transverse, through parietal bone.

Leslie R. Tower was removed by ambulance to Miami Valley Hospital immediately. It is unknown whether or not the injuries incurred by Leslie R. Tower will result in partial or permanent disability. At the time Leslie R. Tower was first seen he was not under the influence of alcohol or narcotic drugs.

I first saw Mark H. Koogler at approximately 9:15 A.M. and found him to be suffering from: Burns, 1st and 2nd degree, face, all surfaces.

Mark H. Koogler was removed by ambulance to Miami Valley Hospital immediately. It is my opinion that the injuries incurred by Mark H. Koogler will not result in partial or permanent disability. At the time Mark H. Koogler was first seen he was not under the influence of alcohol or narcotic drugs.

I first saw John B. Cutting at approximately 9:15 A.M. and found him to be suffering from: Burns, 1st and 2nd degree, face, all surfaces.

John B. Cutting was removed by ambulance to Miami Valley Hospital immediately. It is my opinion that the injuries incurred by John B. Cutting will not result in partial or permanent disability. At the time John B. Cutting was first seen he was not under the influence of alcohol or narcotic drugs.

John B. Cutting (recalled) Saturday, November 2, 1935.

Mr. Cutting was reminded that he was still under oath and testified as follows:

Q. Will you tell us in detail as far as you can, your recollections from the beginning of the take-off until the crash of the Boeing 299.

A. We took off from the ramp heading in a south westerly direction and from my observations the run along the ground was perfectly normal. I was unaware of anything abnormal until the plane began assuming a steep climbing position and I knew then that they were getting to a critical and emergency condition. It did the usual thing that a ship would do, stalling and falling off on a wing and going into the ground. I wasn't watching the pilot's actions so I can't give any descriptions of what was going on there. I was watching the ground and the wing tip.

Q. Where were you when the ship took off?

A. Right behind Major Hill in the pilot's cabin, in the seat assigned to the navigator, I believe.

Q. You realized shortly after the plane left the ground that there would be a crash?

A. Yes.

Q. Do you recall noticing Mr. Towers' position or actions at any time?

A. I just noticed his position. As far as I can recall he was standing in the aisle with his hands on either seat. I wasn't watching him. He was standing in the aisle because there was no seat for him during the flight.

Q. Did you notice any commotion among the pilots as you took off?
A. No, I did not. I wasn't watching them at all.

Q. Could you estimate how long a time elapsed from the time you left the ground until you crashed?
A. As far as I could judge, about five seconds. At the time during the take-off run I was preparing myself for the work I was going to do. When the ship assumed this critical attitude something fascinated me on the ground and I watched that.

Q. Do you remember how you made your exit from the plane?
A. I went out the same exit as Lieutenant Putt did. It was on the right side of the fuselage. At first I thought the fuselage had split open but on checking up I found it did not. I saw Lieutenant Putt clear away something and climb out and I immediately followed him.

Q. Did you talk to Lieutenant Putt immediately after the crash?
A. No, I did not.

Q. What were your duties on this particular flight?
A. I was flight test observer and we were going to do a check climb and I was going to take manifold pressure readings at designated altitudes.

Donald L. Putt,
1st Lt., Air Corps.

Monday, November 4, 1935

Donald L. Putt, 1st Lt., Air Corps, after being duly sworn, testified as follows:

Q. What are your duties?
A. I am assigned to the Flying Branch.

Q. What were your duties on the flight of the Boeing 299?
A. I was riding as co-pilot and as such would be required only to take the readings of the r.p.m. and air temperature during the climb. We were going to do the first climb of the performance test. After we had taxied out to the take-off position I took a quick glance at everything. Did turn around to Mr. Tower and ask him if they had set the propellers in right position for take-off. Major Hill opened the throttles gradually, rolled along not making a quick take-off but just leaving the control column almost in neutral, to let the plane take itself off. Except for the take-off tests, we had been normally taking the plane off with landing wheel rolling along the ground. Noticed it had a little tendency to weave. Major Hill reached up once to adjust the throttles. As the plane tended to swing off to the left he opened the throttles a little on the left side. The ship was a little heavy on the rudder so that we had been using the engines before to maintain directional control on take-off. We got into the air, just off the ground, and everything seemed O.K. All of a sudden the nose shot up into the air. Immediately Major Hill pushed forward on the column as hard as he could. It still continued up so I took hold to help. Both of us pushed just as hard as we could. Had no apparent effect. At the same time Mr. Tower stepped forward to roll the trim tab for us. I had checked the trim tab before we had taxied out to take-off position, before Major Hill got into the plane. I was in the pilot's seat and put the trim tab into the take-off position, so that I know that it was all right. After that, of course, it just kept on climbing before it reached a stall and fell off to the left and came around 180 degrees before it hit the ground.

Q. Do you recall whether you had all the travel on the elevator which you think you should have had?
A. No, it didn't seem like we had. However, I don't believe that at any time previously had we ever used the full forward travel of the column for take-off or any maneuvers. I didn't get the impression at the time of this take-off that we were against a stop or anything else like that.

Q. Whose duty is it normally to unlock the control lock in a flight of that sort?
A. I don't think we had any particular set routine. Most of the time when I was flying as pilot I would unlock it myself. We usually would taxi out into position with them locked because it was the easiest position in which to run the engines up. Instead of running them up on the line after the Boeing engine men had run them up we would taxi out first and then ~~run them up. Usually the pilot would~~ unlock the controls before take-off. Then usually on landing if I was co-pilot I would usually lock them after we had landed.

Q. In this particular flight do you remember seeing anyone unlock the controls?
A. No, I don't. It is possible that they could have been. The pedal could have been depressed and I didn't see it, being busy checking something else. I have no recollection of anybody unlocking it.

Q. Who normally locks the tail wheel at the take-off?
A. On this particular flight I locked the tail wheel. As we taxied out, just before turning, I reached over and tripped the handle. When we started out the light still hadn't gone out which would indicate that it was still unlocked and I asked Major Hill to taxi forward a little farther so that it would click in.

Q. If any attempt had been made after getting off the ground to have unlocked it, you would have noticed it yourself?
A. Yes.

Q. In reference to the locking position of the elevator, is it possible to lock the elevator in neutral?
A. I don't believe I know.

Q. Normally, in what position was the elevator locked? Was the tail up or down?
A. I never knew that you could lock it in more than just the one position. In locking it you sort of had to pull the column back to just what was about neutral, pull up on the control column until you could feel it catch; then you still had the travel of the servo control.

Q. In warming up the engines after you had taxied into position did you have to hold the wheel back or did its locked condition permit you to warm them up without this?
A. You could warm them up with your hands off. That would indicate that the elevator was locked in an up position.

Q. Do you think it was possible to take the ship off in the position you normally had the controls in when you warmed up the engines?
A. Yes.

Q. Did you make any attempt or did you observe whether Major Hill or Mr. Tower made any attempt to unlock the elevator and rudder controls during the take-off run or after you had left the ground?
A. No.

Q. If either Major Hill or Mr. Tower had reached for that control lock, do you think you would have observed them doing so?
A. I believe so, because I did see Mr. Tower step forward and reach across under Major Hill's hands for the stabilizer trim tab. It is possible that he could have made an effort to step on the control lock pedal that I would not have seen. I very definitely recall his stepping forward and reaching down to that side of the column.

Q. Were all meters functioning satisfactorily?
A. Absolutely.

Q. Do you know what Mr. Tower's specific duties were going to be on this flight?

A. We asked him to go along to keep the propellers adjusted at constant r.p.m. The time before when we had attempted to make this climb we had gotten into the air and rolled up the landing gear and adjusted the propellers and then came back down close to the ground and started up. This kept the co-pilot busy to take his readings and adjust the propellers right off the ground so Mr. Tower was to adjust the propellers from the take-off position to rated r.p.m. for climb and then keep them constant during the climb.

Q. Will you give us the occupants of the plane and as far as you know, their positions?

A. Major Hill was in the pilot's seat. Mr. Cutting was in the navigator's seat immediately behind the pilot. Mr. Tower was standing to the rear and between the pilot and co-pilot seats, probably just abreast of Mr. Cutting or a little further forward so that he could get at the propeller control. Mr. Koogler was in the radio cabin, I suppose seated at the table. I, Lt. Putt, was seated in the co-pilot's seat.

Q. Did the take-off up until the time you left the ground seem normal?

A. Yes.

Q. Do you believe from your experience in having flown this airplane a number of times that you or any other pilot could have pulled this airplane up into the position it assumed before it fell off?

A. Yes, I believe you could. During the take-off tests that we ran we were pulling the plane up pretty steep.

Q. Have you ever in any of your tests pulled the airplane up as steeply as it went up just after leaving the ground in this particular flight?

A. No. After we had gotten off the ground everything seemed normal. The movement seemed to come right sudden. There is quite a noticeable pick-up in air speed on the Boeing 299. You would take-off at 74 miles per hour and the air speed would suddenly pop up to about 90.

Q. Did the airplane immediately start up in a steep climb as it left the ground?

A. No, it did not. It seemed to be normal.

Q. Will you describe the action of the airplane after you left the ground?

A. Having left the ground normally, I think that probably we didn't have over somewhere between 20 or 30 feet, not any more than that, when the nose suddenly went up.

Q. Did you notice any sudden vibrations through the airplane?

A. No vibrations at all.

Q. Did you notice any shock at all that might have come from some structural failure?

A. No.

Q. What do you think caused this sudden change in speed?

A. That is characteristic of the airplane.

Q.

A.

Exhibit [illegible]

Q. What is your opinion of the sudden upward tendency just as it left the ground?
A. It startled me.. I couldn't figure out what was happening. Had it nosed up immediately off the ground we might have realized just what had happened and might have possibly throttled the engines and landed straight ahead. Since it didn't occur until after an appreciable length of time after it had cleared the ground it certainly never occurred to me that we might not have unlocked the controls.

Q. From the take-off up until the time of the crash had you had any thought or impression that the controls may have become locked or have been locked?
A. No, that never occurred to me at all.

Q. What was the normal setting of the elevator trim tab for take-off?
A. It was normally set a little tail heavy. It would take-off very nicely with the tabs set in neutral or zero degrees but it required re-trimming as soon as you got off; and we found that by setting the indicator in the cockpit to a position corresponding to 10 degrees tail heavy the airplane took off nicely and did not require re-trimming after taking off.

Q. You stated to Captain Harris shortly after you got out of the airplane: "If possible, look at the control box." Did you say this?
A. If I said that, I very definitely meant the control lock, because that was what I was thinking of at the time and he happened to walk by so I asked him to look at it.

Q. After you had gotten out of the wrecked airplane did any ideas occur to you as to the cause of the accident?
A. They did, yes. It occurred to me that possibly the controls had been locked and possibly caused the crash.

Q. Do you recollect speaking to Mr. Igo?
A. Yes. He and Captain Harris are the only two that I remember seeing, plus Mr. Cutting..

Q. Do you recall what you said to Mr. Igo?
A. I don't remember at all what I said to Mr. Igo. I remember his being out there, sort of moaning and very excited but I don't remember what I said to him.

Q. In your flying of this airplane had any thought ever entered your mind as to the possibility of the pilot forgetting to unlock the airplane before he took off?
A. It had, yes.

Q. About how much play is in the control column fore and aft with the controls locked?
A. I would say there is at least four inches, the important thing being that there was enough play for the kind of take-off we were making. The amount of movement of the control necessary for a normal take-off would be less than four inches and for that reason there would be no indication that the controls were locked.

Q. Do you have any recommendations as to a lock on the control surfaces?
A. On this particular type airplane I believe either a warning, that is, a horn or flashing light would be fine, or more positive still I would strongly recommend when the controls are locked the throttles are positively locked closed.

Q. Have you formed any conclusions from your experience in the airplane and with previous experience in taking off and landing the airplane, and in flight, as to what actually caused this accident?
A. There is a possibility that Major Hill did unlock it and I didn't see him, but I very definitely know that I didn't do it.

Q. Did you ever notice how close to the floor you would have to have the plunger to unlock the controls?
A. When it was unlocked it was flush with the floor, and you had to have it down within 3/8" of the floor. Unless you got it down the last small part of the travel it wouldn't unlock.

Q. Did you ever have occasion to notice whether the elevators and rudder unlocked at exactly the same time? Would it be possible to unlock the rudder by moving the plunger down and still have the elevators locked?
A. I have never actually noted that, but I have noticed the reverse to be true, i.e., that the elevators would lock and the rudders still be free. Most pilots are leary about having other people get their hands on the controls when something happens. We sometimes landed it with both people helping on the elevator. When making take-off tests, and Major Hill was acting as co-pilot we both, with the controls unlocked, held back on the control column until the engines were turning up, so that, in addition to being a natural reaction to reach for the controls, we were working on the theory that we both were flying the airplane. I don't remember any explosion after we hit the ground.

Leslie R. Tower Monday, November 4, 1935.

Mr. Leslie R. Tower, at the Miami Valley Hospital, Dayton, Ohio, was visited by the Board, and after being duly sworn, testified as follows:

Q. Tell as near as you can remember everything that occurred from the time of the take-off to the crash of the Boeing 299.

A. All the engines were run up and everything seemed to be checked about the plane. Then Major Hill opened the throttles and I was at the time standing back of him in the passage-way opposite the navigator's seat watching the instruments. Everything seemed all right to me on the take-off. The airplane just jumped up into a very steep climb and I think it fell off into a left turn and started down. Both Major Hill and Lt. Putt were pushing forward with both hands on the control column at the time. As soon as I realized that Major Hill and Lt. Putt could not get the nose down I started rolling the elevator trim tab forward. I was standing back of the control stand at the time of the crash.

Q. Did you notice any sudden shock or vibration through the airplane that would indicate structural failure?
A. No, there was nothing of that sort.

Q. Did you observe at any time the position of the locking handle?
A. No, I didn't in this flight. I may have but I don't recall it now, but usually do check all those things.

Q. Have you any opinion as to the cause of the crash of the Boeing 299?
A. I am definitely convinced that the controls were locked.

Q. Either before or after the take-off did you observe Major Hill make any effort to unlock the controls?
A. No, I didn't that I can recall.
There is a certain amount of movement you have on the stick that would indicate that it was free.

NOTE: The Board examined Mr. Tower as soon as his physical condition would permit. In view of his serious condition the Board limited its examination, at the request of the Flight Surgeon, to five minutes.

Mark Huffman Koogler — Monday, November 4, 1935.

Mr. Mark Huffman Koogler, after being duly sworn, testified as follows:

Q. What are your duties?
A. I am assigned to the Flying Branch as Airplane Mechanic.

Q. What was your assignment on the Boeing 299 Bomber?
A. I was assigned as assistant crew chief on the Boeing 299, alternating flights with Roy Grooms.

Q. Will you give us a complete account of everything you observed pertaining to this particular flight?
A. They had given us word that the plane was to be gotten ready for flight and we had started the engines. Everything was functioning all right and everything was O.K. for the take-off. They had all gotten into the plane and just before they pulled the blocks out, Roy Grooms and I were both in the rear of the ship at the time and I said: "I will go up and turn the oxygen on", and I asked him if he had turned in the flight coat that he had borrowed. I went back and sat down at the table. He came in with the coat and said everything was O.K. He got out of the ship and it started moving out on the field. Just as we cleared the ramp I was sitting at the radio table in the radio compartment. One of the boys in the radio called "Boeing 299", and I immediately put the earphones on and answered him back and he said to give him a call as soon as we got off the ground. I answered him back that they had given the engines the throttle and the wheels were just leaving the ground. We had just cleared the ground. I was sitting there with the earphones on my ears. I noticed nothing unusual about the take-off. I could feel the climb. All at once it fell off on the left wing and I thought we were in an unusually steep bank. Although I was a bit alarmed, I felt no unusual

maneuvering. The engines were working perfectly. I raised up and glanced out of the window and I could see the wing tip right on the ground. Just at that instant we struck and the radio compartment just simply burst into a mass of flames. Of course, I made an attempt to get out at the rear door in the radio compartment. I attempted three or four times to open the door and I couldn't do it. Finally, I just reared back and caved the door in. I felt the door let go, and I passed out then. I don't remember getting out of the ship. The next I knew I was lying on the ground and when I came to I raised up and saw the whole ship was afire. I got up and attempted to start around the front of the ship and someone grabbed me and put me in the ambulance. As far as anything unusual in the plane was concerned, I had absolutely no warning whatever, due to the fact that I couldn't see the ground.

Q. Did you notice any structural failure before it hit the ground?
A. No, I didn't. I couldn't feel anything give under me even when we hit the ground. I believe the bomb bay door came open or that portion gave way.

Q. Have you made any take-offs in this airplane before?
A. Yes, I have flown in this plane three or four times.

Q. Flying in the same seat?
A. Yes.

Q. Did you notice any difference in this take-off?
A. I didn't notice anything unusual. I wasn't in the least alarmed until we hit the ground. I had no idea of any danger whatever.

Robert K. Giovannoli,
1st Lt., Air Corps.

Monday, November 4, 1935.

The Board visited Lt. Robert K. Giovannoli at the Miami Valley Hospital, Dayton, Ohio. He, after being duly sworn, testified as follows:

Q. What are your duties?
A. I am assigned to the Power Plant Branch as an officer in charge of Specifications and Evaluations.

Q. Were you an eye witness to the take-off and crash of the Boeing 299?
A. I didn't see the whole take-off. I saw it when it was about 200 feet in the air.

Q. Will you give your observations to the Board?
A. I was in the Operations Office when someone yelled "Look". I looked out the window and the plane was in what you might call a steep climb, banked to the left about 45 degrees, with nose up not far off the vertical direction. The plane turned very slowly to the left and appeared to be just about in a stall, turned to the left and nose dropped, and the plane went through just about the motions you would expect the pilot to take coming out of that situation. The plane very nearly leveled off and the nose was coming up when the left wing tip struck the ground slightly before the under-carriage, crumpled almost instantly, broke into flames.

Q. Will you describe your actions.

A. I was standing there in front of the Operations at the time it hit. The fire truck started out and at the time I didn't feel like there was anything I could do. I didn't immediately rush out, and I began to see them running out with hand fire extinguishers and I got my car and picked up a few of the fire extinguishers, drove out and stood around for awhile. Before I started out I saw someone running around the crash, and I was trying to find out how many had gotten out. I saw someone raise up in the cabin and then I realized that may be there was some life still inside. I ran up to the nose and Mr. Tower stuck his head out from the front window. I helped him get out. We got back down and Major Hill raised up. We saw him and I climbed in the window and tried to help him out. Found that his foot was caught on the rudder. So we worried around with him until we got that loose, then helped him out, and then I left the scene of the accident. I noticed Major Hill's seat was broken loose, apparently pivoted about the front.

Q. At any time during this period did any of the men that you helped out say anything.

A. I don't remember Tower saying anything, but Major Hill talked rather sensibly during the time I was in there. He mentioned that he couldn't get his foot loose. He mentioned something about his eyes. Sounded as though he was in his right mind. He said nothing to indicate what had happened.

Q. Do you have any recollection of stepping on the control lock?

A. I don't recall stepping over it or stepping on it.

Leonard F. Harmon,
1st Lt., Air Corps. Monday, November 4, 1935.

Leonard F. Harmon, 1st Lt., Air Corps, after being duly sworn, testified as follows:

Q. What are your duties?

A. Project Officer on Bombardment Airplanes, and assigned to Procurement Engineering Branch, Engineering Section.

Q. Where were you when the crash of the Boeing 299 occurred?

A. I was in the Chief Engineer's Office.

Q. Will you state to the Board your actions after you learned there had been a crash?

A. There was a scheduled conference at 9:00 o'clock in the Chief Engineer's Office. This conference was delayed slightly due to Captain Watkins being Officer of the Day. During the conference the fire whistle sounded and Major Lingle opened the door to the Chief Engineer's Office to inform the Officer of the Day that there was a fire after which Captain Watkins left the conference. The conference continued for several minutes and was interrupted by Captain Carroll opening the door and announcing that the Boeing 299 had crashed and was burning up. Captain Carroll and myself started immediately to proceed to the flying field. We ran all the way to the scene of the crash with the exception of several hundred yards.

Q. Did you actually see any part of the crash?
A. No.

Q. What were your actions when you arrived at the scene of the crash?
A. I ran around the right wing and the next thing that I was aware of was that somebody yelled Giovannoli had started into the airplane. I ran around the nose of the ship and saw Major Hill apparently raise up in the seat. I grabbed a blanket that was in the vicinity and was aware that Captain Carroll was close to me. I yelled to him to have a flat bottom truck backed up to the left side of the fuselage. I kicked a hole in the side of the fuselage and climbed up in the vicinity of the pilot's cockpit. Somebody brought a ladder which made it easy to stand on. The blanket I had apparently could be used to a greater purpose outside of the airplane to keep heat from coming into the cockpit where Giovannoli was trying to work, so I attempted to throw it over the top of the ship to block off this wind. It is my belief that Major Hill said "My foot is caught, can't you do something about it"? Giovannoli yelled for a knife which was furnished by Captain Carroll. There was fire burning just below the rudder pedals. After Giovannoli reached Major Hill's foot we pulled his seat up and I grabbed Hill around the detachable parachute harness and lifted him out the windshield and placed him on the truck that had been backed up into position. Giovannoli came out the window immediately afterward.

Q. Did Major Hill or any of the other occupants of the plane make any remarks at that time?
A. No. Going to the hospital I was in the ambulance that took Lt. Putt in and he just asked if they got Pete out.

Q. Did you hear any of them make any remarks at any time which might have a bearing on the accident?
A. None.

Q. In your position as Project Officer on the Boeing 299 have you had occasion to familiarize yourself with the control locking and unlocking mechanism of the Boeing 299?
A. Only in that I was generally familiar with the manner in which the plunger engaged the holes, in that the lock control in the pilot's cockpit had to be pushed down flush with the floor to unlock the surface controls.

Dudley W. Watkins,
Captain, Air Corps. Monday, November 4, 1935.

Dudley W. Watkins, Captain, Air Corps, after being duly sworn, testified as follows:

Q. What are your duties?
A. Assistant Chief, Power Plant Branch.

Q. What were your duties on October 30th, the day of the accident to the Boeing 299?
A. I was Officer of the Day on this particular day.

Q. Where were you when the crash of the Boeing 299 occurred? Will you state your actions from the time you first learned of the crash, from that point on?

A. I was in a conference in the Chief Engineer's Office when Major Lingle came in and said that the fire whistle was blowing. I rushed out on the front steps of the Administration Building and saw the black smoke. I made my way to the Operations Office and before I got there I met the ambulance coming back from the crash. I went on to the Operations Office and then got onto a truck that was going out into the field. As soon as I arrived at the scene of the crash I saw several people helping a man out of the front cockpit. Immediately after that they started to get another man out. I saw a man wrapped in a blanket getting into the cockpit. At this time there was one fire truck going back to the Operations Office and another fire truck at the scene of the fire which they were trying to get into operation. Several men were pulling the hose and getting it ready to throw the stream on the fire. I would say it was two or three minutes before this stream was played on the fire after I got there. Shortly after that the stream was played on the fire and on the cockpit. A truck was backed up to the nose of the airplane and the last man was removed from the cockpit, was loaded in a vehicle and returned to the hospital. Instructions were then given to all people to leave the vicinity of the crash, except those who were attempting to put out the fire. I then returned to the Operations Office and was instructed to return to the fire and tell everybody to leave except those who had business there. This was done and I returned to the Operations Office, where I talked to General Robins. He told me to return to the scene of the fire and again see that everybody left the scene. After this I returned to the Operations Office and then returned to my office at the Power Plant Branch. This was roughly from forty-five minutes to one hour after the first fire-signal.

The complete membership of the Board, less the Surgeon, Captain C. W. Dingman, made as complete an inspection of the wreckage of the Boeing 299 as was possible.

As a result of the examination the following points were noted:

The rudder was found locked in neutral. The trailing fuselage streamline cone was removed and an examination of the locking pin disclosed the pin only slightly engaged in the neutral hole of the locking quadrant. The rudder trim was in the proper setting for take-off with the geared engines. Reference, Photograph No. 52796, Exhibit "X".

The elevator was found in the down position, the right end resting on the ground. The trim tabs were up nine (9) degrees. Reference, Photograph No. 52800, Exhibit "X". In an effort to inspect the locking mechanism on the quadrant on the elevator torque tube, the Board was unable to make a visual inspection. An inspection of the cam which operates this locking mechanism was made and the position of the pin in the cam slot indicated the locking mechanism was not completely unlocked. In the condition in which it was found with the right trailing edge on the ground it was unlocked but on lifting the elevator it snapped into a very slightly locked condition. By cutting in through the fuselage it was still impossible to completely inspect the locking quadrant. Reference, Photograph No. 52795, Exhibit "X". An examination of the cockpit showed the locking handle approximately an inch above the fully unlocked position. Reference, Photographs Nos. 52801 and 52802, Exhibit "X". The cables from the locking handle to the locking quadrants on the elevator and rudder were found intact and were properly connected. While making our detail investigation, by movement of personnel inside the fuselage, both elevator and rudder became unlocked.

The split trailing edge wing flaps were found in a partially open position. Reference, Photograph No. 52798, Exhibit "X". But all flap hinge bell-cranks showed that the flaps were closed. The open condition shown in the photographs resulted from the burning off of the control tubes leading from the bell-cranks to the respective flaps.

An examination of the right aileron showed it to be free.

An examination of the cockpit revealed the following: all fuel valves and all tank cocks were in proper position for flight. All switches were on. The indicator showed the landing wheels down and the tail wheel down. The indicator showed the tail wheel was in the locked position.

The propeller controls were set in the full "increased r.p.m." position and were unlocked.

The indicator for the elevator trim tab was set to a position which would indicate seven or eight degrees nose down. This corresponds approximately to the angle at which the trim tabs were found.

The Board examined the automatic pilot servo controls together with Captain Crane and Mr. Donald Weaver and found the automatic pilot manual control in the off position.

All control cables were traced as far as the destroyed condition of the airplane would permit and found properly connected.

The quadrant on the elevator and rudder together with the locking pin on the cam, and the locking and unlocking handle and its bell-crank were removed for further detail examination.

Exhibit "Y".

Wright Field, Dayton, Ohio

October 31, 1935.

TO: President of Accident Investigation Board.

SUBJECT: Inspection of the wreckage of the Boeing Airplane Company's Bomber, Model 299, October 30, 1935.

1. PURPOSE: An inspection was made of the Automatic Pilot Control Unit, the servo unit (assembled integral with the control cables) and the manually operated push-pull knob which turns the automatic pilot on and off, etc., to determine whether or not the airplane controls were being automatically operated and if any part of the servo unit had failed.

2. CONCLUSIONS:

a. Whether or not the automatic pilot was turned on cannot be definitely determined from existing evidence; however, all facts support the belief that the automatic pilot was not actuating the controls of the airplane at the time of the accident.

b. Although the rudder cable was found locked at the automatic pilot servo unit by a clevis-guide bolt indexed into a lightening hole in the guide plate, this condition evidently was created by deformation of the structure at the time of accident. Also if the description of the maneuvering of the airplane at the time of accident as learned from several eye witnesses is correct, the rudder alone being locked would not have caused the airplane to go into a steep climb.

3. REMARKS:

a. The directional gyro was in caged position. In azimuth the circular card graduated in degrees was within 15° of being coincidental of zero with the upper follow up dial and both zero markings were visible.

b. The climb and bank gyro was caged.

c. Aileron control wheel was in left position, full around.

Inspection of wreckage of Boeing Bomber,
Model 299, October 30, 1935.

d. The three speed control valves, determining rate of flow of oil to the servo unit, were in full left setting, which is the off position.

e. The control push-pull knob located on the extreme left side of the instrument board near the lower edge was pushed in; i.e., the "ON" position.

f. The by-pass valve of the servo unit was in off position. The push-pull tube by means of which the motion is transmitted from the control knob to the lever on the by-pass valve shaft has been bent sideways, simulating a beam having failed in bending from a load applied at one point. This deformation shortened the length between the end fittings of this tube resulting in the condition set forth above; i.e., control knob in "ON" position and the by-pass valve in off position. This condition makes it impossible to determine if automatic pilot was initially in "OFF" or "ON" position. However, with both gyros found caged and the oil speed control valves turned to "Off" position, indications are that the automatic pilot had not been set preparatory to turning the control of the airplane over to the automatic pilot.

g. The hand on the oil gage for indicating the pressure of the oil in the automatic pilot, points to 240 pounds per square inch marking.

h. Suction gauge hand points to zero.

i. With reference to the servo unit, the piston rods of which are connected in series with the control cables actuating the elevators, rudder and ailerons, inspection shows the following conditions. All connections were together. The clevice bolts which connect the control cables with the rear ends of the piston rods of the servo unit are of a special design, having a rod like head extending out from the fitting (one side only) approximately three inches. This extension of the clevis pin normally was located in a guide slot of a metal plate placed parallel to and below the piston rods, for the purpose of preventing the cables and piston rod assembly from rotating when the controls are actuated. In plan view the inboard piston rod controls the elevators, the center piston rod controls the rudder and the outboard piston rod controls the ailerons.

The guide pin for the aileron cable assembly remains in the guide slot while the clevis-guide pins for the rudder and elevator control cable assemblies are out of the guide slots. The guide plate with the three slots has been deformed and dislodged from its normal position evidently during the impact, at which time the two guide pins could have been pulled out of the guide slots. However, the ~~guide pin in the~~ rudder cable piston rod assembly was found indexed in one of the lightening holes (approximately 1" in diameter) in the guide plate, locking the rudder. The guide pin in the elevator control cable assembly, although not in designed for normal position was not restricting or locking the elevator control cable.

Since the detail design appears to be such that an inexperienced, or careless, assembler could produce the conditions which would let the controls become locked, it is recommended the details of the design be carefully checked and changes made where necessary in the event another Boeing Model 299 airplane is fabricated.

The above inspection was made by Captain Carl J. Crane and Mr. D. B. Weaver.

F. S. BORUM,
Major, Air Corps,
Chief, Equipment Branch.

September 9, 1935

Flight Test Procedure on Airplanes Submitted on Circular Proposal No. 35-26

Chief, Flying Branch

1. To each of the airplanes submitted on Circular Proposal No. 35-26, will be assigned a crew consisting of the following: One pilot, one co-pilot, one crew chief, and such airplane and engine mechanics as may be found necessary to perform the proper maintenance of the airplane and engines.

2. The pilot will be a test pilot of the Flying Branch. His duties will be as follows:

a. To familiarize himself with the airplane.

b. To make such flights as may be required in the obtaining of the required performance data, and such other flights as may be directed by the Chief, Engineering Section.

c. To familiarize with the airplane such other pilots of the Flying Branch whose collaboration may be necessary in obtaining full performance data.

d. To familiarize with the airplane such other pilots who may be designated by the Chief, Engineering Section, to fly the airplane.

3. A qualified co-pilot, designated by the Chief, Flying Branch, will accompany the airplane on each flight. Prior to flight, this co-pilot will have familiarized himself with the location and manner of operation of all controls and accessories of the airplane and engines.

4. On all flights at least one mechanic assigned to the airplane will accompany the airplane in the air. During all flights made by members of the Bombardment Evaluation Board, the pilot or co-pilot assigned to this particular airplane, or when neither are available, then a test pilot selected by the Chief of the Flying Branch will accompany the Board member and will act as pilot or co-pilot. On all performance flights a flight test observer will be one member of the crew. All the personnel will have been thoroughly instructed in the manner of operation of the

Chief, Flying Branch
9-9-35
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retractible gear, etc., so that in case of malfunction of these parts during flight, they will be able to furnish such aid as may be possible.

5. As the airplanes submitted on Circular Proposal No. 35-26, have not been subjected to the more rigorous maneuvers detailed in Handbook of Instructions for Airplane Designers Change Notice dated July 11, 1935, it is directed that during all performance, test and evaluation flights at this station, that these airplanes be flown in such manner as to not subject them to any loads and/or strains that might result in any weakening or damage to the structure. Maximum level flight speed will not be exceeded. No sharp pull-outs and no push-downs will be attempted.

F. L. MARTIN,
Colonel, Air Corps,
Commanding.

Copies to:
Adjutant,
Chief, Engineering Section
" Procurement Section
" Aircraft Branch
Central Files

- A TRUE COPY -

L. C. Craigie Capt. A.C

12/07/36
~~10/30/35~~
Y1B-17

&

XB-17

10/30/1935
Wright Field

10/30/35

Boeing Y1B-17

Last revised July 25, 1999

The Y1B-17 was the initial service test version of the B-17, thirteen of which had been ordered on January 17, 1936. It was assigned the company designation of Model 299B. It had initially been designated YB-17, but this was changed to Y1B-17 on November 20, 1936, indicating procurement from "F-1" funds rather than from regular appropriations. This change was the source of much confusion for historians, since references were made to both YB-17 and Y1B-17 in the documentation of the day, giving the erroneous perception that there were two series of service-test Boeing Fortresses rather than just one.

The Y1B-17 was basically similar to the Model 299, but had four Wright GR-1830-39 (G2) Cyclone radials in place of the Pratt & Whitney Hornet radials of the Model 299 prototype. The Cyclone was to remain the standard powerplant all throughout the long production run of the Fortress. The crew was reduced to six, and minor changes were made in armament details and in the undercarriage. Perhaps the most readily-noticeable difference was in the the main landing gear, which now had only one leg rather than two. A long carburetor intake on top of the engine nacelles distinguished the Y1B-17 from later models.

The first Y1B-17 (36-149) flew on December 2, 1936. Five days later, the brakes of this aircraft fused and seized up during a landing, and the aircraft nosed over. Although the damage to the aircraft was not severe, the episode was very embarrassing to the Air Corps and a Congressional inquiry was ordered, with angry Congressmen threatening to have the whole program shut down. However, nothing came of this threat except perhaps the fear that if another incident should occur, the entire Army Air Corps heavy bomber program would be cancelled.

All Y1B-17s were delivered between January 11 and August 4, 1937. Twelve of the Y1B-17s were delivered to the 2nd Bombardment Group based at Langley Field, Virginia for evaluation. A thirteenth Y1B-17 was delivered to Wright Field for experimental tests. At this time, the dozen Y1B-17s of the 2nd Bombardment Group comprised the entire heavy bombardment strength of the United States.

The 2nd Bombardment Group spent its time working out the bugs in the B-17. One of the recommendations that they came up with at an early stage was the use of a check list that the pilot and copilot would go through together before takeoff, hopefully preventing accidents such as the one which resulted in the loss of the Model 299.

In early 1938, Colonel Robert C. Olds, commander of the 2nd Bombardment Group flew a Y1B-17 to set a new east-to-west transcontinental record of 12 hours 50 minutes. He immediately turned around and broke the west-to-east record, averaging 245 mph in 10 hours 46 minutes.

Six planes of the 2nd Bombardment group took part in a good will flight from Langley to Buenos Aires, Argentina, taking off from Langley on February 15, 1938 and returning on February 27. They covered a total of 12,000 miles without serious incident.

Model 299.

The Model 299 was based heavily on the company's experience with the all-metal Model 247 commercial airliner. It was basically a marriage between the aerodynamic and structural features used by the Model 247 and the basic four-engined format used by the Model 294 bomber. The aircraft was to be powered by four 750 hp Pratt & Whitney R-1690-E Hornet nine-cylinder air-cooled radials, each driving a three-bladed propeller. The large, thick-section wing was to be mounted low on the cylindrical-section fuselage. The main landing gear was to retract forward into the inner engine nacelles, with the lower edge of the wheel protruding into the airstream.

The Model 299 aircraft was painted with the civilian registration X-13372, since it was a company-owned aircraft. It carried a crew of 8, a pilot, copilot, bombardier, navigator/radio operator, and four gunners. There were four blister-type flexible machine gun stations, each of which could accommodate a 0.3-inch or 0.5-inch machine gun. One was in a dorsal position in the fuselage just above the wing trailing edge, a second was in a ventral fuselage position just behind the wing trailing edge, and a blister was mounted on each side of the rear fuselage in a waist position. There was an additional station for a machine gun in the nose. All of the guns were manually swung. Up to eight 600-pound bombs could be carried internally. Loaded weight was 43,000 pounds.

In order to prevent damage by wind to the tail surfaces while the plane was on the ground, the elevators were locked in position. Before takeoff, the pilot would unlock the tail surfaces by releasing a spring lock in the cockpit.

First flight of the Model 299 took place on July 28, 1935 at Seattle with Boeing test pilot Leslie R. Tower at the controls. According to legend, a reporter having seen the 299 for the first time remarked, "Why, it's a flying fortress!". The name stuck.

After a short period of factory testing, the Model 299 was flown by Boeing test pilot Leslie Tower and three other crewmen out to Wright Field on August 20 for Air Corps evaluation. During this flight, it flew the 2100 miles nonstop at an average speed of 232 mph at an average altitude of 12,000 feet, breaking all records for the distance.

The prototype was submitted to the Army as Model X-299, but the Army objected to the designation as being too similar to its experimental military project numbers, so it was officially changed to B-299.

The competitors of the B-299 were the Martin 146 and the Douglas DB-1, which were both twin-engined designs. The Model 299 was clearly superior to both the Martin and Douglas designs, surpassing all the Army requirements for speed, climb, range and bombload. The Army decided to purchase 65 service test examples under the designation YB-17.

On October 30, 1935, the Model 299 crashed during takeoff at Wright Field and burned. Three of the crewmen managed to crawl out of the wreckage with only minor injuries, but pilot Ployer P. Hill (chief of Wright Field's Flight Testing Section) and Boeing test pilot Leslie Tower (who was riding as an observer) both died later of their injuries after being dragged from the burning aircraft. An investigation later showed that the crash was caused by the crew forgetting to unlock the tail surfaces before takeoff, the aircraft losing control immediately after leaving the ground.

Although the aircraft itself was blameless in the crash, the Air Corps got cold feet about the wisdom of acquiring so many YB-17s with the limited funds that were then available, and cut their order back to only

May 2?, 1936
Wright Field
PB-2A
Consolodated
Single Eng Fighter
Retractible Gear

05/27/36

carried oxygen for the crew, an absolute requirement for the altitudes at which the PB-2A was capable of operating.

The first production PB-2A came off the new line at San Diego and flew for the first time on December 17, 1935. The PB-2A had a maximum speed of 274 mph at 25,000 feet, 255.5 mph at 15,000 feet, and 214 mph at sea level. It could climb to 15,000 feet in 7.78 min. Service ceiling was 28,000 feet and range was 508 miles. Weights were 4306 lb empty, 5643 lbs gross. Armament consisted of two fixed 0.30-cal machine guns in the upper cowling synchronized to fire through the propeller arc, plus a single 0.30-cal' machine gun operated by the gunner in the rear seat. In addition, the PB-2A could carry ten 17-pound fragmentation bombs.

Unfortunately, the first PB-2A crashed at Wright Field in late May. Nevertheless, the deliveries of the PB-2A built up quite rapidly, being completed by July 1936. The PB-2A initially served with the 27th Pursuit Squadron, 1st Pursuit Group at Selfridge Field, Michigan. A few were also operated by that group's 94th Squadron. In 1937, the 1st Pursuit Group converted to Seversky P-35s and their PB-2As were passed on to the 33rd, 35th, and 36th Squadrons of the 8th Pursuit Group based at Langley Field, Virginia. A few wee also issued to the 60th Service Squadron at Barksdale Field, Louisiana.

On October 17, 1936, A PB-2A flown by Lt. John M. Sterling won the Mitchell Trophy race at Selfridge Field at a speed of 217.5 mph. In March 1937, a PB-2A reached an altitude of 39,300 feet over Langley Field and remained there for 20 minutes, but high altitude flights were seldom performed in practice because of the expense, inconvenience, and discomfort of the bulky pressure suits.

The PB-2A proved to be a sturdy aircraft, and there were relatively few fatal accidents. However, the retractable undercarriage of the PB-2A was a relatively new and unfamiliar innovation, and on numerous occasions pilots forgot to lower it before landing.

In the spring of 1939, the 8th Pursuit Group reequipped with the Curtiss P-36, and most of the 35 or so surviving PB-2As were transferred to Maxwell Field, Alabama. A few others were transferred to Eglin Field. By 1941, most were out of use. The last one was donated to a ground school in March of 1942. I don't know if any examples survive today.

Although the PB-2A was not exactly one of the shining lights in American aviation history, it nevertheless did chalk up an impressive list of firsts. The PB-2A was the only single-engined two seat monoplane fighter to attain operational status with the USAAC during the inter-war year, it was the first fighter in service with the USAAC to have a fully retractable undercarriage, it was the first fighter with a constant speed propeller, and it was the first truly successful application of a supercharger to an operational military

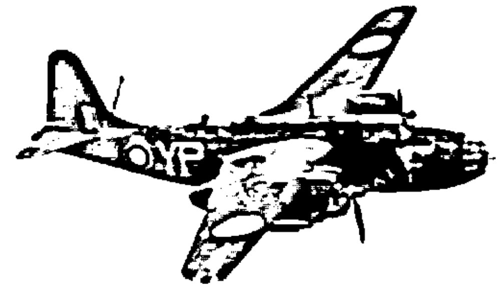
Jan 23, 1939

A-20 Havoc
Douglas

Demo to French
Loss of Control

Douglas A-20 Havoc

The most important and famous Army attack-bomber of World War II was the Douglas A-20, winner of the 1939 competition. Its design was actually begun in 1936 at El Segundo as the Northrop 7A, before that organization became part of the Douglas company. That design was revised as the Douglas Model 7B for submission in the July 1938 attack-bomber design contest, and a prototype was constructed to compete for the 1939 production contract.

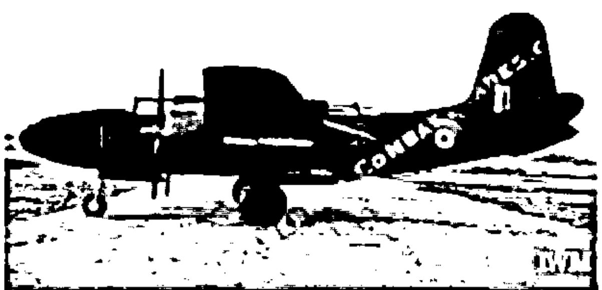


MVM

DOUGLAS HAVOC I
Two Pratt & Whitney Wasp SC4-G, 1100 hp at 6200'; 1000 hp at 14,500'
DIMENSIONS: As DB-7
WEIGHT: Empty 11,520 lb., Max. 17,151 lb. Fuel 325 gal.
PERFORMANCE: Speed- Top 293 mph at s.l., 322 mph at 15,300', Landing 86 mph. Service Ceiling 33,800', Range 462 miles/2,080-lb. bombs, 875 miles max.

As first flown October 26, 1938, the 7B had two 1,100-hp Pratt & Whitney Twin Wasps, a shoulder-high wing, and the first tricycle landing gear on an American combat plane. This nose-wheel gear permitted faster landing speeds and thus a smaller wing, leading in turn to the highest speed of any contemporary American bomber.

For the low-level attack mission, the 7B had a metal-covered nose and could be armed with two .50-caliber and six .30-caliber fixed guns, 80 30-pound or 14 100-pound bombs. A different nose with Plexiglas windows for a bombardier allowed the use of one 2,000 or four 300-pound bombs, while retaining four .30-caliber fixed guns in blisters. Both versions were defended by a rear gunner with a retractable "birdcage" turret, and another .30-caliber gun to fire downwards from a retractable floor mount.



DOUGLAS HAVOC II

The first flights were not announced to the public, but a crash on January 23, 1939, brought the plane widespread controversial attention. It was discovered that a French officer had been aboard, in violation of the Air Corps policy of not releasing information on new aircraft types until they were approaching obsolescence. An investigation revealed that President Roosevelt himself had made the decision to allow France and Britain to buy up-to-date American warplanes, thus rejecting traditional isolationism.

France did order 100 Douglas DB-7s on February 15, 1939, and the first flew at El Segundo in only six months, on August 17, 1939

In March 1937, a design team headed by Donald Douglas, Jack Northrop and Ed Heinemann produced a proposal for a light bomber powered by a pair of 450 hp (336 kW) Pratt & Whitney R-985 Wasp Junior engines mounted on a high-mounted wing. It was estimated it could have carried a 1,000 lb (454 kg) bomb load at 250 mph (400 km/h). Reports of aircraft performance from the Spanish Civil War indicated that this design would be seriously underpowered and, subsequently, it was cancelled.

In the autumn of the same year, the United States Army Air Corps issued its own specification for an attack aircraft. The Douglas team, now headed by Heinemann, took the **Model 7A** design, upgraded to 1,100 hp (820 kW) Pratt & Whitney R-1830 S3C3-G Twin Wasp engines, and submitted the design as the **Model 7B**. It faced competition from the North American NA-40, the Stearman X-100 and the Martin 167F. The Model 7B was maneuverable and fast, but did not attract any US orders.

The model did, however, attract the attention of a French Purchasing Commission visiting the USA. The Neutrality Act of 1935 at the time forbade the sale of arms, including aircraft, to any nation at war, and President Roosevelt had just issued a call both for its revision and a rearmament program for the Air Corps. Aided by the Treasury Department's Procurement Division (headed by retired Naval officers) and Secretary of the Treasury Henry Morgenthau, Jr., the French discreetly participated in the flight trials, so as not to attract criticism from U.S. isolationists. The Air Corps, which controlled the aircraft's development but had been excluded from negotiations between the French, the Production Division, and the Navy's Bureau of Aeronautics, was directed by the White House on 19 January 1939 to release the DB-7 for assessment in contradiction of its own regulations. The "secret" was blown when the Model 7B crashed on 23 January while demonstrating single-engine performance. The French were still impressed enough to order 100 production aircraft, with the order increased to 270 when the war began. Sixteen of those had been ordered by Belgium for its Aviation Militaire.

Although not the fastest or longest-ranged in its class, the Douglas DB-7 series distinguished itself as a tough, dependable combat aircraft with an excellent reputation due to its speed and maneuverability. In a report to the Aeroplane and Armament Experimental Establishment (AAEE) at RAF Boscombe Down, test pilots summed it up as "has no vices and is very easy to takeoff and land... The aeroplane represents a definite advantage in the design of flying controls... extremely pleasant to fly and manoeuvre."[1]

Douglas A-20 Havoc - *Chapter 1*

Model 7B Prototype

Last revised: 29 May 1998

Douglas A-20 Havoc
Douglas A-20 Havoc - Chapter 2: DB-7 for France

The Douglas DB-7/A-20 Boston/Havoc was one of the most popular and effective light bombers of the Second World War. A total of 7478 of these bombers were built, and they served with the French *Armée de l'Air* under the designation DB-7, with the USAAF under the designation A-20, and with the RAF, RAAF, and SAAF under the designation Boston. The largest single user of the Boston/Havoc was actually the Soviet Union, over 3000 of the 7478 built being sent to the Russian ally during the Second World War. Although it never achieved the degree of public fame attained by some of its contemporaries, it was one of the most important types of twin-engined light bombers of the Second World War, and was operated by American, Australian, Brazilian, British, Canadian, Dutch, French, Russian, and South African crews. It had a good performance and had excellent handling characteristics. It had many features which could be considered as being advanced for its time such as a tricycle undercarriage and a two-compartment bomb bay.

The origin of the DB-7/A-20/Havoc/Boston series can be traced back to March of 1936, when Donald Douglas, Jack Northrop, Ed Heinemann and a group of Wright Field technicians drew up a set of requirements for a twin-engined light attack bomber. The initial Douglas proposal bore the designation Model 7A, and was a two-seater powered by a pair of 450 hp Pratt & Whitney R-985 Wasp Junior nine-cylinder air-cooled engines housed in nacelles on a shoulder-mounted wing. The aircraft was very slim and had a tricycle landing gear. Provisions were made for a number of flexible and fixed 0.30-inch machine guns to be carried and a light bomb load. As an alternative, a glazed lower mid-section reconnaissance or observation platform could be fitted in place of the bomb bay. A bomb load of 1000 pounds could be carried. It was estimated that the Model 7A would have a maximum weight of 9500 pounds and would be capable of achieving a maximum speed of 250 mph.

However, by the time that the design was about half complete and a mockup had been built, combat information coming in from the Spanish Civil War indicated that the Model 7A would probably be obsolete even before it flew. In the autumn of 1937, the Army issued its own set of requirements for a twin-engined light attack aircraft. The Army was interested in an aircraft that had a range of 1200 miles, a speed of 200 mph and a 1200-pound bombload. In late 1937, the Army invited companies to submit designs for such an aircraft, with the stipulation that proposals being ready for submission by July of 1938.

On January 1, 1938, Jack Northrop left the Douglas subsidiary that had previously borne his name to strike out on his own, and Ed Heinemann took over as chief designer on the attack bomber project. The design team used the Model 7A as a starting point. More speed, armament, and bomb-carrying capability would be needed. The engines were now a pair of 1100 hp Pratt & Whitney R-1830 S3C3-G Twin Wasp fourteen-cylinder air-cooled radials, offering almost three times the available horsepower of the R-985s. Maximum weight was estimated at 15,000 pounds. Alternative nose sections were proposed, one being transparent for a bombardier position, and the other being solid and carrying a battery of six

0.30-inch and two 0.50-inch machine guns. The "transparent" nose model could also carry "blister" gun packs on either side of the nose. A single 0.30-inch machine gun could be housed in a retractable "birdcage"-type dorsal turret. A second 0.30-inch machine gun could fire downwards through an opening in the floor. A 2000 pound bombload was anticipated. The new design was designated **Model 7B** by the company.

The competitors to the Douglas Model 7B were the North American NA-40, the Stearman X-100, the Martin Model 167F, and the Bell Model 9. The Army invited all of the contestants to build prototypes of their designs at their own expense for a design competition. The deadline for the entries would be March 17, 1939. Bell backed out of the competition, but all of the other contestants submitted entries.

The Model 7B made its first flight on October 26, 1938. Powered by a pair of 1100 hp Pratt & Whitney R-1830 Twin Wasp engines, the Model 7B featured a shoulder-mounted wing and a slim fuselage. There were two crewmen -- a pilot and a rear gunner. The rear gunner was provided with a retractable manually-operated dorsal turret carrying a single 0.30-inch machine gun. In addition, the rear gunner was provided with a single ventral gun which could fire through an opening in the floor at targets coming from below. The Model 7B featured interchangeable noses -- a transparent "bomber" nose with a position for a bombardier and his associated equipment for low level missions and a solid "attack" nose fitted with six 0.30-inch machine guns and two 0.50-inch machine guns. When fitted with the "bomber" nose, teardrop-shaped blisters carrying a pair of 0.30-inch machine guns could be installed on the fuselage sides below the cockpit.

The Model 7B was maneuverable, fast, and had no serious handling vices. It flew with both the "solid" and "bombardier" noses during its brief career, and the only modification required as a result of flight testing was the moving of the horizontal tail surfaces forward and giving them some dihedral. Nevertheless, the US government made no attempt to acquire the aircraft. However, it just so happened that the first flight of the Model 7B coincided with the arrival in the USA of the French Purchasing Commission which was seeking aircraft for the modernization of the *Armée de l'Air* in the wake of the Munich Crisis. The commission obtained US government permission to witness performance trials of the Model 7B, although this had to be kept secret so as not to raise any diplomatic problems or to arouse the suspicion of isolationist forces who were at that time quite strong in the USA.

Impressed by what they saw, the French Purchasing Commission asked for and received permission to participate in the flight trials. Throughout December of 1938 and into January of 1939, members of the commission took part in flight tests of the Model 7B. However, on January 23, 1939, while demonstrating single-engine handling capabilities, an engine failure caused the Model 7B to go into a tight spin at low altitude. The Douglas test pilot, John Cable was able to bail out, but his chute opened too late and he was killed. The French observer, Captain Maurice Chemidlin, was trapped in the spinning aircraft but managed to survive the crash, although with serious injuries. Unfortunately, the press found out about the presence of the French observer on the crashed Model 7B, and there was a firestorm of controversy in the media, with isolationist forces maintaining a constant drumbeat of criticism. There were repeated calls for the resignation of General Henry H. "Hap" Arnold, and he was under tight scrutiny for the next year. Things got so bad that President Franklin Roosevelt was forced to take personal blame for the incident, and apologized to the nation.

Although the crash of the Model 7B was a setback, the French Purchasing Commission was sufficiently impressed by the Model 7B that they ordered one hundred examples on February 15, 1939. This was the first solid order for the Douglas design, since the USAAC had yet to place any firm order. 170 more examples were added to the order in October, following the outbreak of war in Europe.

Nov 04, 1941
Feb 11, 1939
YP-38
XP-38
Lightning

11/04/41

Lockheed YP-38 Lightning

Last revised June 13, 1999

In spite of the loss of the XP-38, the Lightning had shown its true potential. On April 27, 1939 a Limited Procurement Order for thirteen YP-38 service test aircraft was issued. Army serials were 39-689/701. The company designation for the planes was Model 122-62-02.

The YP-38 was redesigned for production and had a pair of 1150 hp Allison V-1710-27 and -29 (F2R and F2L) engines equipped with B-2 turbosuperchargers. These engines were equipped with spur reduction gearing rather than the former epicyclic type of gearing. This caused the engine's thrust line to be raised upward. The propellers were outward-rotating rather than inward-rotating as on the XP-38 (that is, the port propeller turned counterclockwise when seen from the rear and the starboard propeller turned clockwise).

The chin-mounted lip intake under the propeller spinner was replaced by a pair of cooling intakes. Enlarged coolant radiators were adopted on both sides of the tail booms.

Armament was revised to substitute two 0.30-in machine guns for two of the four 0.50-in machine guns, and a 37-mm Browning M9 cannon with 15 rounds was substituted for the 20-mm weapon. The 0.50 inch guns carried 200 rounds per gun and the 0.30 inch guns carried 500 rounds per gun. All the guns were mounted in the nose, with the 0.50 inch guns mounted above the 0.30-inch guns. One or two YP-38s were seen with prominent gun enclosure tubes protecting the two 0.50-inch machine guns, with flush plates covering the other gun ports. In reality, most YP-38s were flown without guns installed. At 14,348 lbs, the YP-38 was lighter than the overweight XP-38 due to structural redesign.

The first YP-38 flew on September 16, 1940 with Marshall Headle at the controls. In March 1940, the Army received its first YP-38 for service trials. Production lagged seriously behind schedule, and all thirteen YP-38s had not been completed until June of 1941. Maximum speed was 405 mph at 10,000 feet, and an altitude of 20,000 feet could be reached in six minutes. Normal range was 650 miles. Empty weight was 11,171 lbs, gross weight was 13,500 lbs, and maximum takeoff weight was 14,348 lbs.

During trials, the YP-38s ran into a problem in which the tail began to buffet severely during high speed dives, making it difficult to pull out. On November 4, 1941, the tail booms of YP-38 39-689 came off #1 A/C during a high speed dive over Glendale, California. Test pilot Ralph Virden was killed. This was initially falsely diagnosed as elevator flutter, and a set of external mass balances were added above and below the elevator. This problem was later solved by adding large wing-root fillets at the points where the wings joined the fuselage. This filleting had to be done very carefully, since failure to ensure a tight fit could severely impair the flight characteristics

References:

1. Lockheed Aircraft Since 1913, Rene J. Francillon, Naval Institute Press, 1987
2. The P-38J-M Lockheed Lightning, Profile Publications, Le Roy Weber Profile Publications, Ltd,

02/11/39

maximum range of 1000 yards. Tail surfaces consisted of a fin and rudder at the end of each boom and a horizontal tailplane and elevator between the booms. It was anticipated that the twin fin-and-rudder tail assembly would increase the effective aspect ratio of the tailplane by the endplate effect, thereby providing stability over a large c.g. range. At 14,800 pounds, the XP-38 weighed more than a bombed-up Bristol Blenheim I, at that time the standard British medium bomber. Fowler flaps were fitted between the ailerons and the booms and between the booms beneath the trailing edge of the wing center section.

The project was given the company designation Model 22-64-01. Lockheed promised a maximum speed of over 400 mph. Although the USAAC was somewhat skeptical about so radical a design, the Model 22 won Design Competition X-608 and on June 23, 1937, Lockheed was awarded a contract for one XP-38 prototype (Ser No 37-457). Construction began in July 1938. Construction proceeded rather rapidly despite the radical features that it embodied. Few problems were presented by the installation of the Allison V-1710-11/15 (C9) engines, which developed 960 hp at 10,000 feet and 1090 hp at 13,200 feet. Each engine had a General Electric B-1 turbosupercharger. To combat torque, the propellers rotated in opposite directions, a special version of the Allison engine being produced with a left-hand rotating propeller shaft. The engines had inwardly-rotating propellers. No armament was installed on the XP-38.

The XP-38 aircraft was completed in December of 1938. On the last day of the year, the completed XP-38 was stripped down, covered with canvas, and loaded onto three trucks. In great secrecy, the convoy of trucks was escorted by police to March Field, near Riverside, California, where Air Corps Project Officer Lt. Benjamin S. Kelsey was to began the flight testing. However, on the very first ground run, the wheel brakes failed and the XP-38 ended up in a ditch. Lt. Kelsey finally took the XP-38 into the air for the first time on January 27, 1939. The early test flights turned up some problems with the wheel brakes and with vibrations of the flaps, requiring that some modifications be made to the prototype. Maximum speed was 413 mph at 20,000 feet, and an altitude of 20,000 feet could be attained in 6.5 minutes. Service ceiling was 38,000 feet. Empty weight was 11,507 lbs, gross weight was 13,964 lbs, and maximum takeoff weight was 15,416 lbs

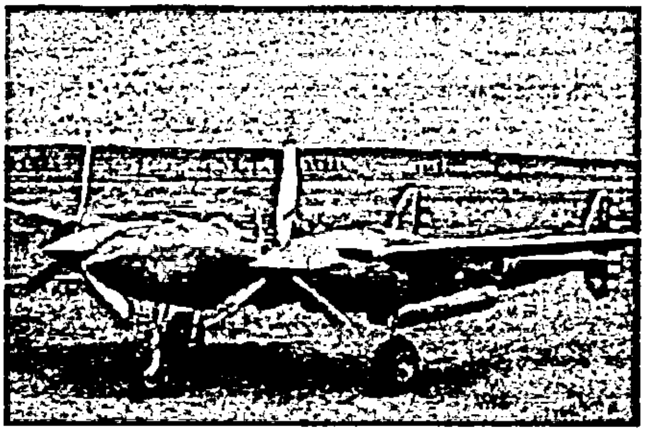
Reaction to the first few test flights was highly favorable. In spite of the problems encountered on its first few flights, it was decided to attempt a record transcontinental flight before delivering the XP-38 to the Army at Wright Field. At daybreak on February 11, 1939, Ben Kelsey left March Field destined for Mitchell Field, New York with refuelling stops at Amarillo, Texas and Wright Field, Ohio. On the final leg of the flight, the XP-38 lost power as Kelsey was coming in for a landing at Mitchell Field and crashed on a golf course just short of the runway. Fortunately, Lt. Kelsey was unhurt, but the XP-38 was a total loss.

2/11/39

The Palm link to the stars

Army's Fastest Plane Crashes

MITCHEL FIELD, N.Y., Feb. 11, 1939- The newest and fastest thing in fighting aircraft, Lockheed XP-38 the Army's twin-engined pursuit plane which took a year and a half to build, crashed today as it roared to a landing after a secret, record breaking speed flight across the continent. With Lieut. Ben S. Kelsey at the all-metal single-seater's controls, the "mystery" plane's tricycle undercarriage struck the top of a tree and crashed into a sand trap on a golf course adjacent to the Army airport. Kelsey was badly shaken but not seriously hurt. He was treated for a slight cut over the left eye and a scratch on one hand at the post hospital and then taken to post headquarters



where he told officers "I'm okay." The plane, which had reached speeds of almost 400 miles per hour in preliminary tests, left March Field, Cal., where its existence was divulged for the first time today., at 9:12 a.m., eastern standard time, and flew over Mitchel Field at 4:55 p.m., having stopped at Amarillo, Tex., and Dayton, O., for fuel. The elapsed time was 7 hours and 43 minutes, but the flying time, subtracting 21 minutes spent at Amarillo and 20 minutes at Dayton, was 7 hours and 2 minutes.

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2/11/39

over what little money was spent on aircraft procurement. There was little support for developing new technology, either from the politicians who saw little payoff in buying toys for the boys, as with senior military officers, most of whom were still thinking in terms of 1920s technology. This now absurd mindset decreed that a single seat fighter was to be restricted to a gun/ammunition load of 500 lbs and a powerplant well below 1,000 HP. At this time, two forward thinking junior officers, Lt. Benjamin Kelsey and Lt. Gordon Saville, realized that a fighter with an air-air weapon load of 1,000 lbs and at least 1,500 HP was both feasible and necessary to defeat the coming generation of long range bombers.

To beat the bureaucracy and circumvent the rules restricting what could be done with fighters, Kelsey and Saville invented the interceptor category and convinced the Army Air Corps to invite submissions on such a design. The February, 1937 Circular Proposal X-608 (ie RFP) for a single and a twin engine fighter called for the use of the very new Allison V-1710 inline liquid cooled V- 12, equipped with the new GE turbocharger for high altitude performance, and for the use of very heavy armament including cannon. Tricycle undercarriage was specified as preferred and large internal fuel capacity was mandatory, to circumvent an administratively imposed ban on the use of drop tanks by fighters.

The single engine fighter contract was won by Bell with what eventually became the ineffective P-39, while the $163,000 AC-9974 twin contract went to Lockheed's Model 22. Lockheed's chief designer, Hall Hibbard, and senior designer, Clarence "Kelly" Johnson, an MIT Master's graduate, had gone through six unorthodox airframe configurations before settling on the twin- boom layout. The XP-38 airframe proposal carried 400 USG of fuel internally, employed a near to symmetrical NACA 23016/4412 section and grossed out at 11,400 lb. Designed for 1,150 HP engines, the Model 22 was built to exceed 360 kts at altitude, stunning performance for the time. Johnson had at the time commented in detail on the possibility of compressibility affecting the handling of the aircraft, this was later to prove to be a major issue.

Construction of the first XP-38 began in July, 1938, while Lockheed was gearing up for mass production of Hudsons for the RAF. Some fabrication problems developed, but these were overcome and the first prototype was loaded on a truck for its journey to March Field on the 31st December, 1938.

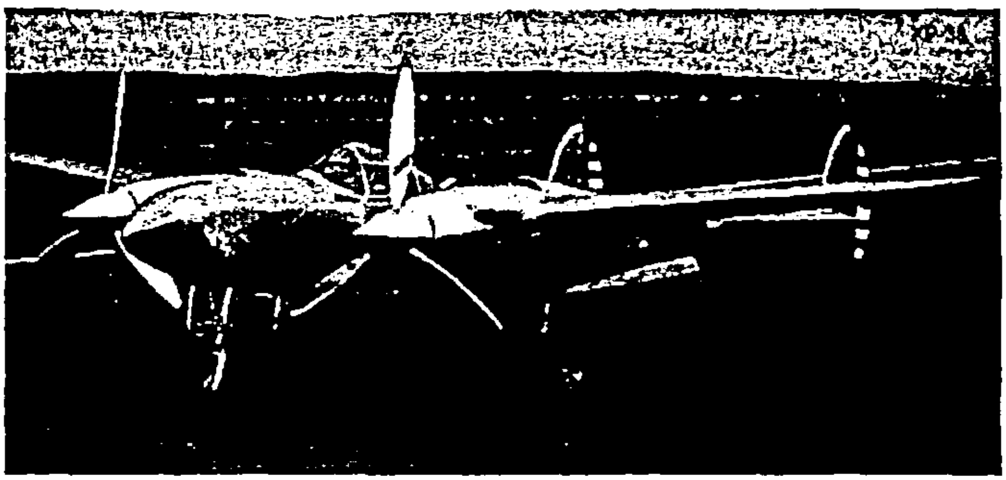
The sleek silver prototype was worked on for the following two weeks, and first flew on the 27th January, piloted by Lt. Ben Kelsey, the writer of the initial specification. The first flight was troubled, with severe flap vibration due to a broken support rod, but ended safely, in spite of brake problems. Subsequent flights saw a range of minor problems resolved, as the flight test program progressed.

The XP-38 proved to be a stunning performer, easily achieving 350 kt speeds. The system design of the airframe and propulsion was unique and radical, while strictly functional. The powerplant installation in the nacelle/tail booms exemplified this. The V-1710 engine was mounted in the front of the nacelle, driving a large 3-bladed Curtiss Electric constant speed prop. The GE turbochargers were mounted in the booms, aft of the wing, with intercoolers embedded in the outer leading edges of the wing, ie: The airflow was channeled to the wing-tip via a corrugated double skin and back via the leading edge cavity, and engine glycol radiators in aft boom scoops. The armament of four 0.50 cal machine guns and a single cannon was mounted in the nose, thus avoiding the dispersion problems associated with wing mounted guns.

The test program progressed rapidly and by February, 1939, the flight test team decided to attempt a long range record breaking flight across the continental U.S., in spite of unresolved flap and brake system problems. The attempt ended however in disaster, when carb icing during a prolonged approach at Mitchel Field (2) on Long Island, near the very end of the flight, caused a loss of power. Lt. Ben

P-38 Lightning Models
The XP-38

With the contract awarded to Lockheed, the design team then focused on creating the prototy This was now designated as the XP-38 by the military. The XP-38 was constructed using butt jointed flush riveted external surfaces developed by James McMinn Gershler. The control surfaces were also metal coated. Kelly Johnson also designed an intercooler, which would foi part of the leading edge of the wing for aerodynamic and mechanical efficiency. Finally in January 1939, and $761,000 later, the XP-38 was ready for its maiden flight.



Jan 7th/1939

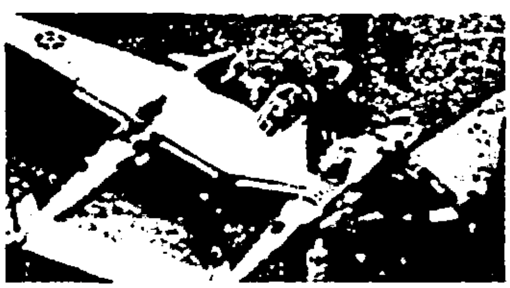
The XP-38 arrived at March Field on December 31, 1938. After a couple of weeks performin final preparations, the XP-38 began initial testing. Lt. Ben Kelsey was ordered to monitor the design process, and when the prototype was ready, he would be behind the controls. Kelsey b the flight-testing by taxing the aircraft along the runway and was able to determine that the braking system was inadequate. His aircraft was unable to stop and scattered a construction c working at the end of the runway. Finally, the XP-38 was ready to take flight for the first tim [redacted]w the XP-38 ready for flight. Kelsey steadily added power to the two Alis engines and lifted off the runway. Shortly after takeoff, the flaps began to shake and vibrate. Unknown to Kelsey, three out of the four aluminum support rods had failed, and allowed the to run out of the stops. If all four support rods failed, the aircraft most likely would be unmanageable. Kelsey throttled back and eased his way back towards the runway. He did not want to abandon the aircraft, which was a result of many months of hard work by Lockheed.

Unable to use flaps for landing, he came is faster than normal landing speeds. He flared out between 120-130 mph and was at 18 degrees. The XP-38 actually was dragging its tail on the runway, causing sparks to fly. Kelsey was optimistic about the flight, and even excitedly proclaimed that the aircraft did not stall even at an extreme angle of attack. This first flight of P-38 was marked with a large degree of excitement, even though it only lasted a short time.

The engineers examined the aircraft, and it was determined that the problem was a result of inefficient flap seals and support rods. With those two problems addressed, and with enhance brakes, the aircraft was ready for its second flight. Kelsey once again took the aircraft up on February 5, 1939. A third flight of the XP-38 revealed some longitudinal instability, which K Johnson resolved by adding an extra seven feet of horizontal stabilizer outside of the fins on e side. Further testing revealed buffeting elevator problems. This was caused by the prop-wash from the inboard wing area. Switching engines resolved this problem, which created the coun rotating engine characteristic of the P-38.

Three additional flights were conducted which brought the total testing time through Februar to 4 hours and 49 minutes. Since the first flight problems, no major problems were encounter throughout this short time of testing. It was time to move from March Field, and the military wanted to use this move to showcase their new aircraft to the public. A decision was made to this move to perform a record breaking flight across the continent, thus breaking the existing speed record. On February 11, 1939, Lt. Kelsey lifted off from March Field and proceeded to to Amarillo, Texas. This three-hour flight was uneventful. Kelsey was benefiting from a tailw and made his way across St. Louis and headed to Wright Field in Ohio. There he met with General Hap Arnold, and he gave Kelsey a final approval to continue the flight. Up to this po the XP-38 was performing flawless, and showed no evidence of any problems. However, this would soon change.

The plan was for Kelsey to take off from March Field and proceed to Mitchel Field, his final destination. Nobody at Mitchell Field was informed of any record-breaking flights, nor were expecting a new prototype to make its way there. Kelsey also did not inform the Mitchell Fiel tower of his record, and did not ask for any time readings or insist on any priority. Instead, he placed in a long landing pattern behind three much slower aircraft. Kelsey describes what happened then.



"I did not give it a second thought when the tower instructed me to take a position behind the PB-2A because I had to get the plane slowed down for flap extension anyway. I did not even think of icing bec we had none of it before. When I added power, I w really surprised to see those damn engines just sit tl and idle at around 1,500 rpm. If the engines just qu thought at the moment and have often thought, whi was going down... if they had just stopped all toget I would have kicked it off to the right and would have landed in an open field. It would have a reasonably good landing and we would have had minimal damage."

The XP-38 ended up crashing onto the Cold Stream Golf Course at Hampstead, Long Island. slashed through some trees, but a sand trap ended up doing the most damage. The aircraft wa: reasonably intact, but it was twisted, which prevented it from being repaired in any way. Spectators quickly approached the crash site and were surprised to see Kelsey unhurt. This cr also demonstrated the strength and durability of the airframe, would be a characteristic of the

38 throughout the entire war.

Arguments have been made about the crash. Some people believed that the program was not : back too much because there was already many improvements planned for the next model, th YP-38. Kelly Johnson put down some improvements he was working on in Report No. 1483. calculated a top speed of 403 mph at critical altitude on 1150 brake hp per engine. All he nee to meet for the original specifications was 360 mph.

Recommended Alteration	Calculated Speed Change
Redesign Prestone coolant radiators:	+8
Improved turbosupercharger installation:	+4
Revised oil cooler inlet:	+3
Reduction in exhaust cooling duct size:	+2
Weight reduction of 800 - 1,000 lbs:	+2
Increase horizontal stabilizer area by 7 sq. ft.:	-1.2
Armament installation:	-7.8
Net Change:	+10 MPH

Looking back at the testing process of the XP-38, Tony LeVier was critical of the record atte He argued that the crash did indeed cause a significant delay in the development of the P-38 program. "It was a grand idea, but the only thing a speed record would give them was some newspaper headline for a day and that's about all. Instead of waiting a few weeks until we kn more about the airplane, they took it when it had hardly been tested." He further states that, " did it do? It set the P-38 back about two years because we had to start from scratch and build another prototype airplane and run a whole new test program, and it was the best fighter plan had at that time. That incident may very well have lengthened the war."

An investigation was immediately launched to probe the cause for the crash. The XP-38 crasl was attributed to either vapor lock or possibly icing of the engines. General Arnold and Lt. K were summoned to Washington to discuss the circumstances of the crash and the possible fut of the P-38 developmental program. Satisfied with the state of the P-38 program, the military decided to order thirteen additional YP-38s from Lockheed.

March 18, 1939

Boeing 307 Stratoliner

Eng Out Demo
w/ Customer

[redacted]

ACCIDENT DETAILS	
Date:	March 18, 1939
Time:	?
Location:	Near Adler, Washington
Airline/Op:	Boeing Aircraft Company
Flight #:	?
Route:	?
AC Type:	Boeing 307 Stratoliner
Registration:	NX19901
cn / ln:	1994
Aboard:	13 (passengers:? crew:?)
Fatalities:	13 (passengers:? crew:?)
Ground:	0
Summary:	The aircraft crashed after the tail broke off.

Return to Home Page

ACCIDENT DETAILS	
Date:	November 30, 1955
Time:	22:00
Location:	Near Ballico, California
Military / Operator:	Military - U.S. Air Force
Flight #:	?
Route:	?
AC Type:	Boeing RB-52B
Registration:	52-8716
cn / ln:	?
Aboard:	10 (passengers:0 crew:10)
Fatalities:	10 (passengers:0 crew:10)
Ground:	0
Summary:	The aircraft crashed into a wooded area in 5 degree nose-down attitude. Abnormal nose-down trim condition which could not be corrected due to a unknown malfunction.

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speeds, not stalling speed, and would get some measurements of forces with a spring scale attached to the control column. They would also do sideslips, stall tests, and other stability tests.

It was a gloriously bright Saturday afternoon in March 193[illegible]. Mount Rainier was out bold. Phones rang. The sheriff's office had a report that a giant plane had crashed in the Mount Rainier foothills near Alder, Washington. Radios went on. An eye-witness said it had fallen out of the sky in pieces. It was a four-engine plane. Hope against hope. The Stratoliner was flying in that vicinity.

The sight in the mountain woods was heartrending. Sheriff's deputies had taken Boeing test pilot Julius Barr out from the pilot's seat; vonBaumhauer, the Hollander, from the co-pilot's seat; chief engineer Jack Kylstra, Ralph Cram, Earl Ferguson, Ben Pearson, Peter Guilonard, the other KLM man, Harlan Hull, the chief pilot of TWA, Bill Doyle and Harry West, Boeing men.

The stark story was pieced together. They had been near stalling speed, at the point of starting the stability tests or possibly the sideslip tests. The cabin supercharging had not been in operation, was not a factor. They had gone into a spinning dive. At an altitude of 3,000 to 5,000 feet, still with plenty of room but with hills looming black and imposing below, they had pulled out of the dive so suddenly that the wings and tail surfaces broke from the excessive loads.

That bleak night, Bob Minshall who was in charge in Egtvedt's absence, asked, "What am I going to do? What am I going to do?"

Claire Egtvedt came home. The President's rearmament program was authorized and the first $50 million for airplane procurement appropriated. An initial order for Consolidated B-2[illegible] was placed, before the experimental model was built. No Boeing planes were included among the orders. Neither was the first B-17B going to be out in May. In spite of everything that had

NX19901 13 on board MSN 1994 Adler, Washington

been done, that schedule just couldn't be met. The plant still operating at a loss.

Ed Wells came to Egtvedt about the new superbomber design. "We've got 4,500 miles range and 390 miles an hour. looks wonderful. But, as you said, we've started out with honest purpose and I've got to be honest about this. It is good airplane. With the engine in the wings there's no good to retract the landing gear, and the structure isn't good and the engines. We can't make the wing any thicker. It's aw wide already to keep the chord in proportion." The chord the width of the wing measured from the leading edge to trailing edge.

Claire Egtvedt listened. One more blow. "Man's extremity

10. *Lightning Strikes*

"We have an opportunity here," said Eddie Allen, "that nowhere else. We've come to the point where we need exhau research. Not just on the ground. In the air. Flight rese Flight and aerodynamic research."

Eddie Allen was in Bob Minshall's office. His brown eyes earnest. He sat on the front edge of his chair, his heels ho over the rungs, and leaned toward Minshall.

"You're right about that," murmured Minshall.

"Now," Eddie's finger shot up. "You can't do that so thing in small airplanes. You have to carry all kinds of in ments and equipment. The Boeing Company is the only com in the world that has a stable full of big airplanes. You have background in big airplanes. You have the need. You have future in big airplanes. You're the ones to do it."

"Just what do you have in mind, Eddie?"

"The day when you build an airplane and call in a pilot

recorded in Washington. The $100,000 final pay-
as handed to Beall. Phones clicked. Beall looked
ried faces.
iell have we done here?" asked the Astoria banker.
t," said Gledhill. Then he turned sternly to Beall.
ppen to be the most valuable guy in the world at
He grabbed Beall by the back of his coat collar.
hat damn piece of paper."
ank ankle deep in the mud bank. What if the cer-
there? What if the rowboat overturned in the
? What if... They got out to the ship. The cer-
ere. The screwdriver shook in Beall's hand as he
wall. He gave it to Gledhill and sat down. Limp,

i vacation," said Gledhill. "Better come along on
ht to Hong Kong."
an was planning to start operation first on the
he Atlantic. On February 22, the Clipper Ship—
—soared out over San Francisco's Golden Gate
d, Wellwood Beall thought of the time he had
t way before, five and a half years ago. He wished
be with him now. Hawaii, Midway, Wake, west-
y. Beall thought of the people at the Cathay, his
om: "Just a stunt...." Those people would know
iey'd know that he knew better.
ue expanse between Honolulu and Wake Island
ve the sailing clipper *Trade Wind*. Captain W. A.
a salute.
n route, the trip lasted three weeks. On March 14
nto the Pan American dock at San Francisco. The
he dock were shouting something. News of their
d hear a little better now: "Nazi troops in Czecho-

ton, an apprehensive Congress was considering
oposal for a half billion dollar defense program,

$170 million of it for airplane procurement. Claire Egtvedt, with Jim Murray, the company's vice president and eastern representative, was holding close to Washington and Dayton. They found the Air Corps people brutally frank about Boeing's chances. "You are good at design, but poor on production. You haven't delivered a single B-17B." Egtvedt felt no one realized the struggle they had with turbo-superchargers and other modifications. There had been no opportunity to work on a production basis. But the record didn't look good.

They learned that the B-17 would be in the defense program, all right, but maybe its production would go to one of the California plants. The schedule now called for delivery of the first two "Bs" in May. Fred Laudan said it was going to be tough to make that. "We've got to," said Egtvedt. Laudan hired more men, though he knew that new hands couldn't get them finished.

Sales manager Fred Collins and his new assistant, Ben Pearson, were working hard to get more orders for the Stratoliner transport. Eddie Allen had finished his part of the initial testing of the Stratoliner. The pressure cabin hadn't been tried in the air yet, though it had been pumped full of air in the plant and given a ten-man rubdown with soapsuds to see if the air would bubble out at the seams. It didn't.

On the weekend of Beall's return from the Clipper flight there were two representatives of the Dutch airline, KLM, in Seattle to fly in the Stratoliner. The visitors weren't so interested in the supercharging as in the control problems of a four-engine plane. "What happens," asked Albert vonBaumhauer, the engineer of the two, "if you have two engines out on one side and the rudder clear over for a maximum angle of yaw"—that would have the airplane crabbing sideways—"and then you put it in a stall?"

Bob Minshall looked at Ralph Cram. "You have no reason to do that with a big ship like this," said Cram. Still, vonBaumhauer wanted to know. He had made a study of this. It was agreed that they would try out various angles of yaw at low

3/18/39

deflection to produce the motion. Trailing-edge upwards deflection of the aileron causes flow field changes that move the upper wing surface normal shock forward and the lower wing surface normal shock aft. This causes relative trailing edge down hinge moment, starting the aileron down, eventually reversing the shock wave upper and lower surface positions. This completes the cycle.

Clearly, control system flexibility plays a role in aileron buzz, permitting symmetric, or in phase, aileron deflections. Restraining the aileron from symmetric rotations prevents buzz. The F-80's control surface boost cylinder is on the airplane's centerline. Control system flexibility from the centerline out to the ailerons is sufficient for buzz to occur.

Eliminating the buzz for the P-80 and later airplanes with centerline aileron actuators involved installing rotary hydraulic dampers at each aileron hinge. Damping is approximately proportional to control surface angular velocity, which is very high during high-frequency buzz but much lower for normal stick motions. Properly sized buzz dampers do not interfere with lateral controllability. Modern jet airplanes normally have irreversible hydraulic actuators located at each aileron. Aileron buzz is not a possibility for this arrangement.

Control surface buzz was a problem for the rudders of two subsonic jet airplanes of the 1950s, a late model North American F-86 Sabre and the Douglas A4D Skyhawk. Both airplanes used splitter-plate or "tadpole" rudders to overcome buzz. Splitter-plate control surfaces are unskinned from about the midchord to the trailing edge, with loads borne by a central or splitter-plate. The normal shock, whose fore and aft motion is central to control surface buzz, is stabilized at the abrupt surface break where the splitter starts.

14.6 Rudder Lock and Dorsal Fins

Rudder lock occurs when at a large angle of sideslip reversed rudder aerodynamic hinge moments peg the rudder to its stop. The airplane will continue to fly sideslipped, rudder pedals free, until the pilot forces the rudder back to center or rolls out of the sideslip with the ailerons. Aerodynamic hinge moments can peg the rudder against its stops so securely as to defy the pilot's efforts at centering. In that case recovery by rolling or pulling up to reduce airspeed are the only options.

Two things must happen before an airplane is a candidate for rudder lock: Directional stability must be low at large sideslip angles and rudder control power must be high. The relative size of the fuselage and vertical tail determines the general level of directional stability. Directional stability is reduced at large sideslip angles when the fin stalls. The sideslip angle or fin angle of attack (considering sidewash) at which the fin stalls depends on fin aspect ratio. Unfortunately, tall, efficient, high aspect ratio fins stall at low fin angles of attack. As a general rule, fin stall occurs at sideslip angles of about 15 degrees.

Unlike normal wings whose lift is proportional to angle of attack until near the stall, the lift of very low aspect ratio rectangular wings is proportional to the square of the angle of attack (Bollay, 1937). There is very little lift generated in the low angle of attack range. However, the angle of attack for stall is increased greatly, reaching angles as high as 45 degrees.

Consequently, a two-part vertical tail is an efficient way to avoid loss in directional stability at large sideslip angles and rudder lock. One part is a high aspect ratio vertical tail, which can provide directional stiffness in the normal flight regime of low sideslip angles and give good Dutch roll damping and suppression of aileron adverse yaw. The other part is a low aspect ratio dorsal fin, with a reasonably sharp edge, which will carry very little lifting load in the normal flight regime. However, at a sideslip angle where the high aspect ratio fin component stalls, the dorsal fin can become a strong lifting surface, maintaining directional stability.

Returning to the role of the rudder, large rudder areas and control power are needed for two-engined airplanes with wing-mounted engines in case of single-engine failure at low airspeeds. This is especially true for propeller-powered airplanes, since full-throttle propeller thrust is highest at low airspeeds and wing-mounted engines tend to be further outboard than for jets to provide propeller-fuselage clearance.

Although it is a four-engined rather than two-engined airplane, the Boeing Model 307 Stratoliner experienced rudder lock with its original vertical tail. This occurred during an inadvertant spin. William H. Cook (1991) writes,

> On a demonstration flight for KLM and TWA, the KLM pilot applied rudder at low speed. The rudder locked full over in the spin, and the control forces on the rudder were too high [to center it]. Wind tunnel tests showed that a long dorsal fin would prevent the rudder locking over. A hydraulic servo on the rudder was also added.

Addition of a dorsal fin to the Stratoliner and a reduction in rudder area corrected the problem (Figure 14.10; Schairer, 1941). George Schairer recently commented that he was unaware of the true inventor of dorsal fins, but that a member of the GALCIT 10-foot tunnel staff might have installed one during tests of one of the Douglas airliners. Small dorsal fins appeared earlier than on the Stratoliner, notably on the Douglas DC-3, first produced in 1935, and on the Douglas DC-4, which had its first flight in 1938.

In spite of the small dorsal fin installed on the DC-3, that airplane is still subject to rudder lock in all configurations with power on (Figure 14.11). John A. Harper flew a U.S. Air Force C-47B, the military version of the DC-3, in NACA flying qualities tests in 1950. Harper later speculated that rudder lock might have contributed to some puzzling DC-3 accidents resulting from loss of power on one engine, followed by a stall and spin. In these strange accidents, the airplane spun into the operating engine—the reverse of what one would expect. Harper argues that rudder lock and high pedal forces for recovery could have occurred if the pilot overcontrolled with rudder to turn toward the live engine.

Rudder lock was suspected in the early Boeing 707 airplanes, which had manually operated rudders assisted by spring tabs and internal aerodynamic balance. An Air Force test of the XC-135 tanker version reported rudder lock, and an American Airlines crash on Long Island may have been due to rudder lock. As a result, the 707 and KC-135 series of airplanes have powered rudders.

In addition to the large rudder area requirement for the engine-out condition on multi-engined airplanes large rudder areas are needed for spin recovery on maneuverable airplanes, to handle heavy crosswinds for airplanes intended to operate out of single-strip airports, and for gliders, to counter adverse aileron yaw. Gliders have a particular adverse yaw problem because their high aspect ratio wings have large negative (adverse) values of yawing moment due to rolling at high lift coefficients. Pilots transitioning from light power planes to gliders, or vice versa, find that vigorous rudder action in rolls is needed for coordination in gliders, as compared with light planes.

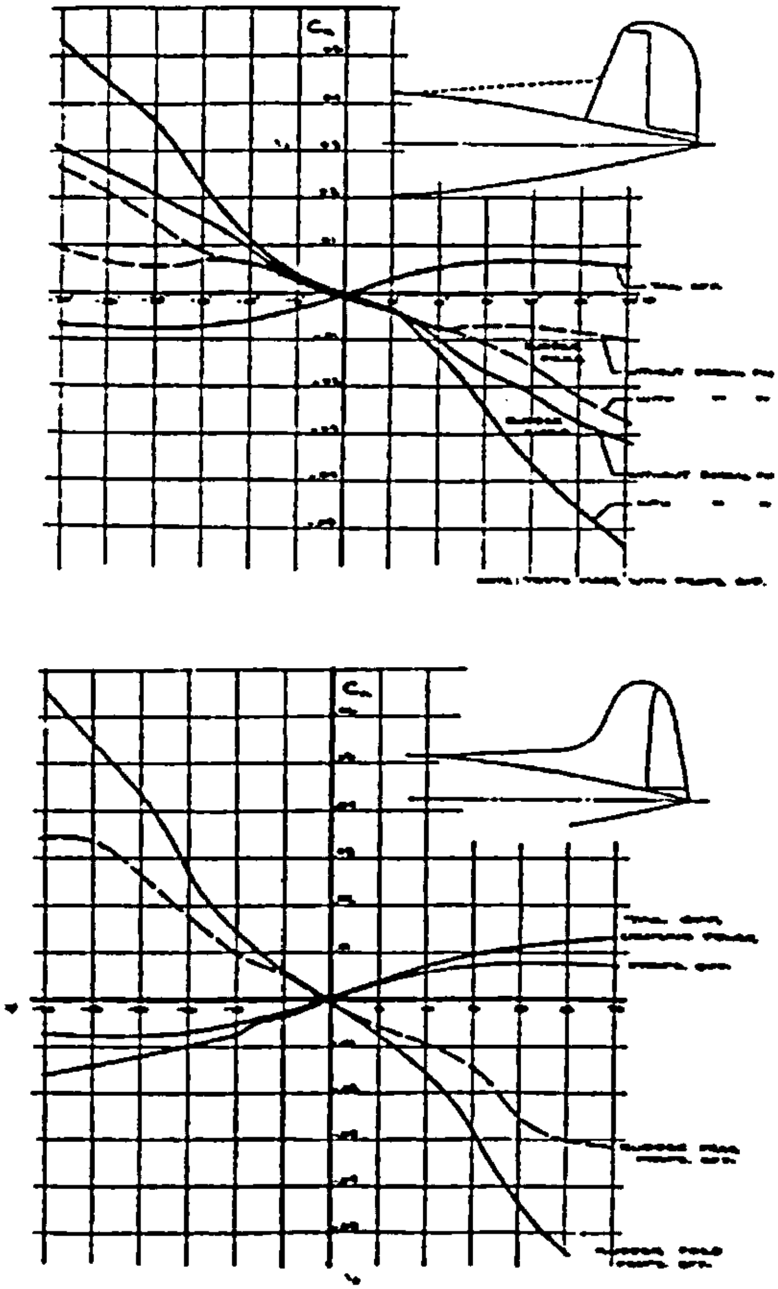


Figure 14.10 The variation of yawing moment coefficient with sideslip angle for the Boeing Stratoliner with original vertical tail (*above*) and revised vertical tail and dorsal fin (*below*). Rudder-free cases are shown by the dashed lines. With the original tail, adverse yawing moment due to the ailerons overcomes the low level of restoring moment at large sideslip angles, and rudder lock occurs. (From Schairer, *Jour. of the Aero. Sci.*, 1941.)

Airplane Stability and Control
Abzug and Larrabee

Airplan
lock. For
before thei
been used
directional

April 11, 1939

NA-40
(B-25 Prototype)

Wright Field

04/11/1939

tandem under a long slender canopy, an arrangement that minimized frontal area and permitted the use of a narrow fuselage. A greenhouse-type nose housed the bombardier/navigator, and the radio operator and gunner were seated in the aft fuselage. The cantilever wings were shoulder-mounted on the upper fuselage, and had a fixed dihedral of 3° 23'. The engines were mounted in underslung nacelles. The engines were a pair of Pratt & Whitney R-1830-S6C3-6 air-cooled radials rated at 1100 hp each. They drove a pair of twelve-foot, three-bladed Curtiss electric propellers. The armament consisted of three flexible, hand-held 0.30-inch machine guns, one ball-mounted in the nose, one in a dorsal turret behind the cockpit canopy, and one that was moveable between waist and ventral positions cut into the sides and bottom of the fuselage. Bays for two fixed 0.30-inch guns were provided in each wing, but these were not actually installed. Twin fins and rudders were fitted, and the aircraft was provided with a retractable tricycle nose wheel undercarriage. The main wheels retracted into the rear of the underslung engine nacelles.

The NA-40 flew for the first time on January 29, 1939, company test pilot Paul Balfour being at the controls. It carried the civilian registration NX14221. On the early test flights, the aircraft experienced severe tail shaking which got worse as the speed increased. In addition, erratic oil and cylinder head temperatures were recorded. Subsequently, elbows and long tail pipes were fitted to the exhaust stacks and a squared fairing was mounted on the nacelle trailing edge. Some improvements resulted, but the basic problems persisted.

Maximum speed was a respectable if not spectacular 268 mph at 5000 feet. There was a general impression that the NA-40 was seriously underpowered, and in late February 1939, the Pratt & Whitney engines were replaced by Wright R-2600-A71-3 Double Cyclone fourteen-cylinder air-cooled radial engines rated at 1600 hp each. The more powerful Wright engines were provided with more streamlined cowlings. The over-wing exhausts were replaced by collector rings that were ported to exhausts outboard of the nacelles and the carburetor intake scoops were moved slightly aft. The aircraft was redesignated NA-40B. The NA-40B took off on its maiden flight on March 1, 1939, Paul Balfour again being at the controls. The airplane had a considerable improvement in performance, with a maximum speed of 287 mph at 5000 feet. The aircraft was delivered to Wright Field in Ohio on March 12. The flight tests at Wright Field turned up very few problems, with virtually the only complaint being the slow feathering characteristics of the Curtiss electric propellers delaying the engine-out testing. A shutdown engine could be simulated by idling the engine with the propeller in full high pitch.

On April 11, the NA-40B crashed near Wright Field when the pilot lost control of the aircraft during an engine-out test. Although the crew escaped serious injury, the NA-40B was destroyed by fire in the crash.

Although the basic design of the NA-40B was deemed not to be at fault in the crash, the Air Corps nevertheless decided not to order the NA-40B into production. The Army's attack bomber contract went instead to the Douglas entry, the Army ordering in July of 1939 123 examples of a revised version of the Model 7B, the DB-7, under the designation A-20.

Since the NA-40 was never ordered by the Army, it never acquired a USAAC serial number.

Specification of North American NA-40B:

Powerplant:

Two Wright R-2600-A71-3 Double Cyclone engines rated at 1500 hp each for takeoff and 1275 hp at 12,000 feet.

Dimensions:

~1940

YP-37

[redacted]

~1940

The YP-37

Much to my distress, things got worse. The Prestone boiled over as I turned downwind. The windshield was covered with gobs of gooey glycol from the radiator, making it impossible to see through the windshield. I rolled the canopy back, and stuck my head out the side, The hot glycol hit me in the face. Luckily, the goggles protected my eyes, but they too were soon covered with the smeary stuff, however, I was able to keep them clean enough by constantly wiping them with my scarf.

A quick glance at the speed indicator just at lift-off showed sixty mph. I knew it was in error, but my attention had been distracted by a more pressing problem. Normally, an inoperative airspeed indicator didn't present any difficulty, if I could have climbed upstairs and got to know the airplane before making a landing. At that moment, I had a grand total of two minutes in the YP-37A, hardly time enough to become comfortable with the airplane. On the downwind leg, the speed showed only eighty, though I knew it had to be closer to one hundred fifty, since this airplane stalled at eighty five miles per hour.

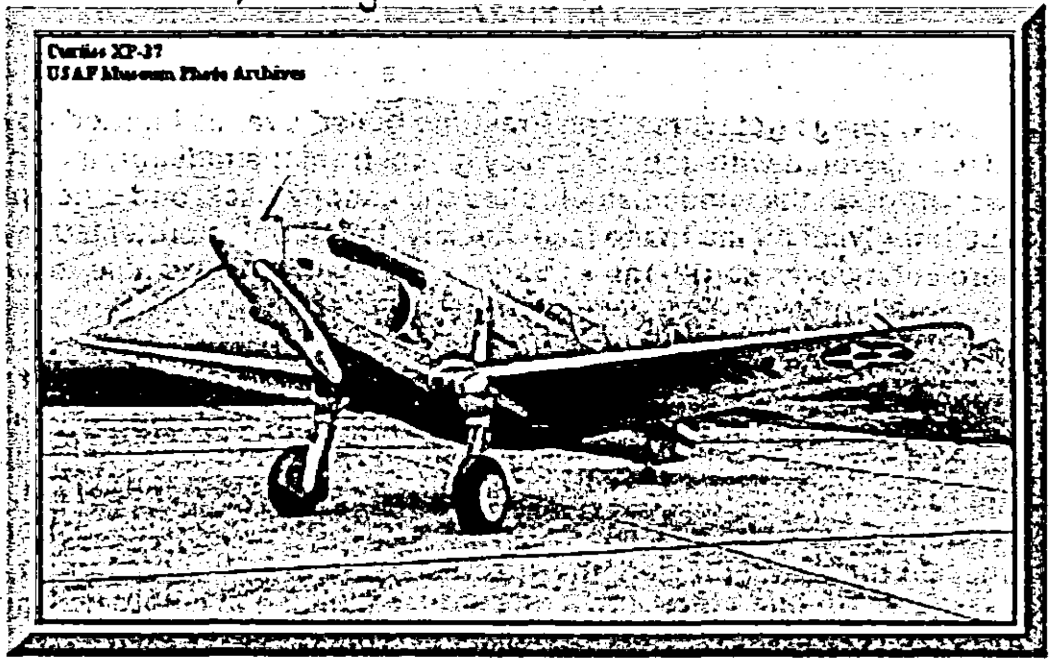
With my head stuck out the side of the cockpit, I still couldn't see very well and didn't know how fast I was going. The landing was going to he a tough one. I had to call on my overworked Guardian Angel once again.

I contacted the control tower, "May Day, I have an emergency and must land immediately."
"Cleared to land. The crash crew is on the way."

I was able to get out a brief, "thanks," and then concentrated my attention on flying the airplane. I circled back for landing and stayed within gliding distance of the field in case the engine quit. I could at least turn toward the field and belly land on the grass. Without the benefit of knowing the speed, I played it safe and came in a little hot. Fortunately, I had plenty of runway, and my landing was okay, but having my head stuck out of the cockpit made it very difficult. I slowed down and turned off the runway. When clear, I stopped in the grass and cut the engine. I could hear it crackling from the heat, so I jumped out in case it caught fire. If it did, I would have a head start and be long gone when it happened. While I waited nearby for the crash vehicles to arrive, I had time to thank my special Angel. I knew I would be lost without him. When the ambulance pulled up, I jumped in and was taken to base operations.

I found out later the airplane had been undergoing flight tests at NACA (National Advisory Committee on Aeronautics), and at the completion of the tests it was turned over to Base Engineering. The tests they were conducting were a series of flights that required the installation of specially calibrated test instruments. The airspeed indicator, of course, was among them. When they removed their instrumentation, NACA forgot to cap off the "T" they used that was part of the airplane's original pitot system which showed the plane's airspeed. This was the reason for the very low airspeed indication.

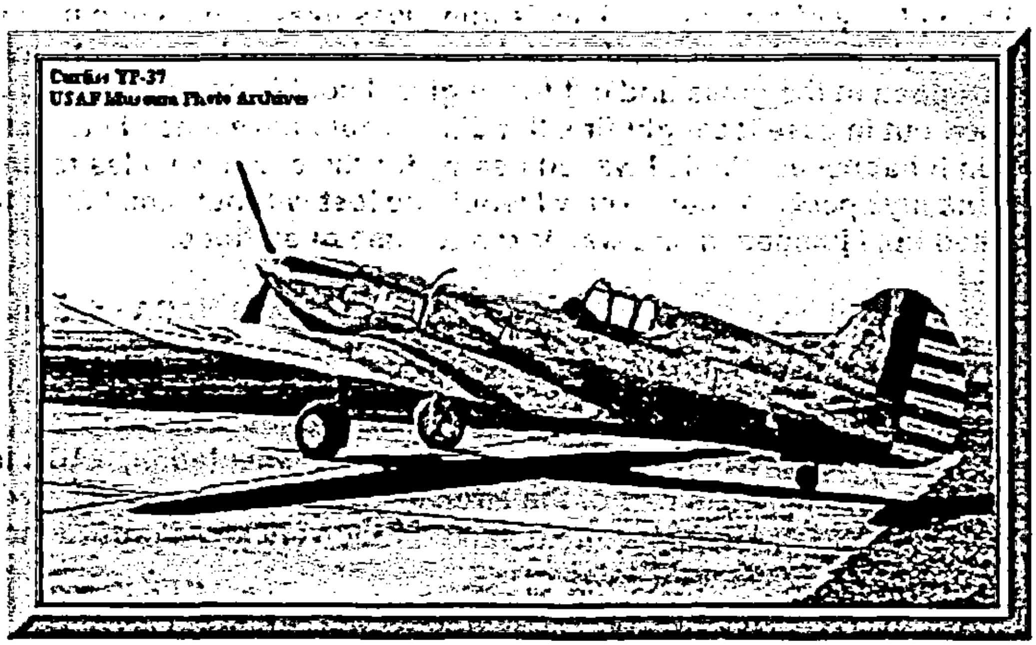
Engineering Eval Squadron



The Curtiss XP-37

The Allison engine checked out okay during run-up. Although the Prestone temperature was on the high side of normal, it was still within limits. I poured the coal on and took off. Just as I became air-borne, the Prestone temperature's warning light flickered, then stayed on.

It was too late to land, since there was no runway left. There was little I could do except throttle back and try to cool the engine. Normally, reducing power would help. I had hoped I could circle the field and land back on the runway, with the reduced power.



02/ ? /1940

01/06/1940

XP-39B
Aircobra

Wright Field

~02/ /40
01/06/40

enemy bombers. Therefore, the development of high-altitude interceptors was curtailed in favor of strike fighters optimized for low-level close support. The 1150 hp V-1710-17 (E2) of the XP-39 was replaced by a V-1710-37 (E5) engine rated at an altitude of 13,300 feet. The carburetor air intake was mounted in a dorsal position just behind the cockpit, where it was to remain throughout the Airacobra production run.

The XP-39B resumed flight trials on November 25, 1939. Empty weight had grown from from 3995 lbs to 4530 lbs, and normal gross weight was up to 5834 pounds from 5550 pounds, and the aircraft STILL didn't have any armament. The removal of the turbosupercharger was to have fateful consequences for the future of the Airacobra. Although the Allison engine was more reliable and more easily service when the turbosupercharger was eliminated, the engine only performed well at low and medium altitudes and lost power quite rapidly at altitudes over 15,000 feet. Even in spite of the improved streamlining, the XP-39B suffered a severe degradation in high-altitude performance. Maximum speed fell from 390 mph at 20,000 feet to 375 mph at 15,000 feet, and it now took 7.5 minutes to reach 20,000 feet rather than five minutes. However, there was an increase in low-altitude maneuverability because of the reduced wing span, and the decrease in low-altitude performance was only marginal. The XP-39B was damaged in a belly-landing at Wright Field, Ohio on January 6, 1940. It was repaired and resumed flying, later to be demonstrated at Bolling Field in Washington, DC. Unfortunately, the XP-39B was destroyed in an accident after only 28 flying hours.

Sources:

1. War Planes of the Second World War, Fighters, Volume Four, William Green, Doubleday, 1964.

2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion Books, 1987.

3. United States Military Aircraft since 1909, Gordon Swanborough and Peter M. Bowers, Smithsonian Institution Press, 1989.

4. P-39 Airacobra in Action, Ernie McDowell, Squadron/Signal Publications, 1980

5. The Calamitous 'Cobra, Air Enthusiast, August 1971.

6. Airacobra Advantage: The Flying Cannon, Rick Mitchell, Pictorial Histories Publishing Company, Missoula, Montana

7. Bell Cobra Variants, Robert F. Dorr, Wings of Fame, Vol 10, AirTime Publishing, Inc., 1998.

Bell YP-39 Airacobra

Last revised June 26, 1999

The USAAC was satisfied with the low-altitude performance of the Airacobra, and directed that the twelve YP-39s be completed without turbosuperchargers. It was decided to embody the changes made in the XP-39B in the service test machines.

The YP-39A was originally to have been delivered with the high-altitude V-1710-31 engine, but the change in USAAC philosophy caused this plan to be abandoned and this aircraft was delivered as a standard YP-39.

The first YP-39 (40-027) was flown on September 13, 1940 with the 1090 hp V-1710-37 (E5) engine driving a Curtiss Electric propeller. It differed externally from the XP-39B primarily in having a wider-chord vertical tail. The first few YP-39s were initially flown without armament, but subsequent machines were fitted with a 37 mm cannon with 15 rounds, a pair of 0.5-inch machine guns with 200 rounds per gun, and two 0.30-inch machine guns with 500 rounds per gun. All of these guns were mounted in the nose. Some armor protection was provided for the pilot. Empty and normal loaded weights rose to 5042 pounds and 7000 pounds, respectively. In comparison, the XP-39 prototype had a normal loaded weight of only 5550 pounds. Consequently, the performance of the YP-39 dropped to a maximum speed of 368 mph at 15,000 feet. An altitude of 20,000 feet could be attained in 7.3 minutes. Service ceiling was 33,300 feet.

The thirteen YP-39s (40-027/40-039) were delivered between September 6 and December 16, 1940. They were used primarily for evaluation and testing. Some of them were returned to the Bell factory for use in the development of improved Airacobra versions. These service-test machines apparently never reached Army aquadrons. Most of the YP-39s were lost in flight testing accidents.

Sources: 8/11/42 8/28/41 accidents (? Moscow?)

1. War Planes of the Second World War, Fighters, Volume Four, William Green, Doubleday, 1964.

2. The American Fighter, Enzo Anguluci and Peter Bowers, Orion Books, 1987.

3. United States Military Aircraft since 1909, Gordon Swanborough and Peter M. Bowers, Smithsonian Institution Press, 1989.

05/09/1940

P-66
Vultee Vanguard

Vultee Field

05/09/40

had a greater span but the same wingtip and root chord as those of the P-48.

After the three trainers had been produced in 1939, Vultee returned to work on their original P-48 design. The P-48 featured a steel-tube semi-monocoque fuselage, a two-spar wing, and a fully-retractable undercarriage. It featured hydraulically-actuated split flaps. The aircraft was all metal-covered, with the exception of the control surfaces. The P-48's detachable outer wing panels shortened its wing span by six feet in comparison to the wings of the trainers. At one time, an armament of no less than TEN 0.30-inch machine guns was envisaged, with two of the guns firing rearwards aimed by mirrors. However, this idea was abandoned during development and a more conventional layout of two 0.30-in guns in the cowling and four wing-mounted 0.30-in guns was adopted.

The P-48 aircraft was to have been powered by a Pratt & Whitney R-1830-S4C4-G air-cooled radial engine rated at 1200 hp for takeoff and 900 hp at 15,400 feet. According to the initial plan, the engine was to be enclosed in an orthodox cowling similar to that fitted to the Curtiss P-36. However, during construction it was decided to switch to an unorthodox long and pointed cowling on order to reduce aerodynamic drag. In order to accommodate the long and pointed cowling, the engine was fitted with a lengthened drive shaft. Engine cooling was provided by a retractable air intake fitted beneath the nose immediately behind the propeller spinner. The nose of the P-48 looked a lot like the nose of the abortive Curtiss XP-42.

The Model P-48 was given the civil designation NX21755, and was flown for the first time in September of 1939 by test pilot Vance Breese. The name *Vanguard* was chosen. Unfortunately, the Model P-48 ran into the same sort of engine cooling problems that bedeviled the Curtiss XP-42. After a few flights with the initial cowling configuration, the variable air intake underneath the nose was fixed in the open position and another scoop was added above the cowling. At the same time, the rudder area was increased. Only limited flight testing had been completed when, on May 9, 1940, the Model P-48 Vanguard was damaged in a mid-air collision with Paul Mantz's Lockheed Sirius during a landing at Vultee Field. The impact severed one of the undercarriage legs, but test pilot Vance Breese succeeding in landing the Vanguard with little additional damage.

The production version of the Model P-48 was to have been designated Model 61, but by the time of the P-48's landing accident it had already been decided to give up on the pointed-nose for the Vanguard, since the drag reduction that it provided was insufficient to justify the increased weight and the cooling problems that it caused. Consequently, the second prototype Vanguard, the Model 48X (NX19999), reverted to the orthodox radial engine cowling that had originally been planned. The Model 48X made its first flight on February 11, 1940. The second prototype also differed from the first in having a compound wing dihedral with a break in the middle.

The damaged first prototype was rebuilt with the originally-planned orthodox radial cowling, a modified main undercarriage, and a rearward-retracting tailwheel. Provisions were made for twin guns in the upper fuselage decking and two wing guns.

Some instability was encountered by the Model 48X during flight testing, and substantial increases were made in the areas of both the vertical and the horizontal tail surfaces. The maximum speed was 358 mph at 15,600 feet. Initial climb rate was 3300 feet per minute. Service ceiling was 34,300 feet, and normal range was 738 miles. Weights were 4657 pounds empty and 6029 pounds gross. Dimensions were wingspan 36 feet 0 inches, length 29 feet 2 inches, height 9 feet 5 inches, wing area 197 square feet.

On February 6, 1940, Vultee received an order from Sweden for 144 Vanguards, the production version being given the company designation Model 48C. The Flygvapen designation for the aircraft was J10. The first production prototype bore the civilian serial number NX28300 and flew for the first time on September 6, 1940. It was essentially similar to the Model 48X, but had an R-1830-S3C4-G (R-1830-33) engine rated at 1200 hp for takeoff and 1050 hp at 13,100 feet. Armament consisted of four 0.30-in machine guns in the wings and two 0.50-in machine guns in the fuselage. The military equipment added to the Model 48C caused the weight to go up-- weights were 5237 pounds empty, 7100 pounds gross, and 7384 pounds maximum. The extra weight caused the performance of the Model 48C to degrade in comparison with that of the Model 48X. The maximum speed was 340 mph at 15,100 feet. Initial climb rate was 2520 feet per minute, and an altitude of 19,680 feet could be attained in 9.2 minutes. Service ceiling was 28,200 feet, and normal range was 850 miles. Weights were 4657 pounds empty and 6029 pounds gross. Dimensions were wingspan 36 feet 0 inches, length 28 feet 4 inches, height 9 feet 5 inches, wing area 197 square feet.

Before any production aircraft could be delivered to their Swedish customer, the US government placed an embargo on the export of military aircraft to Sweden, fearing that they might fall into Axis hands. Although the British had earlier rejected the Vultee fighter for their own use, they agreed to take over 100 of these aircraft under Lend-Lease as Vanguard Is. RAF serials BW208 through BW307 were assigned to these aircraft. The Vanguard I was considered as being unsuitable for combat use by the RAF, but it was considered appropriate for advanced training use by units based in Canada.

In early 1941, Chiang Kai-Shek's Nationalist Chinese forces were being hard-pressed by Japanese air attacks, and were in desperate need of more combat aircraft. So dire was their need that they were willing to accept just about anything that had wings. On May 19, 1941, the British government agreed to release its Vanguards for supply to Chiang Kai-Shek's Nationalist Chinese forces. The 144 Vanguards were given the USAAC designation P-66 and were assigned the serial numbers 42-6832 thru 42-6975.

May 29, 1940

F4U Corsair

5/29/40

The pilot sat in a large cockpit over the wing trailing edge. The view straight forward over the engine cowling was poor, even more so than common in single-seat fighters of the day. View too the sides was reasonable, although the cockpit canopy was heavily framed. No concessions were made to rearward view, the aft of the cockpit being faired into a gentyly sloping fuselage decking. The tailplanes and fins had rounded tips, and the control surfaces were fabric covered.

Armament consisted of one .50 gun in each wing, and a .50 and a .30 in the engine cowl decking. There was also room for 20 small anti-aircraft bombs, stored in the wings.

Testing

In June 1938 the USN signed a contract for a prototype, the XF4U-1, BuNo 1443. After mock-up inspection in February 1939 construction of the XF4U-1 went ahead quickly.

First flight of the XF4U-1 was made on 29 May 1940, by Lyman A. Bullard Jr. The XF4U-1 was powered by a XR-2800-4 engine, rated at 1805hp. The first flight was not uneventful. A hurried landing was made when the elevator trim tabs failed because of flutter.

Early testing encountered a serious setback when project pilot Boone T. Guyton ran out of fuel during the fifth test flight and made an emergency landing on a golf course. The XF4U-1 was badly damaged, but not beyond repair, and Chance Vought rebuilt it.

On 1 October the XF4U-1 made a flight for Stratford to Hartford with an average ground speed of 650km/h (404mph). It was then the first US fighter to fly faster than 400mph. The XF4U-1 also had an excellent rate of climb. On the other hand, the testing of the XF4U-1 revealed that some of the requirements of the US Navy would have to be rewritten. In full-power dive tests speeds of up to 885km/h were achieved, but not without damage to the control surfaces and access panels, and in one case, an engine failure. The spin recovery standards also had to be relaxed, as recovery from the required ten-turn spin proved impossible without recourse to an anti-spin chute.

Much time was spent trying to improve the handling of the XF4U-1. Numerous changes were made to the ailerons, with success, as these were later known to be very effective. However, the low-speed handling characteristics left much to be desired. The F4U had a troubling tendency to drop a wing when it stalled. And this was a critical factor for a shipboard fighter, which would have to make dangerous deck landings.

F4U-1

Changes

At the end of June 1941 the US Navy ordered 584 F4U-1 fighters. The first of these would appear a year later, in June 1942. At that time Brewster and Goodyear were already tooling up to join the Corsair production program.

For the production F4U, the US Navy required some changes, which were logical in itself but had

11/20/1940

XP-51

[redacted]

P-51 Prototype 11/20/40

At British insistence, armament was somewhat heavier than American standards of the day. Two 0.5-inch M2 Browning machine guns were installed in the underside of the nose beside the engine crankcase, synchronized to fire through the propeller arc. The left gun was staggered ahead of the right in order that the magazines could lie one behind the other. Two 0.50-inch guns were mounted upright inside the wings, outboard of the landing gears. Four 0.30-inch Browning machine guns were mounted further outboard on the wing, with each inboard 0.30-inch gun being mounted lower so that its muzzle was below the leading edge. Ammunition for all the wing guns was in three long spanwise boxes outboard of the guns.

Final assembly and engine installation began on September 9, 1940, 102 days after the initial British order.

In a contract approved on September 20, 1940, it was agreed that the fourth and tenth production NA-73s would be the planes diverted to the Army. The designation XP-51 was to be assigned to these two planes.

On September 24, 1940, the RAF increased their Mustang I order to 620 planes.

The NA-73X prototype emerged from Inglewood plant in only 102 days, thus meeting the 120-day deadline with time to spare, although the airplane rolled out of the factory without an engine, which had been delayed at the Allison factory. In the absence of the new disk brakes, the aircraft was rolled on wheels borrowed from an AT-6 trainer. It was completely unpainted except for six aperture shapes painted on the wing leading edges to show where the guns would be installed. These aperture shapes were retouched out in many reproductions of the most famous photographs of the aircraft. Only later was the civil registration NX19998 applied and the fuselage ahead of the cockpit painted with anti-dazzle black.

The reason for the delay in engine delivery was because it was "government-supplied equipment" that was furnished on an as-available basis. Since the NA-73X was a private venture it was not allocated a very high priority in comparison with P-40s that were then rolling off the production lines. The engine that was eventually installed was an un-turbosupercharged Allison V-1710-F3R liquid-cooled Vee, rated at 1100 hp.

Veteran test pilot Vance Breese flew the NA-73X for the first time on October 26, 1940. Weights were 6278 lbs empty, 7965 lbs normal loaded. It was a clear 25 mph faster than the P-40, even in spite of being powered by the same engine.

Following tests, there were several changes in the geometry of the ventral ducting and the controllable flaps. By the time that the NA-73 had been cleared for production, the duct had had its inlet moved downward so that its upper lip was lower than the underside of the wing, thus avoiding the ingestion of a turbulent boundary layer of air into the radiator cooler.

On November 20, 1940, while on the fifth test flight of the NA-73X, test pilot Paul Balfour forgot to change fuel tanks, ran out of gas, and suffered a forced landing. The plane ended up on its back in a farmer's field. This mishap put the prototype out of action for several months. However, since this accident was not the fault of the aircraft itself, this did not unduly delay the program. The NA-73X aircraft resumed flying on January 11, 1941 and continued in the initial development program until being retired on July 15, 1941.

In December 1940, the RAF ordered 300 more of the Mustang Is which embodied only minor modifications. These were designated NA-83 by the factory. RAF serials were AL958/AL999, AM100/AM257, and AP164/AP263. They differed from the NA-73s only in having broad fishtail ejector exhausts. Sources:

1. American Combat Planes, Ray Wagner, Third Enlarged Edition, Doubleday, 1982.

2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion Books, 1987.

3. War Planes of the Second World War, Fighters, Volume Four, William Green, Doubleday 1964.

4. United States Military Aircraft since 1909, Gordon Swanborough and Peter M. Bowers, Smithsonian, 1989.

5. Fighting Mustang: The Chronicle of the P-51, William N. Hess, Doubleday, 1970.

6. Classic Warplanes: North American P-51 Mustang, Bill Gunston, Gallery Books, 1990.

7. Famous Fighters of the Second World War, Volume I, William Green, 1967.

8. British Military Aircraft Serials, 1912-1969, Bruce Robertson, Ian Allen, 1969.

05/06/1941
08/08/1942
XP-47B

[redacted]

05/06/41

transferred to the XP-47B.

One week later, on September 13, 1940, 773 production examples of the new fighter were ordered by the USAAC, 171 to be delivered as P-47Bs and 602 as P-47Cs. At the same time, the Army contract placed back in 1939 for 80 P-44 Rockets was cancelled. The contract was replaced with an order for a similar quantity of P-43 Lancers which would keep the Farmingdale production lines occupied pending the introduction of the new fighter.

Kartveli decided to design the XP-47B fuselage around the large turbosupercharger from the start, rather than to add it onto the aircraft later as sort of an afterthought. In order to preserve a streamlined fuselage with a small cross-section, the large turbosupercharger was placed in the rear fuselage. It was fed by an air duct located beneath the large R-2800 engine. Engine exhaust gases were directed back to the rear fuselage in separate pipes to the turbine and were expelled through an exhaust under the rear tail. Ducted air was fed to a centrifugal impeller and was returned to the engine under pressure via an intercooler.

Another problem that had to be solved was that the aircraft required a very large twelve-foot diameter four-bladed propeller in order to take full advantage of the R-2800 engine's high power output. This large propeller in turn required a long and stalky undercarriage in order that the propeller be given adequate ground clearance during takeoff and landing. If a conventional retractable undercarriage were used for the P-47, its suspension would have to have been placed very far outboard on the wings, leaving insufficient space for the eight wing guns and their ammunition. In order to solve this problem, the landing gear telescoped and was nine inches shorter when retracted than when extended. Somewhat surprisingly, this complex telescoping landing gear seems to have caused few problems in the field.

Like the earlier P-35 and P-43 fighters, the P-47 was a cantilever low-wing monoplane, the wing being elliptical in shape with the ailerons on the outer trailing edge and flaps on the inner trailing edge. The semi-monocoque fuselage was all metal, but initially the control surfaces were fabric covered. The tailwheel was steerable and was fully retractable. All the fuel tanks were inside the fuselage and were self-sealing from the start. The cockpit was protected by armor and was unpressurized.

The name *Thunderbolt* for the P-47B was originally thought up by C. Hart Miller, Republic's Director of Military Contracts. The company approved his choice, and the name stuck.

The XP-47B prototype (40-3051) flew for the first time on May 6, 1941, piloted by Lowry L. Brabham. This was only eight months after the order had been placed. The

XP-47B was the largest single-engine fighter built up to that time. At a loaded weight of 12,086 pounds, the XP-47B dwarfed all previous fighters, being almost twice as heavy as most of its contemporaries. On the first flight, the pilot was forced to make an unplanned emergency landing because of a leakage of exhaust fumes into the cockpit. Its eighteen-cylinder XR-2800-21 radial engine offered 1960 hp at 25,800 feet, and gave it a maximum speed of 412 mph, 12 mph faster than Kartveli had projected. An altitude of 15,000 feet could be attained in five minutes. Empty and normal gross weights were 9189 pounds and 12,086 pounds respectively. The prototype was destroyed in an accident on August 8, 1942.

Sources:

1. American Combat Planes, Ray Wagner, Third Enlarged Edition, Doubleday, 1982.

2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion Books, 1987.

3. War Planes of the Second World War, Fighters, Volume Four, William Green, Doubleday 1964.

4. United States Military Aircraft since 1909, Gordon Swanborough and Peter M. Bowers, Smithsonian, 1989.

5. The Republic P-47D Thunderbolt, Aircraft in Profile, Edward Shacklady, Doubleday, 1969.

6. Famous Fighters of the Second World War, Volume I, William Green, 1967.

7. Thunderbolt!, Robert S. Johnson and Martin Caidin, Ballantine Books, 1958.

8. Thunderbolt: A Documentary History of the Republic P-47, Roger Freeman, Motorbooks, 1992.

05/14/1941

XP-50

05/14/41

The strongest point of the XF5F-1 was its rate of climb—4000 feet per minute as compared to 2660 ft/min for the XF4U-1 and 2630 ft/min for the XFL-1. However, maximum speed was only 383 mph at sea level. Empty weight was 8107 lbs and normal loaded weight was 10,138 lbs. Service ceiling was 33,000 feet and maximum range was 1170 miles. The XF5F-1 was used off and on for tests in support of the XF7F-1 project for the next couple of years, until it was finally stricken off record on December 11, 1944 after suffering an undercarriage failure.

As detailed in the article on the XP-49, in early 1939, the Army had issued a Circular Proposal calling for a new generation of fighters which would match existing airframes with new and more powerful engines. Four companies submitted designs in response to the proposal. Lockheed submitted its Model 522, which was an adaptation of the P-38 powered by either Pratt and Whitney XH-2600 or Wright R-2160 turbosupercharged engines. Grumman submitted a proposal known under the company designation of Design 41. Design 41 was an aircraft quite similar to Design 34 (XF5F-1) but was powered by a pair of Wright R-1820 radials fitted with turbosuperchargers.

The Lockheed design came in first in the competition, and was ordered by the Army as the XP-49. However, the Army saw sufficient merit in Grumman's Design 41 that they encouraged the company to submit a revised design, just for insurance in case the XP-49 ran into problems. The revised proposal, known by the company as Design 45, incorporated a nosewheel tricycle undercarriage and a longer nose. Provision was to be made for self-sealing fuel tanks and for armor protection for the pilot. On November 25, 1939, the Army issued a contract for one prototype of Grumman's Design 45 under the designation XP-50. The XP-50 was to be powered by two 1200 hp Wright R-1820-67/69 radials fitted with turbosuperchargers. Armament was to be two 20-mm cannon and two 0.50-in machine guns, all mounted in the nose.

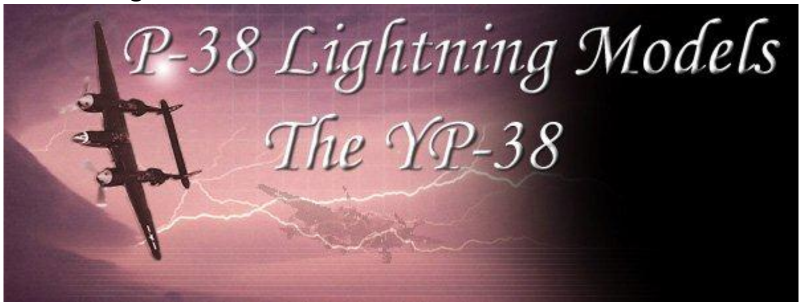
The XP-50 (Ser No. 40-3057) flew for the first time on February 18, 1941, with Grumman test pilot Robert L. Hall at the controls. Early tests were encouraging, and the XP-50 handled much better than did the XF5F-1. Furthermore, the supercharged engines of the XP-50 gave it a much better performance at medium and high altitudes. However, on May 14, 1941 the XP-50 experienced an inflight turbosupercharger explosion while on a flight over Long Island Sound, and pilot Robert Hall was forced to parachute to safety. The loss of the aircraft brought an abrupt end to the XP-50 program.

Estimated maximum speed of the XP-50 (never achieved in tests) was 424 mph at 25,000 feet. Estimated service ceiling was 40,000 feet. An altitude of 20,000 feet could supposedly be reached in 5 minutes. Maximum range was estimated to be 1250 miles. Empty weight was 8307 lbs, and loaded weight was 10,558 lbs. Maximum weight was 13,060 lbs. Wingspan was 42 feet, length was 21 feet 11 inches, height was 12 feet, and

11/04/1991

YP-38

YP-38 Design



In spite of the XP-38 crash, Kelly Johnson had some enhancements planned for the next prototype. The order for additional P-38 prototypes allowed Johnson to able to incorporate many improvements into the next design. The first YP-38 was rolled out nineteen months later.

Lockheed was struggling to fill many types of orders and was rapidly growing. The main focus was to produce the Hudson. There were not many available engineers and designers to work on the fledging P-38 project. Lockheed looked to the 1939 contract with Curtis to produce the P-40 as an example. In 1939, there were not many orders for the P-40, and it was basically a break-even proposition for Curtis. Lockheed was informed not to expect many orders for the P-38. Lockheed also had put up most of the money for the first prototype, and the proposition for profit was limited. So as any company would do, they focused on making money. The country was not at war, so there was no immediate need to produce something that would at best break even. In June 1939, Lockheed took over a local distillery building and began to use it for YP-38 production.

Lockheed engineers were following Allison improvements in their V-1710 engine and planned to incorporate the new V-1710-F engine in the YP-38 models. Lockheed started production for the thirteen

YP-38s soon after taking over the distillery building. During this time, Bob Gross thought that no more than sixty models would ever be produced. He based his belief on the overwhelming favoritism being placed on bombers than fighters in the military. The military believed a bomber with massive armor and machine guns would not encounter problems with enemy fighters.

The YP-38 design was also improved for production ease. The XP-38 was not designed with this mindset, and would be extremely hard to produce in any significant numbers. The new Alison engine was rated at 1150 hp at 20,000 ft. Propeller rotation was changed and reduced downwash onto the wing/centersection/fuselage juncture. This solved the problem of disturbed airflow over the horizontal stabilizer (tail flutter & buffeting). The YP-38 had a designed empty weight of 11,171 lbs., and a designed gross weight of 13,500 lbs. This rose to 14,348 when additional space was allotted for fuel tanks. Lockheed engineers guaranteed a high speed on 405 mph at 20,000 ft.

The YP-38 models began trickling out of the factory and immediate testing was conducted. Marshall Headle, Milo Burcham, Ralph Virden, Jimmy Mattern, and Swede Parker performed initial Lockheed testing. Headle and Burcham teamed up with Dr. F. E. Poole in an attempt to anticipate the many "unknowns" that would be encountered. Working with the Mayo Clinic, procedures were developed to hopefully prevent any problems due to excessive altitudes. Lockheed constructed a special altitude chamber to test new equipment. During this time period, many of the standard pilot equipment were very primitive. Oxygen systems were unreliable, there were no ejection seats, and data recording was only beginning to move from the "knee pad" methods were only a few of the developing techniques. Soon after testing began, Marshall Headle was seriously injured in an altitude chamber accident, which permanently ended his flying career, and led to a premature death.

The last YP-38 trickled out of the factory in May 1941. By this point of production, Lockheed released some of the YP-38s over to the military for additional testing. Pilots from the First Pursuit Group at Selfridge Field, Michigan, were able to perform additional testing. These pilots would form the initial cadre of P-38 pilots during the war. Major Signa Gilkey was one of these pilots who flew the YP-38. During one flight, he decided to perform a limited test dive. Gilkey underestimated the potential speed buildup of the aircraft, and soon built up excessive speeds. He was one of the first military pilots to experience firsthand the problems of compressibility. He was able to recover the aircraft and land safely.

By September 1941, the YP-38s were in a committed program to test compressibility. Test engineers wanted the test pilots to go past 300 mph starting above 30,000 ft. This was not normally done, and many of the test pilots thought the test dives were too ambitious at this early stage. Ralph Virden was committed to fly the tests and took off on November 4, 1941 for a series of test dives. Partially through the testing, an object broke off from the aircraft. The aircraft entered an inverted spin and crashed. Virden was killed. Kelly Johnson would later say, "I was back in my office when I heard Virden's plane screaming towards the plant. That most unusual sound probably resulted from the propellers striking the air at an angle abnormal to the line of flight." Johnson concluded that a spring tab like broke, which caused full deflection (Virden's aircraft was observed to rise sharply prior to the part breaking off). At a speed of 300 mph at 3,000 ft. of altitude, this deflection would cause the airframe to exceed design criteria. Designers were pushing the limits of aerodynamic knowledge and material strength in the quest for maximum performance. Often these limits were exceeded leading to unexpected or tragic events.

The YP-38 was destined to spend the rest of its operational life with dive testing. If the problems with compressibility were not figured out, much of the aircraft potential as a fighter would be removed. The

YP-38 proved to be a great step towards operational P-38s during the war. Without the hard work and sacrifice of the Lockheed engineers and test pilots, the P-38 may have never developed into the aircraft it was. It opened the door for many other aircraft which experienced compressibility and other related phenomena, and allowed the engineers and designers to immediately know what exactly was happening and were able to overcome these obstacles much easier.

Compressibility encounters go as far back as the YP-38 testing. The XP-38 was never tested enough to encounter compressibility (one further reason why the program was set back at least 2 years). If the XP-38 had encountered it, the problem may have been resolved very early in testing. The initial test flights of the YP-38 were very successful, and no problems were encountered. Prior to the testing of this aircraft, flying at 25,000 was rare, and flying at 40,000 was unheard of. Dr. F. E. Poole and Lockheed test pilot Marshall Headle worked closely with the Mayo Clinic to develop methods to cope with potential serious problems when operating at extreme altitudes. Lockheed constructed a new altitude chamber to test new equipment. The testing during this period was hazardous, simply because this type of testing was not normally done. Also, when testing the aircraft, there were no ejection seats, oxygen systems were unreliable, and data recording was just beginning to move beyond the "notepad on knee" system. The first setback was when Marshall Headle was seriously injured in the altitude chamber, which ended his flying career and lead to a premature death.

YP-38s would continue to trickle out of production, with the last one completed in May 1941. YP-38s were sent to various groups for additional testing. Pilots from the 1st Pursuit Group, stationed at Selfridge Field in Michigan, received the assignment for testing. The P-38 was finally forming a cadre of pilots. Major Signa Gilkey was one pilot who performed some testing on the YP-38. He decided to perform a test dive, and wanted to ease it into the dive conserving as much speed as possible. It accelerated beyond his expectations and encountered severe tail buffeting when he approached 400 mph. He described the sensation of the aircraft wanting to continue diving onto its back, and not wanting to pull out of the dive. Gilkey experienced classic compressibility problems, as well as a tail-buffeting problem. The buffeting problem was easily resolved through aerodynamic testing, but the problem of compressibility was cause for concern.

Military officials called for the P-38 design to include tail weights to prevent tail flutter. Kelly Johnson wrote Report No. 2414, which stated that the tests on the weight balances indicated no positive effects. The weights did not prevent or enhance the performance of the aircraft in any significant way. Johnson would say off the record that the weights only killed several pilots who came in contact with them while bailing out of the aircraft. Many changes were tried in order to address the compressibility problem. Lockheed designers re-skinned the elevator and stabilizer using thicker aluminum, modified the turbo exhaust hoods to reduce the intake area and to potentially change the airflow pattern, and redesigned the canopy shape and gondola skin roughness. Nothing they tried solved the problem.

Testing of the YP-38 was continuing throughout 1941. By September, the YP-38 was committed to testing compressibility problems. Test engineers wanted pilots to go past 300 mph above 30,000 ft. Lockheed test pilots Milo Bircham, Jimmy Mattern, and Ralph Virden were given the assignment for testing the YP-38 in the specified dive tests developed by Lockheed engineers. Bircham and Mattern had some reservations, but were committed to developing the P-38. Virden, on the other hand, was absolutely committed to testing the aircraft to the degree specified by the engineers. On November 4, Virden tested a single YP-38, which had new spring tabs at each end of the control surfaces. The tabs were supposed to increase leverage to assist the pilot overcoming tremendous loads while pulling out of a dive. By this point in the testing process, Lockheed was in high spirits, and extremely close to solving the buffeting problem. Virden lifted off and began his appointed tests for the day. While performing tests, pieces of the aircraft were observed breaking off, and witnesses claimed the sound of the aircraft was drastically different. Virden's aircraft went into an inverted spin, and crashed. Virden was never able to get out and was killed. Kelly Johnson stated, "I was back in my office when I heard Virden's plane screaming towards the plant. That most unusual sound probably resulted from the propellers striking the air at an angle abnormal to the line of flight."

Designers were pushing the limits of aerodynamic knowledge and material strengths in their quest for performance, often exceeding limits of their own ability to predict outcomes from their experiments. This resulted in a high degree of risk, and a slow development rate. Johnson concluded that Virden's crash was a result of a spring tab operating link. The faulty link caused the tabs to operate at full deflection (which were most likely the objects seen breaking off the aircraft). While at 3,000 and traveling at 300 mph, it would far exceed design criteria.

Kelly Johnson would issue a report early in 1942. In the "Study of Diving Characteristics of the P-38", Johnson would state that at a critical airspeed, which varies in altitude, a certain condition exists which causes problems with the airflow. The airflow over the surface area of the wings would separate to produce a special form of stall. At higher speeds, flow separation spreads over the upper surface, and the aircraft tends to be nose-heavy due to a shift in the center of lift. This caused a loss of pitch control. Lockheed engineer Phil Coleman originally specified a dive test plan as early as 1940. He stated that vertical dives should be initiated at 35,000 at modest power settings. The dive would continue until reaching a constant speed at 16,000 ft., and would continue until 13,000 ft. The pilot would then execute a 3 - 4 'g' pullout. The pullout should be completed at 7,000 ft., and should never exceed 570 mph.

Most early combat operational models would suffer from the compressibility problem. However, the problem was not experienced in all theaters of operation. The P-38 did not have compressibility issues while operating in India, the Mediterranean, or in the Pacific. This was primarily due to the nature of combat. In these areas, combat rarely took place above 25,000 ft., and compressibility would not occur if a dive was initiated below 25,000 ft. In Europe, combat operations were normally conducted at high altitudes. Soon, German pilots knew if they were in a bad situation, they could easily dive to safety. The P-38 would be able to dive faster than German fighters, but P-38 pilots were probably more scared of a high-speed dive than enemy fighters.

After extensive testing, the answer to the problem was the use of a dive flap (or brakes). These flaps would be attached to the main spar under the wing. This would offset the loss in lift while in high-speed dives, and would allow the pilot to remain in control throughout the dive. Test pilots Tony Levier and Milo Bircham began a series of dive tests with the flaps. Lt. Benjamin Kelsey was sent by the Air Corps to evaluate the progress of the dive flaps. He took the modified P-38 and proceeded to enter the dive. He had problems engaging the flap as he was beginning his dive. While in the dive, he experienced normal compressibility problems because the flaps were not activated, and the violent thrusts sheared the tail off from the main structure. Kelsey was able to bail out and only sustained a broken ankle. The aircraft was totally destroyed. Another test P-38 would not be fitted with dive flaps for a few months.

Finally, another test P-38 was fitted with the dive flaps and testing was resumed. The Air Corps wanted Lockheed to test the aircraft with 2,000 lbs. of more weight and to start dives at 35,000 ft. The extra weight would cause additional acceleration of the aircraft during its dive, and would approach the critical Mach number sooner. This would be even more hazardous than before. Levier and Bircham resumed testing and would start at a 45-degree dive, and increase each test dive an additional 5-degree until they encountered problems. Levier was the first to encounter problem while using the dive flap. He was in a 60-degree dive, and began having problems when we reached 31,000 ft. The aircraft began to get away from him, even with the flaps deployed. Levier was fighting the aircraft to prevent it from tucking under itself as if it were in a regular dive. He decided to ride it out to see what would happen. He began his recovery at 20,000 ft., but he would not really begin to regain control until he was at 13,000 ft. The instruments registering the strain on the airframe were all over the 100% limit load. Bircham eased it back to the base without putting further stress on the aircraft. This was the evidence they needed to prove the flaps would hold up under an extreme dive, and not lead to disaster like many P-38s prior.

Taken from “p-38online.com” a now dead link.

FF of this AC 39/16/40
13 YPs built - all flying by this date 11/19/91

WAR DEPARTMENT
Air Corps
Form No. 14

RESTRICTED

42-11-4-19

TECHNICAL REPORT OF AIRCRAFT ACCIDENT CLASSIFICATION COMMITTEE

(1) The Accident Classification Committee of Western Air Corps Proc. Dist. met on November 5, 1941 and determined the following:

(2) Place, date, and time of accident Glendale, Calif. November 4, 1941 - 11:47 A.M.

(3) Aircraft station Lockheed Org. xx

(4) Aircraft model YP-38 A. C. No. 39-689 #1 YP

(5) Date accepted from contractor Sept. 17, 1940

(6) Total hours 142:00 Hours since overhaul xx

(7) Engine model RH V1710-27 LH V1710-29

(8) Engine A. C. No.'s See next line
L. O. 39-1171 L. I. xx R. I. xx R. O. 39-1152

(9) Extent of damage to engine(s) Complete wreck
L. O. xx L. I. xx R. I. xx R. O. xx

(10) Total engine hours New engines installed 11:06 before crash
L. O. 11:06 L. I. xx R. I. xx R. O. 11:06

(11) Engine hours since overhaul xxx
L. O. xx L. I. xx R. I. xx R. O. xx

(12) Purpose of flight Test Flight

(13) Took off from Lockheed Air Terminal Time 10:35 A.M.

(14) Weather at time of accident. (If weather was a causal factor attach copies of weather report and forecast for the flight.)
Clear - unrestricted visibility and ceiling

(15) Pilot (name and rank) Ralph B. Virden, Civilian

(16) Pilot's station Lockheed Aircraft Corporation

(17) Reg. Army xx Res., ext. duty xx Res., inactive xx
Res., 14-day xx Grad. cadet xx Student xx
Other (specify) Civilian

(18) Org.—assigned xxx

(19) Org.—attached for flying xxx

(20) Regular duties assigned Test Pilot for Lockheed Aircraft Corporation

(21) Original pilot rating and date F.A.I. - 1920, C.A.A. 1927

(22) Total pilot hours 15,166:59 Hours on this model 32:52

(23) Hours per month last 3 months 65:08
(1) 16:13 (2) 24:36 (3) 22:19

(24) Models flown last 3 months
(1) P-38 32:52
(2) Hudson 4:17
(3) Ventura 28:30

(25) Secure from Flight Surgeon, if pilot error is a causal factor: Was there any physical or neuropsychic condition which would in any way account for this accident? Yes or No. No
If "Yes", attach complete statement of the condition and its bearing upon the accident.

(26) Damage to private property: Yes or No. Yes
If "Yes", attach A. C. Form No. 17, "Damage to property certificate."
See attached letter from Lockheed

(27) RESULTS TO PERSONNEL

In column "Duty" enter symbols as follows: (legend illegible)

Duty	Name, rank, and Army status	a	b	c	d
P1	Ralph B. Virden - Civilian Test Pilot, employed by Lockheed Aircraft Corp., Burbank, Calif.	A			

(Explain any unsuccessful parachute jump by attachment)

		%	%	%	CAUSES
PER-SONNEL ERROR	PILOT ERROR				Error of judgment
					Poor technique
					Disobedience of orders
					Carelessness or negligence
					Miscellaneous
	OTHER PER-SONNEL				Supervisory personnel
					Maintenance personnel
					Other personnel
MATE-RIEL	POWER PLANT				Fuel system
					Cooling system
					Ignition system
					Lubrication system
					Engine structure
					Propeller and propeller accessories
					Engine control systems
					Miscellaneous (specify)
					Undetermined
	AIR-CRAFT STRUC-TURE				Flight control systems
				50	Main wing surfaces
				50	Tail flying surfaces, struts, wires, and fittings
					Wings, struts, wires, and fittings
					Landing gear, struts, wires, fittings, and retract. mech.
					Wheels, tires, and brakes
					Fuselage, engine mount and fittings
					Cowling, fairing, and fittings
					Tail wheel assembly and skid
					Miscellaneous (specify)
			100		Undetermined
					Handling qualities
					Instruments
					Miscellaneous equipment (specify)
		100			
MISCEL-LANEOUS					Weather
					Darkness
					Act of God
					Other
					Undetermined

NATURE (Check one only)

DAMAGE TO AIRCRAFT (Check proper place)		NATURE
A—Complete wreck	A	A Collisions in full flight with other aircraft
B—Major overhaul		B Collisions in full flight with objects other than aircraft
C—Major replacement		C Spins or stalls following engine failure
D—Minor damage		D Spins or stalls without engine failure
E—No damage		E Emergency forced landings
		F Unforced forced landings
		G Landing accidents
		H Take-off accidents
		I Taxiing accidents
		J Fires in the air
		K Fires on the ground
		L Structural failures
		M Miscellaneous
		N Undetermined

RESTRICTED

(28) PILOT'S STATEMENT (state how the accident occurred, giving all details as to conditions, causes, and influencing factors):

Pilot deceased

Signature .... Pilot.

(29) STATEMENT OF ACCIDENT CLASSIFICATION COMMITTEE (give complete causal statement, amplifying the pilot's statement where necessary to explain the causes):

See attached report

(30) RECOMMENDATIONS:

See attached report

Each member of the Committee has read and understands A. C. Circular No. 15-14, A. R. 95-120, and N. A. C. A. Report No. 576.

The above statement and recommendations, and the classification and analysis shown on the reverse hereof, are the concensus of opinion of this Committee.

	(Name)	(Rank)	(Designation)
Signed D. F. Stace	D. F. STACE	Lt. Col., A.C.	President
Signed Wm. W. Mounts	WM. W. MOUNTS	Major, A.C.	Member
Signed R. B. Stith	R. B. STITH	Capt., A.C.	Recorder

(31) REMARKS AND RECOMMENDATIONS (accomplish only if this report is initiated at other than the home station):

It is recommended that the Materiel Division consider the advisability of limiting the top speed of all P-38 type airplanes now in service, pending further investigation by the Lockheed Company leading to the elimination of undesirable characteristics of this airplane at high speed.

Station Santa Monica, Calif. Date November 13, 1941 Signature [signature]

CHAS. E. BRANSHAW,
Lt. Col., Air Corps,
Western District Supervisor

(32) REMARKS AND RECOMMENDATIONS:

Station .... Date ....

Signature .... Commanding.

Enclosures (line out those not applicable):
Airplane (Accident) Flight Report.
~~Identification Report.~~
Photographs.
Certificates of principal witnesses.
~~Report of ... parts.~~
Newspaper clippings.
~~... A. C. Form 17.~~
Lockheed Report

COMMITTEE FINDINGS

YP-38 Airplane A.C. #39-689, a Government accepted airplane, crashed at approximately 11:47 A.M. on November 4, 1941, at 1147 Elm Street, Glendale, California. This airplane was being flown on an authorized test flight by Mr. Ralph Virden, test pilot, employed by the Lockheed Aircraft Corporation, Burbank, California.

This airplane was loaned to Lockheed Aircraft Corporation by the Air Corps for the purpose of conducting numerous tests. Its total time was 142:00 hours. The only modification on this flight was auxiliary tabs on the elevator.

Crash resulted in death of the pilot and complete destruction of the airplane. There was no apparent indication of sabotage or poor workmanship.

The cause of the crash was the complete loss of entire tail surface structure.

The airplane was being flown in a series of tests in an effort to eliminate an inherent dangerous flying characteristic in this type aircraft. Particularly, this condition is a tendency of the airplane, when diving, to increase the diving angle and at the same time to tighten the controls to the point that recovery is extremely difficult.

In an attempt to alleviate the above mentioned condition the elevator on this airplane was modified by the addition of two tabs at the extremities of the elevator. The normal tab is in the center of the elevator. These auxiliary tabs were connected to the control system in such a manner that they did not become operative until an elevator stick force of approximately thirty five pounds was applied. Three previous flights had been made with the modified installation with normal cable tensions. Dives were made on at least one of these flights. Prior to the final flight the elevator cable tension was reduced to fifty pounds.

From an examination of the wreckage and testimony of witnesses it appears that the following sequence of events occurred:

A. That Mr. Ralph Virden took off from Lockheed Air Terminal at approximately 10:35 A.M., November 4, 1941, for the purpose of conducting dive tests. Mr. Virden's instructions for these tests were,

"Climb to 27,000' at 2,600 r.p.m. 33 HG.
"Turn on Camera
"Trim to 300 m.p.h. indicated
"Dive and study control
"Repeat if necessary
"Turn off camera ---
"Land. Then ---"

Balance illegible - destroyed by fire.

Apparently Mr. Virden also had instructions to pass over the Lockheed Factory in sight of the speaker's stand at about 11:45 A.M. if his tests were complete.

B. Three dives and recoveries were successfully completed. A fourth dive was made. The altitude at which the fourth dive was started is unknown. It may have started at high altitude or it might possibly have been the start of a dive for the purpose of passing the speaker's stand at exceptionally high speed. In either case the airplane was observed in a sustained dive of about 15 degrees just prior to the structural failure. Due to the distance from the observers the amount of engine power being used is problematical. However, it is believed that considerable power was used at some altitude above 5000 feet and that the airplane as it approached the 5000 foot level was traveling at a speed greater than normal but not at an excessively high speed.

C. At approximately 5000 feet it was observed that the tail surfaces started to leave the airplane in increments with great rapidity, the bare booms only remaining. The airplane continued on course momentarily then pitched forward completing the first 180° of an outside loop with very little loss in altitude. From this point on the airplane was observed in a series of inverted flat spin gyrations until it crashed in a flat inverted position.

D. Unsatisfactory Report, Materiel Division Number 41-3935, Station Serial Number FAD 41-384, dated June 9, 1941, prepared by Major Gilkey describes a condition of severe buffeting in a sustained dive, the elimination of which could only be accomplished by use of the trim tab to change the altitude of the airplane to a flatter position with a resulting decrease in speed. That this condition was not unusual with this type of airplane has been confirmed by other pilots during the course of this investigation. Testimony as given substantiates that Mr. Virden had encountered this condition frequently and that this buffeting had been of a very severe nature and that he stopped it by use of trim tab. The probability that Mr. Virden encountered severe buffeting and/or flutter in the final dive is evidenced by the fact that in the examination of the wreckage the trim tab indicator on the elevator was set at 13° in the nose up position.

E. Examination of the wreckage at the scene of the crash revealed that the entire tail structure was torn away at approximately the attaching points to the booms.

F. The greater portion of the tail structure was recovered and was laid out for examination with all pieces in their proper relation. Examination of the tail pieces indicates that there was a very severe flexing of the horizontal stabilizer and the elevator.

Both the horizontal stabilizer and the elevator were separated in an almost straight fore and aft line just to the right of the external elevator counterbalances. The upper external counterbalance was still attached to a portion of the elevator while the lower counterbalance had been torn completely off. The lower counterbalance had evidentally been moved forward and upward with forces great enough to drive it entirely through the lower skin of the stabilizer and fracture the upper skin. A portion of the elevator just to the right of the fracture was torn completely loose and may have been the first large piece to leave. The left hand portion of stabilizer and elevator fell individually, while the right hand remainder of the stabilizer and elevator fell as a unit. The main internal counterweights, on the interior of each vertical surface, and mounted on the end of the elevator torque tube, were torn loose at the mounting point. Only one of these has been recovered. The interior of the vertical surfaces indicates they received a severe battering from these counterweights.

G. The appearance of the main break in the stabilizer and elevator, coupled with the indications of battering of the interior of the vertical surfaces by the main counterweights and the forward movement of the lower counterweight, lead the committee to the conclusion that the cause of the failure of the tail surfaces was a violent flutter. *

H. This excessive flutter may have been the result of the inherent characteristic of the airplane to buffet, combined with the use of additional auxiliary tabs and a lowered cable tension. The committee, however, could find no positive indication that the auxiliary tabs became free at any time before the disintegration. To the contrary, however, the battered condition of the slots at the end of the torque tube through which the arms serving the auxiliary flaps pass, would indicate that the tabs were attached to the system until the main counterweights broke loose.

*other, Later, documents say this was wrong conclusion!?

RECOMMENDATIONS

The Committee recommends that:

A. An immediate and extensive flutter and vibration survey of the P-38 type aircraft be initiated.

B. Pending the outcome of this survey and installation of necessary modifications, the restrictions on the P-38 type aircraft be extended to include operation at all altitudes and that lower allowable indicated speeds be permitted.

C. The above recommendations are made due to the fact that the failure occurred at approximately 5000 feet.

ENCLOSURES to Technical Report of Aircraft Accident Classification Committee of Western Procurement District, dated November 5, 1941, covering accident YP-38 Airplane, AC No. 39-689.

Copy Special Orders No. 129, Paragraph 1, dated 11/4/41

Lockheed Letter, 11/5/41, File YP-38/3351

Forms 1 and 1a

Testimony on crash dated 11/5/41

Map showing location of crash

Photographs 759, 764, 789, 794, 824

Newspaper clippings

MDAC-402-WF-4-1-41-200M

WAR DEPARTMENT
AIR CORPS
MATERIEL DIVISION
OFFICE OF THE AIR CORPS REPRESENTATIVE
LOCKHEED AIRCRAFT CORPORATION

BURBANK, CALIFORNIA
November 5, 1941

Subject: Testimony on crash of
YP-38 type airplane,
A.C. Serial No. 39-689

To:

In compliance with Special Order #129, issued by the Western District Supervisor, Western Air Corps Procurement District, Santa Monica, California, under the date of November 4, 1941, a board of officers consisting of Lt. Col. Donald F. Stace, Major Wm. W. Mounts and Captain Richard B. Stith, convened at 9:00 A.M., November 5, 1941. The board was duly sworn. The board then proceeded with the taking of testimony regarding the accident involving YP-38 airplane A.C. 39-689 that occurred on November 4, 1941 resulting in the destruction of the airplane and causing the death of the Lockheed Aircraft Corporation pilot, Ralph Virden.

The first witness was called.

The witness was duly sworn and testified as follows:

Q. State your name.

A. Staff Sergeant Thomas Collins.

Q. What is your Station?

A. March Field, California.

Q. If you'll just tell in your own words what you saw and observed yesterday in the crash of the YP-38.

A. Yesterday, at approximately 11:45, I mounted the platform at the Lockheed plant prior to the Army Officers visiting there, and standing in the middle of the platform I heard an unusual roar of the engines of an airplane and immediately raised my eyes up in that direction and saw the P-38 in a flat spin, spinning to the right, dropping very fast and then it disappeared behind the hangar. Therefore, I immediately told the high officials about it, and they investigated immediately.

Q. Did you see any portion of the airplane leave the airplane?

A. No sir, I didn't.

Q. You didn't notice anything at all leaving the ship?

A. No sir.

Witness was dismissed.

The witness was duly sworn and testified as follows:

Q. State your full name please.

A. B. Mason Vallie.

Q. Where are you employed?

A. Plant Protection Investigator - Lockheed Aircraft Corporation.

Q. You do not work for the Lockheed Aircraft Corporation?

A. No, I work for the United States Government.

Q. Will you tell us in your own words what you know about the crash?

A. I was sitting in my office, the Plant Protection Office of the U. S. Army Air Corps, Lockheed Aircraft Corporation, Burbank, California, at approximately ten minutes to twelve when I heard the sirens of the motorcycle escort detailed to conduct the employee morale committee through the plant. They started out on their motorcycles which immediately aroused my curiosity; whereupon I made inquiry from the Plant Protection Department of the Lockheed Aircraft Corporation and they informed me that a crash of the YP-38 had taken place in the neighborhood of Glenoaks and Robertson. I therefore proceeded to the parking lot, obtained my car and proceeded to the scene of the crash. Upon arrival, the first thing that I did was to assist in organizing the guards and the firemen to rope off the area in order to enable those who attempted to extinguish the fire, and those working in that vicinity, room to conduct their servicing. After things had become somewhat organized I made inquiries as to who had seen the airplane in the air and had seen it crash. The following witnesses were contacted.

Captain Rowe, Burbank Fire Department, who stated that he first observed the airplane in what he thought was a spin and what he had been told was a flat spin, at an approximate altitude of 1,500 ft. He stated that he saw parts fly off in the air and he described it floating slowly to the ground.

Jack Skinner was next contacted. He stated that he was a guard of the Douglas, El Segundo Plant, his badge number is 81, and that he lived in the vicinity of the crash. He stated that he was, what he thought, was the first one to arrive at the actual crash. He stated that he did not observe the airplane in the air, but when he heard the noise he immediately proceeded to the spot.

Lt. Koontz, Chief of the Guards at Vega, was interviewed and stated that he observed the airplane flying around in the air and after watching it, he observed it going into what he called a spin. He was unable to make a guess as to the exact altitude but figured it was in the neighborhood of 2,000 ft.

That is all I have, Colonel.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. Will you please state your name and your employer?

"Kelley"

A. Clarence L. Johnson, Chief Research Engineer, Lockheed Aircraft Corporation.

Q. I'd like to have you testify primarily as to the purpose of this flight and as to what changes had been made in the airplane since the previous flight.

A. The airplane which crashed, was sent on a test flight to make, first some dives at altitudes between 27,000 and 18,000 ft. The dives were to be made in this case with power off at speeds above 350 miles per hour indicated speed. The pilot was to use his discretion as to whether or not he was to make more than one dive. If he did not like the feel of the airplane after one, his instructions were to proceed to land, except if he were in the vicinity of Lockheed Air Terminal at a time between 11:45 and 12:00, he should engage in the flight past that had been arranged at the time in connection with the committee for employment morale. Observers at our hangar heard him make three dives at altitude. He was so high, I do not know that anyone saw him, but he could be heard from the ground.

The data to be taken consisted of all of the things such as airspeed, altitude, temperatures, and a large number of other records to determine the stress in the horizontal tail and in the boom structure.

No radio contact was maintained between the test base and the airplane although the airplane was in contact with the normal Lockheed Station, LC-6. It was Mr. Virden's desire during the dives not to give the results by radio because he was too busy, as he put it.

The airplane at the time of the test had been modified from the standard P-38 airplane by incorporating two auxiliary tabs on the elevator. The purpose of these tabs was to aid the pilot in pulling out of any dive and to improve the airplane's maneuverability in turns and on landing. We had four flights operating, the flights consisting of two at low altitude and two at high altitude. Mr. Virden expressed himself satisfied with the operation of these tabs for the low altitude condition. He was greatly pleased at the ease of maneuverability of the airplane with the tabs. On making dives at higher altitude he was not particularly pleased with the operation because, while it reduced the forces required to pull the airplane out, it affected the stability of the airplane so that the nose would oscillate slightly as he was pulling out. He was not concerned about the oscillation as it affected safety, but he did not believe the airplane, as a pursuit airplane, could keep its guns on the target should that condition be allowed to prevail. In order to eliminate the oscillation, the tab system was inspected prior to his last flight with the idea of reducing the friction of the auxiliary tabs. In order to reduce the friction the control cable tension in the elevators was reduced to a value of 50 lbs. I believe the standard cable tension rigging is from 80 to 90 lbs. There was nothing unusual in reducing the cable tension to this value as we have previously made flights with cable tensions of this value although not with the auxiliary tabs in place. We have recorded in flight, cable tensions lower than those with which the airplane was rigged.

We were in the midst of an investigation to study the effect of compressibility phenomena as they affected the dive characteristics of the airplane. We had run some thirty or more dives at high altitude with this airplane and another, Serial No. 2218, in an effort to derive various fillets and airplane changes which would overcome a diving tendency that developed at true speed between 550 and 600 miles per hour. We had made considerable improvement over the original conditions by the installation of a fillet between fuselage and the wings. We were carefully investigating the effect of the auxiliary tab by investigating first the loads that would be developed, first without the tabs and then with the tabs in operation.

In the previous set of dives, to the number of seven, that the airplane in question had made, the measured tail load and tail stresses were of the nature of one-sixth to one-third of the design value for the tail and booms. We felt, therefore, that a continued and careful investigation with this unit was in order.

Mr. Virden's tests on the last flight were, if anything, to be less strenuous than his previous tests as we were trying to investigate carefully the effect of power on the dive condition. With power off he could not reach as high speeds at altitudes as he could with power on.

I believe that states our present position.

Q. I understood this was the first flight with the tabs.

A. He had definitely made four flights previously with the tabs.

Q. All with Mr. Virden as pilot?

A. Mr. Virden made all of the flights.

Q. Was the photographic record normally taken on the other four flights?

A. Yes. We have photographic records for all flights of that airplane except the last, in that case, the camera equipment was destroyed.

Q. In your opinion, what was the cause of the crash?

A. The direct cause of the crash, as I believe it, was due to a failure of the horizontal tail surfaces of the airplane. I believe the failure was induced by high stresses caused by tail flutter. I further believe that the factor which influenced the tail flutter on this airplane was connected with the auxiliary tabs and I believe that one tab being loose, due to a faulty weld on the restraining member. We know very well, from other flight and wind tunnel experiments, that a loose tab is the most disastrous flutter mechanism that is known. We have always been greatly concerned with such items and have tried to take ample care in the design of tab mechanism. If the tab became loose, it would induce elevator flutter. The flutter would be more severe at high speeds than low, and adding the flutter load to a normal down load on the tail, such as exists in the dive, could cause structural failure of the horizontal tail. We know Mr. Virden was a very experienced pilot on these dives. He knew the limitations of the aircraft. He had reached speeds of 450 to 475 miles per hour, indicated values, at altitudes between 3,000 and 10,000 ft. He had no intention, ever, of going higher until the condition which was giving us trouble at altitude was corrected. I believe then that the flutter, if it developed, occurred at speeds less than 450 miles per hour and that the flutter was so great the pilot had no control over the airplane.

Q. Do you think, if you had flap flutter that an indication would have shown on the balance? There was no indication where the weld was broken of the arm going back and forth across the face of it, which would have occurred if there had been contact and the flap was fluttering. The tab was fluttering, I should say.

A. I believe that the arm which prevents movement of the auxiliary tab could have become disconnected from the counterbalance support and allow flutter without marking the surface. I saw that because at the present time the arm is slightly loose in the direction parallel to the elevator hinge line and in spite of the fact that there are no marks except possibly one which might indicate any movement of the two parts concerned to show flutter.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. State your full name, occupation and employer.

A. Eugene C. Frost, Structural Engineer, Lockheed Aircraft Corporation.

Q. Will you state what you know about these series of tests? The reason for them? And then when you get through with that, if you will tell what you think from examination of the wreckage as to the possible or probable cause, in your opinion, of the wreck.

A. The tests as described by Mr. Johnson are fully described and I don't believe I could add to that except to describe, possibly, the measurements which we were after. I reiterate that four flights had been made with this new tab installation prior to the last one. During those tests, and also previous to that, when the airplane had the standard elevator, the airplane was equipped with not only the standard gauges on the structure which Mr. Johnson mentioned, but indicator gauges which gave us the angles on the three major control surfaces, as well as the tabs. I think that's about all that I can add to the flight tests themselves.

Q. I'd like to ask you if it would be possible for you to determine from small pieces of metal that were adjacent to the tear that occurred in the horizontal stabilizer, as to how much flexing was encountered there before failure occurred. In other words, how much metal strain and fatigue is there from bending?

A. The fracture in the center of the stabilizer shows evidence of several bending cycles. I would not be sure that that is true of the elevator failure although it is evidently possible. However, upon complete failure of the stabilizer unit and the fracture which w.s noted, it is difficult to estimate the bending cycles due to the nature of the failure when the structure tore completely apart. I'd like to add, also, that investigating and inspecting the parts as we have them, the results are obscured considerably by the dents and fractures which may or may not have been caused by impact on the ground after falling off the airplane.

Q. From the examination of the parts of the tail surfaces, what in your opinion is the cause of the failure?

A. I am a structural man by training and experience and have had very little to do with other problems, such as flutter problems. In my opinion, the failure in the horizontal tail surfaces could have been due to a very high load on the tail or due to flutter. I believe the flutter is the more probable cause for approximately three reasons; the first reason is that the lower external balance weight is completely torn from its support on the elevator; and, second, the lower balance weight, which tore off the elevator, was found, I have been told, a considerable distance from the unit to which it was attached; and, thirdly, the large hole which was noted in the lower surface of the stabilizer was caused by very high deflection of the elevator in a downward direction and would have failed the stops in order to cause such damage. I believe it was the opinion of the group as a whole that the hole in the bottom of the stabilizer was undoubtedly caused by the lower external elevator balance weight.

The board adjourned at 12:20 and reconvened at 12:25 for additional testimony.

The witness was duly sworn and testified as follows:

Q. Will you please state your full name?

A. George E. Rowe.

Q. Your occupation and your employer?

A. Fire Captain, City of Burbank.

Q. Will you state in your own words what you know about the crash of the Lockheed P-38?

A. Well, I was going to Los Angeles. I live at 619 Tujunga, Burbank, and I was on my way to L.A. to pay my insurance policy. I was going over Sixth Street and I heard the noise and it got in behind some trees. I didn't see it hit but I saw the other plane take off for the field. There was another plane with it, he struck off up toward the hills and up around this way.

Q. Did you see it before it went into a spiral?

A. No. I didn't.

Q. Did you see anything leaving the airplane?

A. I thought I saw something flying through the air when he started falling down but I was watching the airplane.

Q. About how high was the airplane when you saw it?

A. About 1,500 ft.

Q. Do you know how many turns he made?

A. No. He was coming down too fast.

Q. You are familiar, Captain, with the general appearance of the P-38?

A. Yes.

Q. Do you recall from seeing the airplane falling yesterday whether there was any tail surfaces on the ship or just the two bear booms?

A. No, I couldn't say.

Q. About how far away from the ship were you?

A. Well, I'd say about six blocks. I was one of the first there.

Q. When the ship was turning was the nose toward the ground considerably?

A. No, it was more down, just spiraling down like a corkscrew.

Q. Have you seen an airplane in a tail spin?

A. Yes.

Q. Did it appear to be a normal tail spin?

A. No. He was coming too fast for that.

Q. You'd say the rate of descent was considerably faster than a normal speed?

A. Yes.

Q. Did you hear the engines?

A. Yes. Then I heard Healey take out for the airport just when he was coming down.

Q. Who is Healey?

A. He's the other test pilot in the other ship. There were two of them up at the same time.

Q. One more question, Captain. When this ship was coming down in the spiral, or spin, as you described it, was it revolving on the axis of the nose of the airplane or was it describing an arc?

A. Just coming down and the nose was coming down.

Q. Was it on one given point or was it describing an arc?

A. It was more like an arc.

Q. When they describe an arc such as that, sir, that's what is termed as a flat spin. When they are spinning on a given point, that is a true spin.

A. Well, he was going around, and I'd like to say that a Japanese boy ran away with a piece of the tail. Are you missing an aileron or any of that stuff?

Q. We've got an awful lot of pieces over there and there is no major piece that is missing now.

A. They told me that this was a pretty good sized piece.

Witness was dismissed.

The board adjourned at 12:45 and reconvened at 1:30.

The witness was duly sworn and testified as follows:

Q. State your full name, your occupation and employer.

A. William Curry Saunders, occupation Assistant Chief Pilot, employed by the Lockheed Aircraft Corporation.

Q. Mr. Saunders, you had a pilot in your employ by the name of Ralph Virden? Is that correct?

A. That's correct.

Q. Will you please give us any information you have on him relative to what his duties were, his flying, the number of hours, the number of hours in this particular plane in which he met the accident, and any other information you may have?

A. Mr. Virden came to work for us in March, 1940. He had formerly been employed by United Airlines for some thirteen years. He had an Air Line pilot's rating, his original license was issued by the Civil Aeronautics Authority in 1927. According to our records, Mr. Virden had logged records of his flying time amounting to 15,186 hours and 59 minutes. He had 75 hours of flying on the P-38 and Lightening type airplanes.

Q. You considered him a very competent and capable pilot?

A. We considered him the most competent among the most capable that we've ever had.

Q. In other words, there was no question about Mr. Virden's flying ability and physical condition?

A. The Lockheed company, in addition to his physical examination that was required, had submitted Mr. Virden to our Medical Director, Dr. F. E. Poole, to a very thorough physical examination of their own. The date of this examination I don't recall exactly but it has been within the last sixty days.

Q. What was the reason for it?

A. High altitude work and we wanted to ascertain for our own benefit and knowledge, and we wanted to ascertain that the men were extremely well qualified to carry on with it. Mr. Virden's condition was reported to us by the Medical Director as being excellent and from personal contact with Mr. Virden over a period of two years, or approximately so, he has been an extremely healthy individual, very virile, and, in general, I should say his physical condition is far above the average. The company went to considerable pains to ascertain this in view of the work that Mr. Virden was doing and, as I've said before, the findings of our Medical Director indicate that he was well fitted to carry on the type of work he was doing.

Q. What was the particular test he was assigned to yesterday?

A. The particular test that he was assigned to yesterday was a dive test which was a portion of experimental work that is being conducted for both the benefit of Lockheed and the Air Corps by our Flight Research Department. Mr. Virden had made many dives of similar nature for this company and had made several in the same airplane, either three or four, Friday and Saturday preceding this accident.

Q. Did he talk to you, anything about the dives he made last Friday and Saturday?

A. Yes, he did.

Q. What, in general, did he say:

A. Well, to be perfectly frank, he didn't appear to be alarmed at all.

Q. Mr. Saunders, have you ever heard anything said by any of your pilots; by that I mean pilots employed by the Lockheed company relative to flutter, buffeting, or any such kindred troubles that might be encountered in the empennage?

A. Yes. We have had buffeting in this airplane under certain conditions at high speeds, but to my knowledge, we've never encountered any flutter, nor have I ever heard anybody complain of flutter. The buffeting might have been due to several reasons which I am not competent to answer, but it has been encountered by more than one of our pilots in test work; and, while alarming as described to me, Virden never considered it, I mean he always felt that he always had control of the airplane. The buffeting was severe as described by him at times under certain conditions, but he didn't feel that it could be called particularly dangerous - I'm putting it that way.

Q. Did you see the airplane while it was falling?

A. Yes, I did. I saw the airplane first. I was located at approximately a distance of four miles away from the crash and when I first observed the airplane I estimated its elevation at around 1,500 ft. and it was spinning quite rapidly with the nose well down and it went out of sight in that attitude. It went out of my sight in that attitude.

Q. Were you able to observe whether the tail group was attached to the ship or not at that time?

A. Frankly, I thought that I saw the horizontal stabilizer in place but I can not be sure of that.

Q. In the tests which he was running, or these dives, would he have experienced the buffeting that you mentioned?

A. Well.

Q. Under normal operations?

A. I can't answer that directly because as reported to me by Virden on several of the dives that he made prior to this, that, one particular dive that he had no buffeting at all.

Q. So it might have been there and it might not?

A. Yes.

Q. He had reported buffeting in previous dives with this experimental tab?

A. Yes, he had.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. Will you state your full name and your occupation and employer?

A. Elmer Cecil MacLeod, Assistant Chief Test Pilot of Lockheed Aircraft Corporation.

Q. Will you just tell us in your own words what you observed about the crash yesterday of the P-38 and what you know about the test that was being run?

A. Well, the test that was supposed to be run, or maybe was, was to take the airplane up to 27,000 ft. trim it and start down; trim it at about 300 miles, start down, and increase the speed and see if it was nose heavy or tail heavy; bring it out of the dive at whatever speed he obtained, come down and land and the report would be on the camera and also the pilot's report as to what had happened. That had been going on for several days, practically a month or so. They've been running several tests of that type, in other words - dive tests.

Q. Did you see the airplane yesterday at any time during its flight, or when it was falling?

A. I was standing in the open space there by where the new canteen is, where the speech was about to start for whatever occasion of the Army being here with several officers, and I heard a loud noise that sounded like high r.p.m's, and motors or engine or engines. I looked up in the sky and I saw the P-38 which I easily distinguished by the booms and the tail and at that time it was headed straight down in a turn, and I wouldn't say whether it was to the left or right but I knew right away that it was a spin of some sort. I immediately left and saw it for probably one second. It was going down and I can't remember whether it was turning to the right or left - it was a violent maneuver. It looked to me at that time it was about 2,000 ft.

Q. Do you recall when you saw the ship coming down if the tail group was in place, or was missing?

A. It was too far away. It was down at Grand Central and I was down at Lockheed and I couldn't say whether it was on or off.

Q. Did you see anything fly off the ship at any time?

A. No, I did not.

Q. Were these tests discussed?

A. Well, we asked the flight section what they intended to do and they said they intended to dive the ship with an experimental tail on the ship that had an extra pair of tabs that operated after pulling 30 lbs. load on the stick and after pulling 30 lbs. load that it cut it the extra tabs to aid the pilot in bringing the ship out without using the regular tabs or without using too much of the regular tabs. That had been done the day previous.

Q. Who was at that conference?

A. Saunders, Virden, Ward Beman and myself.

Q. Do you recall Mr. Virden ever mentioning buffeting or flutter to you with this tail group you just spoke of?

A. Well, he had had it up the day previous and it buffeted and what we were talking about mostly was, did the spring arrangement aid him in coming out or did he use the tab in coming out in the normal way. He was under the opinion that it did cut in and Mr. Beman was of the opinion that it didn't cut in. Mr. Virden thought it did and Beman thought it didn't, so they rearranged the camera and got the ship ready for another flight to prove whether it did or didn't, and this was the flight. He was supposed to fly it that evening and got instrument weather but it was getting along towards dark so they put it off until the next morning.

The witness was dismissed.

Mr. Clarence L. Johnson again took the stand.

Q. Mr. Johnson, in your testimony I believe you mentioned the fact that one of the reasons for running the test was the airplane continued to dive.

A. The airplane develops a diving tendency at speeds above 550 miles per hour. We believe the cause for the diving tendency is what is known as compressibility phenomena. By that, we believe that when the airplane is flying at the high speed indicated at high altitude, the flow speed over the wing goes considerably higher than that. The air must speed up to get around the wing and fuselage and the booms. When it does that there are many points on the airplane where the speed of the air flow goes over 700 miles per hour. Whenever you reach a condition like that at altitudes of 25,000 ft., you reach a condition where a pressure wave can not propigate in the air. In other words, the air can not follow the surface of the wing or the various scoops or around the wing fuselage intersection. Now we believe that the diving tendency is caused by compressibility effects on the outboard wing panels. When you get to very high speeds you have a type of flow separation that gives rise to the buffeting and at the same time causes a diving tendency to the airplane at the center of pressure shifts.

Q. Isn't there an increase in the stock forces in a dive, we'll say at speeds under 400 or 450?

A. There is an increase in stick forces due to the natural stability of the airplane. The amount of increase is roughly ten to thirty pounds, depending on the center of gravity position that is being flown. However, when the airplane develops this compressibility effect, the stick force then goes up very rapidly because the whole wing is tending the airplane to increase in its dive. In order to overcome this at those high speeds, where the forces were already of the nature of some twenty or thirty pounds, and where they rapidly went up to 100 or 200 pounds, we wanted to give the pilot a means for overcoming that condition.

Q. Mr. Johnson, as I recall from what you said in your testimony this morning, the testimony of Mr. Saunders and Mr. MacLeod, there had been trouble experienced in previous flights with this experimental empennage?

A. There was some question as to whether or not in one of the dives, the one under question, that he actually made any use at all of this tab to pull out. I believe that in one condition he got just on the verge of using the tabs, but due to the buffeting, one instant he used it and the next he didn't. From our photographic record the indication is that he did not use the tab to any appreciable extent. That was the basis for Mr. Beman's statement that he was not into the auxiliary tab range. I believe, myself, that he was intermittently in and out of it and our answer to that was to increase the spring tension so that he was definitely in or out. We had, however, no chance to change the spring tension. It was exactly the same on his previous flight. In order to settle that point, we wanted him to repeat this test.

Q. That definitely establishes then that you have had buffeting with this tail group? Has buffeting ever encountered with the standard tail group?

A. Yes, buffeting is independent of the tail group. We believe it develops on the wing. We don't know that the tail is being buffeted. We know that the airplane is being shaken, but when the airplane is descending at 45,000 ft. a minute, and when the affair lasts from three to four seconds, it is very difficult to get an accurate impression of what is going on. We've run very elaborate programs to tie down what is going on in this condition. We know that there are other airplanes that have dived as fast as our airplane, but we do not know if they have dived as fast at high altitudes. Our problem is more difficult than with the other single engine pursuits in that we have the region of very high speed flow between the fuselage and the nacelle which you do not have with a single engine airplane. We have run a large number of wind tunnel tests on the subject and have the complete report just about finished.

May I add that I saw the airplane during the last thousand feet of its fall? I was standing on the roof of the Lockheed Administration Building and the airplane was making some indeterminate maneuver, hardly a spin because it had no well-defined motions, and when I saw it, it definitely did not have the tail unit in place.

Q. How long have the counterweights been on?

A. The elevators have always had counterbalances, the original counterbalance arrangement consisted of balances in the fins only. In the initial flight we ran into a mild flutter condition at a fairly low speed that required our installation of these center balance weights. After the installation of those balance weights we have never had the flutter condition. We have discussed it with the representatives from Dayton. We have given them ossilograph records to prove that the condition is not flutter and we have records to show that there is no defined period to this buffeting condition.

The witness was dismissed.

Copy of the following letter was received from Jean Bennett, introduced into the record, and is recorded below:

"Yesterday I was visiting a friend who lives at 1013 Raymond Avenue. I was working in the kitchen when I heard a P-38 coming. As I usually do I went out to watch it. The plane was flying in a level position around 2,000 ft. high. It didn't seem to be going as fast as they usually do when they fly over. There was another P-38 near by. Just after the "plane went over the house the tail part seemed to suddenly disintegrate into pieces as if caused by an explosion or the like. The plane then wobbled on for a few seconds then spiralled to the earth. The instant it hit the earth I could see smoke, so I imagined that it had burst into flames.

"I walked up to Glenoaks Blvd. and as I reached there pieces were still coming down. I saw several pieces of the tail and one big part of the rudder. I then walked on to where it had crashed. A fire engine had just arrived and the men were trying to get to the pilot but it was impossible.

"I hope this helps you in some way.

Very truly yours,

JEAN BENNETT (signed)
1607 N. Highland Ave.
Glendale, Calif."

The witness was duly sworn and testified as follows:

Q. State your name, occupation and your employer.

A. Firman C. Gray, Supervisor of Experimental Flight, Lockheed Aircraft Corporation.

Q. When was the new experimental tail put on this P-38?

A. Well, I don't know just the exact date, sometime within a week or two.

Q. Approximately how many flights have been made with that?

A. Oh, I'd say, maybe four.

Q. What was the main difference between this experimental tail and the standard tail group?

A. It had two extra tabs on the outside of the elevators that were independent of the rest of the system.

Q. Prior to the last flight were there any changes made in the tail or any special inspection work done on the airplane?

A. The elevator cables were rigged to fifty pounds instead of ninety pounds.

Q. That was the only change?

A. That's the only one I know of.

Q. Mr. Gray, do you know from your work there at the test hangar of any troubles that have been encountered with this airplane? Either before the installation of this new tail group, or I should say, experimental tail group or since its installation?

A. That's on the tail, you mean? No, I don't.

Q. In other words, you did not discuss any results with the engineers or the pilots?

A. No, I never have. I don't have any complete knowledge to amount to anything, only just the work that goes on on the ships.

Q. You're satisfied in your own mind then that when the airplane took off on this last flight that everything was in proper order as far as the construction of the airplane, and the tail was in good shape, as it was engineered?

A. It was in good shape.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. Will you please state your full name, your occupation and your employer?

A. Josiah Claremont Toll, employed by Lockheed Aircraft Corporation as a test pilot.

Q. You flew this P-38 that crashed on the flight that preceded it?

A. I flew it Saturday noon.

Q. What was the nature of your test?

A. Altitude climb.

Q. No dives in the test?

A. No.

Q. What was the maximum indicated air speed?

A. I don't remember but coming down I didn't dive to any excessive speed. I would say, if you wanted me to make a guess, but its all I can do, that it was less than 300 miles per hour. A very casual descent.

Q. Did you make any other flights in the airplane after the modified tail was on?

A. You mean after the trim tabs were put on? I think that was the only time I flew it.

Q. How much time do you have in the P-38 type?

A. I couldn't say exactly.

Q. Just make a guess.

A. Thirty to fifty hours, not over fifty.

Q. Did you ever run into any tail flutter?

A. No, buffeting at low speeds; the different type of flutter at low speeds, in production flight.

Q. Describe it please.

A. Well, I thought it was due to rough air at first, and I couldn't determine just why or what it was. It felt like rough air and I went over to another part of the valley and reported. I came down and reported a rough engine - I wanted them to check that engine. One of the engines, or both of them, to see if there was a rough engine or propeller. And, as I recall, that's the only time I flew that particular airplane.

Later, I got another ship that did the same thing a little bit worse and I reported that being rough, the same type of roughness, which I thought was rather peculiar, that I had found before.

That was the only time that I flew that one, but it was flown by a couple other of our pilots later on and they turned it back to engineering to determine why it was doing that.

Q. At about what speed was that?

A. It seemed to be about 160 to 170 miles per hour.

Q. Indicated?

A. Yes.

Q. What altitude?

A. Well, I wasn't at any particular altitude. As I recall, I was between 5,000 and 10,000 ft., just a normal production flight which would seldom go over 10,000 ft.

Q. That was on a straight production model being produced for the Air Corps?

A. I don't remember the number, but it was on a production model.

Q. Do you know what was done to correct that?

A. I'm quite sure I was straight on it, the only thing I found different was that the fillets around the sliding panels on the side of the cockpit, the fillet was wide on that side of the window, and they bent those in and closed that gap up, and I know that it did stop that same roughness and buffeting that I have had. We stopped another plane just like that. We asked them to do that and it stopped it again.

Q. Did you see anything pertaining to the accident yesterday?

A. No, I was up at the time but I didn't see it.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. Will you please state your full name, your occupation and employer?

A. Tom Laughton Kennedy, pilot, Lockheed Aircraft Corporation.

Q. We understand you were flying yesterday at the same time this other P-38 crashed, and we'd like to know what you saw.

A. Well, I was cruising in a westerly direction at about 3,000 ft. and the first I saw of the airplane was when it spun down right on straight away vision, I'd say about 1,500 or 2,000 ft. in front of me. It was spinning at the time I saw it. I kept my eye on it until it hit the ground. I was positive that the stabilizer, I don't know about the rudder or the flippers, but the stabilizer at the point I saw it at 3,000 ft. was on the airplane definitely; and in following it down, it left, as I found out since then, but I did not see it leave because as it got lower on down, it blended in with the houses and it was spinning at a pretty fast rate of speed to the right. Just before it hit, it seemed to stop spinning, just seconds. It came out and just went in like that.

Q. Was that a normal spin or a flat spin?

A. To me it looked like normal, it wasn't in a flat spin, it was spinning too fast and I couldn't tell whether it was an inverted spin or not.

Q. Spinning to the right?

A. Yes.

Q. You visited the scene of the accident after you landed?

A. Yes.

Q. What position was the airplane in when it hit the ground?

A. It appeared to be in an inverted position.

Q. It struck in that inverted position then?

A. Yes.

Q. Could you tell from where you were whether the ship was inverted in the spin or not?

A. No.

Q. What makes you think it was the horizontal stabilizer on?

A. Well, I could plainly see it.

Q. Could you tell whether it was the stabilizer or the elevator?

A. The elevators couldn't be on there without the stabilizer.

Q. That was on when you saw it spinning?

A. At 3,000 ft. It could have left between then and the time it hit the ground and I wouldn't have noticed it.

Q. How about the rudders?

A. I couldn't distinguish that, I particularly looked at the ship closely because I could tell it was in trouble because no one would intentionally spin that ship at 3,000 ft., so I just kept my eyes glued to it.

Q. Then you are sure the stabilizer was on but you don't know whether the rudder or elevator was on.

A. I don't know, I know there was a cross-member between the two booms, so I judged it was the stabilizer.

Q. Could you tell whether the cross-member was intact?

A. I couldn't tell but it seemed to be, it was between the two booms.

Q. Repeat again how far away you were.

A. I'd say between 1,500 and 2,000 ft. away from him.

Q. He was approximately on a level with you?

A. I didn't see him until he was right across in front of me.

Q. Then you had good vision?

A. Until he got below me and then the vision wasn't so good.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. State your full name.

A. William Alonzo Mundy.

Q. Your occupation?

A. Pilot.

Q. Who is your employer?

A. Lockheed Aircraft Corporation.

Q. Will you tell us what you know about the crash of the P-38 yesterday?

A. Well, approximately at between 11:44 and 11:45, I was flying one of the P-38's. I was about at 4,500 ft. elevation and I saw the ship spinning when I first noticed it. I was approximately over Forest Lawn, southeast Glendale, and the ship was to my left at about, I would say, a little better than 5,000 ft., because I was watching the altitude that I had pretty close. We were supposed to have 3,000 foot and I was above the haze line when I first noticed it. It was spinning, or looked to me just after it went out of a roll or something when I first noticed it. I thought somebody was just putting on a show and

I kept watching it. It wasn't coming out and I kept noticing it all the way down and by that time I'd dropped down to approximately 3,000 foot and I came over just where it hit at. I was over there before any fire started, there was the dust from it. I came down over the Terminal here and I called into the station to see if there was a P-38 crash. I couldn't see that he hit the ground but I could see the dust there but I didn't want to start any rumour of anything and I just asked if the P-38 had crashed over Glendale when I made the turn here and turned back. I imagine I was about 200 ft. high.

Q. Did you see anything leave the airplane?

A. No.

Q. Was the tail intact?

A. I wasn't close enough to tell, I could tell it was a P-38 and could tell that it was the silver job because it was off the sun that first called my attention to it, it was just the reflection off the sun on it.

Q. But you could definitely establish he was spinning when you first saw him, and that was approximately 5,000 ft.?

A. Yes, I'd say approximately 5,000 ft. taken off the altitude that I had and from the direction, I mean in comparing the height off because I wasn't looking down, I was looking just a little bit up from where I was and I would say he was a little over 5,000 when I first saw him, not very much over 5,000.

Q. Could you tell whether he was spinning upside down or not?

A. No, I couldn't. But the ship, when I first noticed it, it looked as if it had come up just like it was rising when I first saw it. It may have been coming down, I don't know, but it looked as if somebody had started to pull it up for a roll or something like that when I first saw it, because it was coming down and looked just like somebody just started to pull it up to roll it. I may have been loosing a little altitude when I noticed that.

Q. But you didn't see a roll of any kind? He was in one attitude and maintained that going down?

A. Yes.

Q. When you first saw him was he spinning?

A. He wasn't going in a straight forward direction, he was in a rotation, he wasn't in a direct forward motion, it was more or less starting into a spin, or may have slowed down on part of his turn.

Q. But you feel that he was coming out?

A. I feel that there was a rising in the ship but I thought from watching it there it looked as if somebody was making a spin or doing some maneuvers.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. State your name.

A. Walter Smeck.

Q. Your position?

A. Associate Procurement Inspector.

Q. Your employer is the United States Army?

A. Yes.

Q. Will you tell us what you know about the crash of the P-38 yesterday?

A. Well, sir, at approximately 11:50 A.M. of yesterday, I noticed, or rather heard of three muffled explosions, what I thought were explosions, and I looked toward the south and what I thought was a ship in a dive; but, on second recognition, I saw that there was a ship with two booms minus tail empennage. It was in a tight spin, nose down, approximately at a thousand feet and in the maneuvers the ship inverted and it did a series of tight flat spins toward the ground. Of course I did not see the crash because I was some distance away. The horizon blocked my vision of the crash. The first thing that I saw was what I thought was a dive. Apparently it must have lost its tail empennage at that point but I did not see any other object in the air.

Q. You saw none of the tail surfaces?

A. No sir, I didn't.

Q. How far away were you from the accident?

A. I'd say approximately a mile, sir. Yes, I was on Amherst between Glenoaks and San Fernando Road at my residence, returning from home to come back to the office.

Q. When you saw the airplane there definitely were no tail surfaces on it?

A. Yes.

Q. And about how high was the airplane then?

A. About 1,000 foot, sir. How I know there was no tail empennage was because I saw the two booms as the ship was gyrating toward the ground.

The witness was dismissed.

The witness was duly sworn and testified as follows:

Q. State your full name, your occupation and the name of your employer.

A. Arthur Benjamin Chilver, Department 39 - Police Department, Lockheed Aircraft Corporation. I'm a guard.

Q. Employed by Lockheed Aircraft Corporation?

A. Yes, Lockheed Aircraft Corporation.

Q. Will you describe, please, in your own words what you saw of the crash of the P-38 type airplane yesterday?

A. I, my wife and I, was in the car and had been down to Burbank to start with. We live just one block from where it fell. We live on Linden, at 1241, and the plane fell on 1147 Elmhurst. We'd been in Burbank and stopped on Linden and Glenoaks and I got out there to get some groceries, it was about a quarter to twelve and these planes were flying up. It was one of the dark planes and the silver plane was flying up. My wife is very anxious to look at it, so am I, everytime one is flying. At that time we were watching them, the silver plane was up quite a little higher than the other one. It seemed to come into a dive from a glide and all of a sudden we could see him coming along and the motors started blaring out as if he had it on full speed, and when we were looking at him it looked like pieces were flying off and he rolled over. It looked like as if he had rolled over and at that time the motors stopped and he

12/5/1941
&
07/ ? /1945

MARTIN "MARS"
FLYING BOATS

12/5/41
7/4/45

Martin 170, 193, 199

XPB2M-1, JRM-1 To JRM-3, Mars Flying Boats

In some respects the PBM represented an interruption in Martin's work on huge four-engine flying boats. These had become something of an obsession with the firm's founder and president. In 1938 the Navy ordered a single prototype Martin Model 170 as an experimental patrol bomber, designated XPB2M-1. This was to be the Martin Mars, a 140,000-pound behemoth that was the largest plane in the U.S. military inventory until the arrival of the B-36 intercontinental bomber in 1947. The Mars was originally conceived as a "sky battleship" or "flying Dreadnought," armed with multiple gun turrets, capable of flying long distances with huge bombloads (and Marine paratroopers as well). In speeches and articles, Glenn Martin predicted that a single Mars could capture an enemy island or "totally destroy" a rail center or shipyard. A squadron of them, he wrote, could "devastate Tokyo in one trip."

The XPB2M-1 was accordingly treated like a warship. Its keel was ceremoniously laid on August 20, 1940, with Glenn Martin driving the first rivet. Its launching into Dark Head Creek on November 5, 1941, was stern-first, after a bottle of champagne had been duly smashed over its bow. The plane's interior was laid out with separate mess rooms, berths, and washrooms for officers and enlisted men. Its commander had a private stateroom and issued his orders from a desk behind the pilots' seats. A huge bomb-bay, located in the hull underneath the wings, contained racks capable of holding five 1,000-pound bombs each. When it came time to drop them these could slide out on either side along the lower edge of the wing.

12/5/41

Initial taxiing tests in Middle River came to an abrupt end on the Friday before Pearl Harbor when one of the giant laminated-wood propellers threw a blade. It just missed the Martin flight engineer inside the hull and started a fire in one of the huge Wright R-3350 engines. The stricken sky battleship had to be towed closer to shore to allow firemen to put out the blaze. When the smoke cleared serious damage to the starboard wing and number-three engine nacelle were apparent. Repairs took more than six months, by which time the plane's mission had undergone a complete re-evaluation.

Pearl Harbor showed that fast carrier planes made very effective bombers indeed, while German U-boats turned the Atlantic coast into "Torpedo Alley." Thoughts naturally turned to a "sky freighter" as an alternative way to ship supplies to Britain and other battlefronts, invulnerable to torpedoes. The industrialist Henry J. Kaiser suggested that, given Martin's blueprints for the Mars, he could quickly build hundreds of the planes in his west-coast shipyards. Martin's response was ambivalent. Although the company issued calculations suggesting that building the Mars in quantity would be more cost-effective than Liberty ships, Glenn Martin was not inclined to share his prize plane with another manufacturer. Kaiser joined forces instead with Howard Hughes; this was the origin of Hughes' 400,000-pound "Spruce Goose." Like Hughes, what Martin really wanted was government support for an even larger flying boat. Plans for the 250,000-pound Model 163, projected back in 1937, were dusted off and modernized. Building five hundred six-engine Model 193's could win the war, declared Glenn Martin, and company ads frequently depicted it as a postwar airliner. Meanwhile the Navy redesignated the original Mars as a transport, XPB2M-1R, and Martin began to remove its turrets and bombing equipment.

Long before either Mars transports or the Model 193 could have been ready, the tide had turned in the

Battle of the Atlantic. The Mars was sent to the Pacific instead, where it built an impressive record between 1943 and 1945, carrying cargoes of up to 34,811 pounds. Particularly impressive was the plane's ability to carry ten tons of cargo on the critical California to Hawaii route.

In January 1945 the Navy ordered twenty more Mars transports, now designated JRM-1. In comparison to the original, their hulls were to be six feet longer and the split PBM-style tail replaced by a single 44-foot vertical fin. Fewer internal bulkheads and an overhead hoist would assist cargo-handling. Maximum take-off weight grew to 148,500 pounds. Recalling the China Clippers a decade before, the first JRM-1 was christened the "Hawaii Mars" in July 1945. It crashed just two weeks later in a landing accident on Chesapeake Bay. Four more JRM-1's were completed in 1945, but, in the wake of V-J Day, the Navy order was cut to six.

Peace allowed Martin pursue the long-cherished goal of selling giant airliners. The Mars was offered in several commercial versions for passengers and cargo. Re-engined with massive four-row Pratt and Whitney R-4360 Wasp Majors, the largest piston engines made, Model 170-21A offered transatlantic range with 58 sleeper or 79 coach seats. Model 170-24A could seat 105 for shorter ranges. But the construction of so many long runways during the war eliminated one of the flying boat's principal advantages. Martin recognized this and began work on a 145,000-pound landplane using the same engines and wings as the JRM-1; the Model 199 was to have a floor level no higher than that of a truck. Other four-engine airliners were already on the scene, however. There were no airline purchasers for either the 170 or the 199.

The Navy did purchase its sixth and last Mars with Wasp Major engines, which enabled the single JRM-2 to carry an extra 18,000 pounds of cargo on the San Francisco-to-Hawaii run. The four earlier planes were eventually re-engined with Wasp Majors as well and designated JRM-3's. All five served in the Pacific, carrying military personnel, Korean-war wounded, blood plasma, and other priority cargo over the same routes as were once flown by the glamorous clippers. Like them, they were duly christened for Pacific destinations: Philippine, Marianas, Marshall, a second Hawaii, and Caroline.

A fire destroyed the Marshall Mars in 1950; the other four JRM's served the Navy until 1956. They were then sold as surplus to Forest Industries Flying Tankers Limited, a Canadian firm, which uses them to drop 60,000-pound loads of water and foam on forest fires. The Marianas Mars crashed in an accident in 1961, and the Caroline Mars was destroyed in a hurricane a year later - but as they approached age 40 both the Philippine and Hawaii Mars were still flying.

Complete Model Specifications

12/21/1941

A-25

12/21/41

Curtiss A-25 Helldiver - *Chapter 1*

Army Version of SB2C-1

Last revised: 29 May 1998

Curtiss A-25 Helldiver
Curtiss A-25 Helldiver - Sources

Following the success of *Luftwaffe* Ju 87 Stukas in the German attack on Poland in 1939 and in the offensive in the west in the spring of 1940, the US Army developed a sudden interest in dive bombers. Up to this time, the US Navy and the US Marine Corps had been the only American armed services interested in dive bombers, and had in fact done some pioneering work which had been one of the inspirations behind the German development of the Stuka.

In pursuit of this new interest, the Army decided to acquire some Navy designs and use them with very little modification as land-based dive bombers. One of these designs was the **Curtiss SB2C Helldiver**, which the Army acquired under the designation A-25.

The development of the Curtiss SB2C Helldiver began back in 1938, when the US Navy laid down requirements for a new scout/dive bomber aircraft. In August of 1938, an invitation was sent out to the aircraft industry calling for a new dive bomber powered by an air-cooled radial engine. It was to be equipped with folding monoplane wings, retractable landing gear, de-icing equipment, heavy armament, and armor protection for the crew. Six companies submitted proposals, with the Curtiss and Brewster designs showing the greatest promise. They were both powered by the 1700 hp Wright R-2600 air-cooled radial. In January of 1939, Brewster and Curtiss were selected to build prototypes of their designs under the designation XSB2A-1 and XSB2C-1 respectively.

The XSB2C-1 was a monoplane with wings mounted up high enough on the fuselage to permit the installation of an internal bomb bay. The main landing gear retracted inwards, and the wing training edge had split dive flaps. The aircraft was all-metal except for fabric-covered control surfaces. The crew was two -- a pilot sitting underneath a rearward-sliding canopy and a gunner sitting underneath a separate forward-sliding canopy. The rear fuselage arrangement was quite similar to that of the earlier SBC biplane dive bomber.

The XSB2C-1 prototype took to the air for the first time on December 8, 1940, Curtiss test pilot Lloyd Childs being at the controls. The prototype crashed on December 21, 1941 after the wings and tail failed while trying to pull out of a dive. Fortunately, the pilot was able to parachute to safety.

On October 1, 1941, the Navy decided to give its combat aircraft names. The SB2C was assigned the name *Helldiver*, a name long associated with Curtiss naval dive bombers.

Following Pearl Harbor on December 7, 1941, the Helldiver program took on a new urgency. The first four SB2C-1s were assigned special priority so that flight testing could get underway as soon as possible. In the spring, the Navy announced that 3000 additional Helldivers would be ordered from Curtiss. In May, 1000 Helldivers were ordered from Canadian Car and Foundry at Fort William, Ontario. These were assigned the designation SBW, and 450 of them were allocated to the Royal Navy.

03/26/1942

P—47
Thunderbolt

03/26/42

Republic P-47B Thunderbolt

Last revised July 4, 1999

The first production P-47B (41-5895) was really a specially-built second prototype. It was delivered to the Army on December 21, 1941, and was immediately dispatched to Wright Field for testing. The XP-47B remained with the manufacturer. The first four P-47Bs from production (41-5896/5899) were delivered in mid-March of 1942, only eight months after the XP-47B prototype had first flown. These planes were used for an extensive test program by various agencies.

#4 prod

Numerous problems soon presented themselves as the test program advanced. 41-5899 crashed on Salisbury golf course on Long Island on March 26, 1942, killing Republic test pilot George Burrell. Examination of the wreckage showed that part of the tail assembly had broken off in flight. This accident resulted in restrictions being placed on P-47B flying while the cause of the structural failure was under investigation. At altitudes above 30,000 feet, the ailerons tended to snatch and freeze, the cockpit canopy could not be opened, and control forces became excessive. The fabric covering for the elevators was often found to be ruptured after high speed flights, the aerodynamic pressures having caused it to balloon out and burst. These problems caused further P-47 acceptances to be delayed until May of 1942.

The problem of the freezing ailerons and the ruptured elevators was solved by having these control surfaces being fully metal-covered on all subsequent P-47Bs. Some time elapsed before metal-covered elevators and ailerons could be incorporated into production machines, and deliveries went forward with the understanding that appropriate modifications would be completed later. Most earlier P-47Bs were eventually modified to take metal-covered control surfaces, and the earlier restrictions on flight were removed. In addition, the ailerons were revised in shape and were fitted with blunt noses, which largely alleviated the excessive control force problem. Balanced trim tabs were adopted to reduce rudder pedal loads.

The stuck cockpit canopy problem was solved by replacing the original hinged canopy by a rearward sliding hood. This change meant that the dorsal radio antenna had to be redesigned and moved further aft to accommodate the rearward-sliding hood. This innovation is believed to have been applied to P-47B serial number 41-5896 onward.

A windshield defroster was introduced with P-47B number 41-5951. Beginning with 41-5974, major changes were made in control surface movement limitations and tailplane incidence. New landing gear tires were introduced from 41-5974 onwards. Modified link ejector chutes were added to the guns on 41-6016 and subsequent aircraft.

The production P-47B was fitted with a production R-2800-21 engine of 2000 hp. The engine drove a 12-foot 2-inch diameter Curtiss Electric C542S-A6 propeller. An increase in the amount of internal equipment raised the empty, normal loaded, and maximum loaded weights to 9346, 12,245, and 13,360 pounds respectively. Consequently, the climb to 15,000 feet now took 6.7 minutes rather than the promised five. However, the increased power of the production-ready engine provided an increase in level speed to 429 mph at 27,000 feet.

At one time, it had been hoped that it would be possible for the RAF to test the Thunderbolt in combat in the Middle East, but production difficulties caused the British Air Ministry to be informed in September 1941 that it was probably not a good idea to do this until all the bugs had been wrung out of the design.

P-47Bs were first issued in mid-1942 to the 56th Fighter Group. This group was chosen to be the first recipient of the P-47B because it was based near New York City and hence located near the Farmingdale plant where Republic engineers could be easily called upon to help in ironing out problems as they arose. The P-47Bs of the 56th Fighter Group were used largely for stateside testing and operational training, and very few ever went overseas.

The 56th Fighter Group found the process of working up to its new mounts rather difficult--13 pilots and 41 aircraft were lost in accidents. By the end of June, the 56th FG had damaged or wrecked half of its aircraft. Many of the crashes were the result of pilot inexperience, but a significant number were caused by loss of control during high-speed dives. After a rudder was ripped from a P-47B in flight, an order was issued on August 1, 1942, restricting the speeds to 300 mph or lest, forbidding violent maneuvers, and stipulating that fuel be carried in the rear tank.

Later, the 80th Fighter Group was moved to Farmingdale with the intention that it too would begin training on P-47s.

The last P-47B was delivered in September 1942. Serial numbers of the 170 P-47Bs constructed were 41-5895/6065. A total of 171 were built.

The last example of the P-47B series (41-6065) was converted during manufacture in September 1942 as the XP-47E with a pressurized cockpit and a hinged canopy. However, increased emphasis on low-level operations over Europe lead to the cancellation of plans to introduce this pressurized Thunderbolt into production.

01/01/1943

XP-49

01/01/43

XIV-1430-9/11 twelve-cylinder inverted-vee liquid-cooled engines rated at 1540 hp for takeoff. In order to counteract torque, the engines rotated in opposite directions--the port propeller rotated CCW when viewed from the rear, and the starboard propeller rotated CW. Other changes included the substitution of dummy armor plate for the genuine armor plate called for in the original specification, thus expediting construction of the prototype. A maximum speed of 458 mph at 25,000 feet was now anticipated.

On December 23, 1940 , detailed design of the XP-49 began under the direction of project engineer M. Carl Haddon. Two-thirds of the XP-49 airframe components were common with the P-38. The primary differences were in the engine installation, the use of a heavier and stronger undercarriage, and a pressurized cockpit similar to that of the XP-38A.

Since much of the airframe was common with the production P-38, the construction of the XP-49 prototype (serial number 40-3055) went fairly rapidly. However, the first flight was delayed by problems with the experimental Continental engines, which were not yet cleared for flight operations at the time they were delivered to Lockheed in April 1942. It was not until November 14, 1942 that the XP-49 took to the air for the first time, flown by test pilot Joe Towle.

The aircraft was grounded only a week later for replacement of the engines by XIV-1430-13/15 engines rated at 1350 hp for takeoff and 1600 hp at 25,000 feet. The fuel tanks were replaced by self-sealing tanks taken from a P-38, and a flight engineer's jump seat was added behind the pilot's seat. Flights were resumed in December, but were marred by continual hydraulic problems. When it was actually able to fly at all, the aircraft handled fairly well and had good maneuverability, but the Continental engines gave the XP-49 a rather uninspiring performance--the maximum speed was only 406 mph at 15,000 feet as against a promised speed of 458 mph at 25,000 feet.

On January 1, 1943, the XP-49 was damaged during an emergency landing at Muroc AAB after a simultaneous inflight failure of both the hydraulic and the electrical systems. While being repaired, the XP-49 received 7 3/4 inch taller vertical tail surfaces. The XP-49 flew again on February 16, 1943. In this form, it was delivered to Wright Field on June 26, 1943, almost 27 months later than expected. By that time, the Army had lost all interest in the XP-49, since the performance was actually inferior to that of the standard P-38J which was already in service. In addition, the questionable future of the troublesome Continental engine caused the Army to abandon any further consideration of quantity production of the XP-49.

Even after the USAAF had decided not to proceed with quantity production of the XP-49, the Army continued testing the aircraft at Wright Field. However, maintenance difficulties with the Continental engines and problems with the fuel system limited the usefulness of

 only

XP-63

01/28/1943
05/25/1943

01/28/43
05/25/43

Each of these three aircraft tested different wing and tail configurations. XP-39E Number one had a rounded vertical tail, but the tailplane had squared-off tips. XP-39E number two had a squared-off fin and rudder and had large wing fillets. XP-39E number three had all its flight surfaces squared off. The XP-39E proved to be faster than the standard Airacobra--a maximum speed of 386 mph being attained at 21,680 feet during tests. However, the XP-39E was considered to be inferior to the stock P-39 Airacobra in all other respects, so it was not ordered into production.

Even before its first flight, the USAAF considered the XP-39E project as showing sufficient promise that on June 27, 1941 they placed an order for two prototypes of an enlarged version powered by the same Allison V-1710-47 engine. The designation was XP-63 (company designation was Model 24) and USAAF serials were 41-19511 and 41-19512.

The XP-63 was larger in all dimensions than the Airacobra. The wings were of a NACA laminar flow design that reduced drag by a significant amount and increased the overall span by 4 feet 4 inches to 38 feet 4 inches. In pursuit of a better high-altitude performance, the Allison V-1710-47 engine was fitted with a second hydraulic turbosupercharger supplementing the normal single-stage supercharger, effectively adding 10,000 feet to the service ceiling. A four-bladed propeller was standardized. A persistent complaint against the Airacobra was that its nose armament wasn't easily accessible for ground maintenance, and in order to cure this problem the XP-63 airframe was fitted with larger cowling panels.

In September of 1942, even before the first flight of the prototype, the aircraft was ordered into production by the USAAF as the P-63A (Model 33). The P-63A's armament was to be the same as that of the P-39Q--a single 37-mm cannon firing through the propeller hub, two 0.50-inch machine guns in the upper nose, and two 0.50-inch machine guns in underwing gondolas.

The XP-63 Ser No. 41-19511 flew for the first time on December 7, 1942. This was the first anniversary of Pearl Harbor, and the significance of that date was not lost on anyone. The XP-63 was fitted with a 37-mm hub cannon and two nose 0.50-inch machine guns (the underwing guns were not fitted). Weights were 6054 pounds empty, 7525 pounds gross, and 10,000 pounds maximum takeoff. Dimensions were wingspan 38 feet 4 inches, length 32 feet 8 inches, height 11 feet 5 inches, and wing area 248 square feet. As anticipated, the XP-63 exhibited a performance that was much better than that of the P-39. A speed of 407 mph was attained at sea level during early testing.

On January 28, 1943, the XP-63 prototype was lost in an unfortunate accident. Test pilot Jack Woolams was just about to bring the XP-63 in for a landing after a routine test flight when he found that the landing gear wouldn't extend. He circled the airfield for several hours to burn off excess fuel. By the time he was ready to attempt a belly landing, the sun had set. Woolams mistook the runway side lights for end lights and put the XP-63 down in a field of small trees. Woolams walked away from the accident, but the XP-63 was damaged beyond repair. The wreck was later shipped to Wright Field for ground-based gun firing tests.

The second prototype (41-19512) flew for the first time on February 5, 1943. It did not have much better luck. During a test flight on May 25, 1943, the Allison engine threw a rod at altitude, and the cockpit filled up with smoke. Test pilot G. E. "Gus" Lundquist was forced to parachute to safety, and 41-19512 was destroyed in the ensuing crash.

Sources:

1. The American Fighter, Enzo Angelucci and Peter Bowers, Orion, 1987.
2. War Planes of the Second World War, William Green, Doubleday, 1964.
3. United States Military Aircraft Since 1909, Gordon Swanborough and Peter M. Bowers, Smithsonian, 1989.
4. P-39 Airacobra In Action, Ernie McDowell, Squadron/Signal Publications, 1980.
5. Bell Cobra Variants-P-39 Airacobra and P-63 Kingcobra, Robert F. Dorr, Wings of Fame, Vol 10, 1998.

02/18/1943

XB-29

Eddie Allen
Boeing Field

02/18/43

mockups for the regular wings of a Fairchild PT-19A trainer (serial number 41-20531). The wing loading of the B-29 was projected to be so high that special means would have to be taken to prevent the landing speed from being prohibitively high. This was done by using Fowler-type flaps to increase the lift coefficient of the wing. These flaps added 20 percent to the overall wing area when extended. The rear portions of the inner engine nacelles were extended aft of the wing trailing edges, which were modified to improve the flap characteristics. During design, the forward fuselage was extended, increasing overall length from 93 feet to 98 feet 2 inches, and the contours of the streamlined transparent nose were rounded off. A large dorsal forward extension was added to the vertical tail surfaces to improve asymmetric handling.

A remotely-controlled armament system had been adopted for the Model 345, since manned turrets were rejected as being impractical for the altitudes at which the B-29 would be operating. Four turrets were to be fitted, two on top and two underneath the fuselage, each with a pair of 0.50-inch machine guns. A fifth turret was in the tail and was under direct control of a tail gunner. It carried two 0.50-inch machine guns and one 20-mm cannon. Four companies competed for the contract to develop the armament system, including Bendix, General Electric, Sperry, and Westinghouse. The Sperry system involved the use of retractable turrets that were aimed by periscopic sights and won the initial contract.

Bombs were to be carried in two separate bomb bays, each with its own set of doors. The release of bombs was to be controlled through an intervalometer to preserve aircraft balance by alternating release between the bays.

The engine for the B-29 was the completely new 2200 hp Wright R-3350 Duplex Cyclone eighteen-cylinder twin row air-cooled radial. In order to gain the utmost power at high altitude, the engine was fitted with two turbosuperchargers instead of the usual one. The superchargers were General Electric B-11 units, automatically regulated by a Minneapolis-Honeywell electronic system. The engine was to drive a three-bladed 17-foot diameter propeller. The propeller efficiency was preserved by gearing the propeller to 35 revolutions for every 100 revolutions of the engine crankshaft. Special attention was paid to the nacelle designs to reduce aerodynamic drag. The oil coolers and the supercharger intercooler were mounted directly underneath the engine cooling air intake.

The construction of the B-29 was fairly conventional, being of all-metal throughout but with fabric-covered control surfaces. Each undercarriage unit had dual instead of single wheels. A retractable tail bumper was provided for tail protection during nose-high takeoffs and landings.

It was anticipated that the crew would vary from 10 to 14, but would normally consist of 12. The crew consisted of two pilots, a navigator, a bombardier, a flight engineer, a radio operator, a radar operator, and five gunners. The bombardier sat in the nose with his bombsight and gunsight. The pilot and co-pilot sat side-by-side behind panels of armor and bulletproof glass. The flight engineer, radio operator, and navigator sat immediately behind the pilot's cockpit. The rear pressurized compartment housed four gunners plus the radar operator, all protected by an armored bulkhead. The tail gunner sat in a separate pressurized compartment in the extreme rear of the aircraft. He could enter or leave the compartment only during unpressurized flight.

The first XB-29 (41-0002) flew on September 21, 1942 at Boeing Field, Boeing's chief test pilot Edmund T. "Eddie" Allen being at the controls. By this time, there were 1664 B-29 aircraft on order. No armament was initially fitted. The engines were four R-3350-12s with 17-foot diameter three-bladed propellers. Unfortunately, the early R-3350 engines were subject to chronic overheating and were specially prone to catching fire upon the slightest provocation. By December, Allen had been able to get only 27 hours in the air out of 23 test flights. Sixteen engines had to be changed, nineteen exhaust systems had to be revised, and twenty-two carburetors had to be replaced. There were also problems with the governor. On December 28, one of the R-3350 engines of the prototype caught fire during a test flight, forcing Allen to return immediately to Boeing Field. Aside from the engine problems, the performance and handling qualities of the B-29 were found to be excellent. Other than the rudder boost being removed, no significant aerodynamic changes were found to be necessary. The first XB-29 remained at Boeing throughout the war as a test aircraft.

The second XB-29 (41-0003) flew for the first time on December 30, 1942, but this flight was cut short by another engine fire, which caused a suspension of further tests until the engines could be replaced. The engines from XB-29 number 1 were removed and put in No. 2. The second XB-29 flew again on February 18, 1943, but an inextinguishable engine fire broke out just eight minutes into the flight, forcing an emergency return to the field. While attempting to land at Boeing Field, the fire burned through the main wing spars and caused the wing to buckle. The burning XB-29 plunged into the nearby Frye Meat Packing Plant factory, killing test pilot Eddie Allen and everyone else aboard, plus about 20 workers on the ground.

This crash caused ripples up the chain of command all the way to President Franklin Roosevelt, who was already unhappy about the delays in the B-29 program. He wanted B-29s on their way to India by the end of 1943 so that they could begin bombing attacks against Japan. Senator Harry Truman's Special Committee to Investigate the National Defense Program, which had been established to expose fraudulent overcharging and other violations in defense acquisitions, looked into the B-29 program and concluded that the problem lay with substandard or defective engines delivered by the Wright Aeronautical Company. The USAAF also came in for a share of the blame, by having put too much pressure on the Wright company to speed up engine delivery.

The third prototype (41-18335) flew for the first time in June of 1943. It incorporated extensive powerplant and equipment revisions as a result of experience with the first two. It was sent to Wichita to assist in the establishment of the production line. It was soon handed over to the USAAF for armament and accelerated flight testing. It too eventually crashed, but not before verifying the potential of basic design.

Serials:

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41-0002/0003        Boeing XB-29 Superfortress
41-18335            Boeing XB-29 Superfortress
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Boeing B-29 Superfortress
Boeing B-29 Superfortress - Chapter 2: YB-29 Service Test Aircraft

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Joe Baugher jbaugher@worldnet.att.com
Maintained by Carl Pettypiece

Form No. 14
(Revised May 15, 1942)

WAR DEPARTMENT
U. S. ARMY AIR FORCES
REPORT OF AIRCRAFT ACCIDENT 43-2-18-52

(1) Place Seattle, Washington (2) Date February 18, 1943 (3) Time 12:26 4

Aircraft: (4) Type and model XB-29 (5) A. F. No. 41-3 (6) Station Boeing Field SEATTLE

Organization: (7) ~~Office, AAFTR~~ MAT (Command and Air Force) (8) — (Group) (9) Boeing Aircraft Company (Squadron)

PERSONNEL

Name (Last name first) (11)	Rating (12)	Serial No. (13)	Rank (14)	Personnel Class (15)	Branch (16)	Air Force or Occupation (17)	Result to Personnel (18)	Use of Parachute (19)
Allen, Edmund T.	-	-	-	10	-	-	Fatal 4	-
Dansfield, Robert R.	-	-	-	10	-	-	" 4	-
Wersebe, Edward I.	-	-	-	10	-	-	" 4	U
Mohn, Fritz	-	-	-	10	-	-	" 4	-
Blaine, Charles E.	-	-	-	10	-	-	" 4	U
Maxfield, Robert W.	-	-	-	10	-	-	" 4	-
Ralston, Harry W.	-	-	-	10	-	-	" 4	U
Lankford, Thomas R.	-	-	-	10	-	-	" 4	-
North, Vincent W.	-	-	-	10	-	-	" 4	-
Basel, Raymond L.	-	-	-	10	-	-	" 4	-
Henshaw, Barclay J.	-	-	-	10	-	-	" 4	-

Also [illegible] for civ. personnel injured [illegible]

PILOT CHARGED WITH ACCIDENT

Allen (Last name) Edmund (First name) T. (Middle initial) (21) — (Serial number) (22) — (Rank) (23) 10 (Personnel class) (24) [illegible]

Assigned (25) MAT (Command and Air Force) (26) T- (Group) (27) — (Squadron) (28) SEATTLE, WASH (Station)

Attached for flying (29) MAT (Command and Air Force) (30) T-P (Group) (31) — (Squadron) (32) SEATTLE (Station)

Original rating (33) Comm (Rating) (34) — (Date) Present rating (35) — (Rating) (36) — (Date) Instrument rating (37) (Date)

Pilot Hours:
(at time of this accident)

(38) This type	100:00	(42) Instrument time last 6 months	Not applicable
(39) This model	31:51	(43) Instrument time last 30 days	Not applicable
(40) Last 90 days	23:26	(44) Night time last 6 months	Not applicable
(41) Total	7563:08	(45) Night time last 30 days	Not applicable

AIRCRAFT DAMAGE

Damage					(46) List of Damaged Parts
Aircraft	W	5			Complete destruction
Engine(s)	W 5	W 5	W 5	W 5	Complete destruction
Propeller(s)	W 5	W 5	W 5	W 5	Complete destruction

Weather at the time of accident Ceiling 6500 feet, visibility 5 miles. Weather not a factor. 00

Was the pilot flying on instruments at the time of accident No

Cleared from Seattle (50) To Seattle (51) Kind of clearance Contact C

Pilot's mission Experimental test flight relative to powerplant performance and cooling, propeller governing, airplane performance, two engine ceiling 4169

Nature of accident: Aircraft caught fire in the air and crashed into top floor of 5-story [illegible] Packing Plant [illegible] and [illegible] fire to the plant. All members [illegible]

(11)

[illegible] was followed by fire and gasoline explosion [illegible] resulted not only [illegible] in both No. 1 and No. 2 [illegible] which in turn [illegible] resulted in [illegible] ability to [illegible]

[illegible]

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DESCRIPTION OF ACCIDENT

Brief narrative of accident. Include statement of [illegible]

REPORT OF AIRCRAFT ACCIDENT CLASSIFICATION COMMITTEE
ARMY AIR FORCES
MATERIEL COMMAND
WESTERN PROCUREMENT DISTRICT
SEATTLE, WASHINGTON

PART I

INTRODUCTORY STATEMENT

1. Brief resume and sequence of events in connection with accident to XB-29 Airplane, Serial No. 41-3, ship No. 1003 which occured at Seattle, Washington, February 18, 1943, is given as a prulude to report of committee appointed by the Commanding General, Western Procurement District, for investigation of the subject accident.

2. At about 12:20 PM on February 18, 1943, information was received advising that fire in flight had been encountered and the airplane was coming in for forced landing. Army Air Forces were advised, and they, with Boeing Company personnel, saw that proper fire fighting equipment, crash trucks, and similar apparatus were at hand. Further reports were received as to the progress of the flight. At about 12:30 information was received that the aircraft had crashed near Airport Way, in south side of the city.

The Army Air Forces Resident Representative with portions of his staff, followed by various Boeing personnel, proceeded immediately toward scene of accident and during trip could see large billows of smoke and flames extending upward, realizing this must be the scene of accident, which was Frye and Company Packing Plant, 2203 Airport Way, Seattle, Washington.

The Army Air Forces Resident Representative assumed charge and proceeded to detail officers and men of this command in the assignment of duties at the scene of the accident. The 772nd Military Police Battalion assigned to Boeing Field and Boeing Aircraft Company were called upon for guard detail, which was to protect government property and prevent idle curiosity seekers from interfering with the proper authorities in fighting the fire, rescuing the injured, removing the deceased, etc.

During the progress of the fire, Commanding General of the Western Procurement District and Commanding General, Materiel Center, Wright Field, Dayton, Ohio, were advised by Army Air Forces Resident Representative on long distance telephone as to what had happened. As soon thereafter as possible, the preliminary accident report was transmitted by TWX, extra priority.

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The Commanding General, Army Air Forces Materiel Command, Los Angeles, California, on February 18, 1943, in accordance with provisions of Army Regulation 95-120, AAF Regulation 62-14 and Wright Field F. O. Memo. No. 42, appointed Lt. Col. Wiley R. Wright, AC, Major Felix Waitkus, AC, and Capt. Harold R. Hansen, AC, as members of an Aircraft Accident Classification Committee to investigate subject accident.

Commanding General, Materiel Center, Wright Field, Dayton, Ohio appointed Col. Rudolph W. Propst, AC, Col. Dennis Mulligan, AC, Lt. Col. Henry T. Dorrance, JAGD, Maj. Robert M. James, AC, and Maj. John Y. Latta, AC, as a group of officers to make a special report on all phases involved in the accident of the XB-29, Serial No. 41-3.

Commanding General, Army Air Forces Materiel Command, Western Procurement District, Los Angeles, California, by special orders No. 43, paragraph 7, dated February 23, 1943, appointed Captain Marvin M. Chesebro, AC, as Claims Officer in connection with subject accident.

Col. G. F. Smith, AC, Power Plant Section, Wright Field, Dayton, Ohio, was detailed to Seattle, Washington to make a special technical study of the engines of the airplane involved. Col. Smith was aided by Mr. W. D. Kennedy and Mr. R. E. Johnson, of the Wright Aeronautical Corporation.

The Seattle Area Supervisor delegated to Seattle Area Internal Security Officer the responsibility of a study of the accident in regard to sabotage or fire. In addition to the above named committees and boards appointed, the Boeing Aircraft Company appointed a group of its personnel for investigation of the accident and the determining of its cause as well as the study of preventive measures to prevent repetition.

In this introductory statement the above-named committees, groups, boards are mentioned for the purpose of showing the various angles of investigation conducted on the subject accident, which various committees no doubt all submitted their reports and have covered conclusively the various angles involved, which therefore this committee does not deem it advisable to duplicate, adhering mainly to a description of the accident, its opinion of the cause, and its recommendations. The committee headed by Col. Propst made a study of responsibility in general, ownership of the aircraft, operation of the aircraft, nature of flight, Government's responsibilities to the third parties, Boeing's responsibility, insurance angles, liabilities involved, death and injuries to Boeing employees, Frye & Company employees and city firemen, and in which connection, disability benefits as well as State of Washington Industrial Insurance coverage, damage to Frye and Company property as well as damage to city power lines and sub-stations, as well as to railway rolling stock, and properties in the line of flight which were damaged by burning objects from the aircraft.

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The Claims Officer worked with the various boards and committees investigating the accident and in addition contacted officials of the various companies involved, other agencies and individuals in connection with his work as Claims Officer.

The various boards and committees worked independently and jointly and sat together on many discussions, as well as, conduction of various tests in the study of the cause of the accident.

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Report of Aircraft as per AAF Form No. 14, giving (a) Summary, and (b) Recommendations.

(A)

At 12:09 PM, February 18, 1943, subject airplane took off to perform the mission of an experimental test flight relative to power plant performance and cooling, propeller governing, airplane performance and two-engine ceiling. The quantity of fuel in the tanks of the aircraft at the time of the take-off was approximately 5,000 gallons.

The gross weight of the aircraft was approximately 105,000 pounds. The take-off was from the north to the south.

At 12:16 PM, according to radio log, the aircraft reported its position at Lake Tapps, which is about twenty miles south of Boeing Field, and an altitude of 5,000 feet, southbound.

On the engineer's flight report, which was thrown or blown from the aircraft prior to the accident, a copy of which is Exhibit (10) of this report, it was shown that at 12:14 PM, rated power conditions for all engines was set for a rated power climb as outlined in the Plan of Test which is shown here in Exhibit (6) and Report of Test Exhibit (7). According to the above engineer's report, at 12:17 PM, a fire was noticed to be in Engine No. 1, which report further shows that the mixture was off, the propeller feathered, fuel valve off, and cowl flaps closed. This fire was reported as having been brought under control by the use of one CO-2 bottle, by radio to the Boeing radio station and further that the airplane was returning. At this time tests were discontinued and the aircraft started to return to Boeing Field. At 12:19 the Boeing Radio advised XB-29 to contact them (Boeing radio) if they thought at any time that fire equipment was needed. After reporting its position at 12:21 to the Boeing Radio as being south of Renton at 2500 feet heading north, the transmission frequency was changed and the Boeing Field Control Tower was contacted. At 12:22 the aircraft advised the Seattle Tower that they were at Renton, 2400 feet descending, and requested immediate landing clearance, as No. 1 engine was on fire, propeller was feathered, trouble not serious, and ordered crash equipment to stand by.

At this point it might be brought out that there was no undue alarm on the part of the pilot or crew in reporting the fire in No. 1 engine and of any possibility of its progressing, remembering that on a flight several weeks previous similar type of aircraft, fire developed in No. 4 engine at close to the same locality and was kept under control on that instance by the use of CO-2 until the aircraft had landed and stopped when the ground equipment continued to flush the engine nacelle with additional CO-2.

At approximately two minutes after the aircraft, Army 1003, had reported to the Tower its position as being at Renton, it reported again to the Seattle Tower that the position was over the Lake Washington Bridge at approximately 1500 feet altitude and no mention being made of fire. One minute later at 12:25 PM, the controller of the Seattle Tower overhead a conversation apparently to the pilot, Mr. Allen, by some crew member. The conversation is as follows: "Allen, better get this thing down in a hurry. The wing spar is burning badly." This conversation was immedately followed by radio contact to the control tower which advised, "Have fire equipment ready. Am coming in with wing on fire." Approximately 45 seconds later the electric power at Boeing Field failed, due to the airplane or some falling object striking a high tension line running east and west, approximately 200 yards north of the Frye Packing Plant across which at right angles the aircraft proceeded prior to its crash into the Frye Packing Plant.

Previously a similar aircraft equipped with the same type of engines which are Wright R-3350-13 engines had a fire in the No. 4 nacelle which appeared to be an engine fire. Therefore, in the study of this accident, first study was made from the power plant angle and particular efforts were exerted to retrieve all four engines from the wreckage so that a minute study could be made of the engines and particularly No. 1 engine. This study was made by the Boeing Aircraft Company committee and the Wright engine committee represented by Col. George F. Smith and others, and two power plant inspectors of the Army Air Forces Resident Representative's office, as well as the Aircraft Accident Classification Board. The conditions found are shown in Exhibits 24 through 30. No. 1 engine: No. 1 engine was dismantled and all parts remaining were examined carefully for possible failure. Reference to this examination is made in Exhibit 11, of this report, which in substance shows that (a) the propeller reduction gears appeared to be in good condition prior to fire. (b) Master rod bearing was in good condition. All possible evidence of failure was destroyed by fire. (c) No. 6 cylinder with piston rings and intake manifold was found in good condition. This shown by Exhibit 31. Exhibit 32 is a photograph of No. 6 intake pipe which shows oil both inside and outside of the pipe. Exhibit 33 is a photograph of intake and exhaust valves of engine No. 1. No. 2 engine: Any evidence of failure apparently destroyed by fire. Exhibit 28 of this report is a photograph of the engine as was found. Engines No. 3 and 4: All component parts examined and no evidence of internal failure noted, particular attention being given to nose section reduction gears and bearings, which were carefully examined.

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While there is no evidence to indicate that the fire in No. 1 engine nacelle was caused by mechanical failure, the committee took under consideration that on December 30, 1942, a fire broke out in flight in No. 4 engine of XB-29 airplane 41-3. This fire was caused in the opinion of the Army Air Forces' investigating personnel by a backfire which ignited blower case and eventually gutted the entire nacelle. Further evidence of fires in this type of engine is presented by Exhibit 9, which shows that a similar engine on test block caught fire due to a backfire under rated power conditions.

The induction system has never functioned properly, the carburetor throttle opening being restricted to 65º travel, which indicates improper fuel induction. Crank case pressures have been excessive on full power run-ups and it became necessary to install a two inch line from the breather to the lower part of the nacelle to prevent oil from spraying on top of the wings. This pressure is probably caused from blow-by of the piston rings.

As many witnesses as could be ascertained were interrogated and discussions were held with Boeing officials, Boeing mechanics, Boeing Flight and Aerodynamics personnel as well as tests being made on a similar aircraft in order to ascertain how gasoline, that might have leaked from the filler cap, would course through openings or apertures and become clogged in any recesses in the leading edge, or seep out through the motor nacelles, which tests developed there are several possible sources of leakage into the leading edge, through the anti-siphon holes in the filler neck, and through the filler well cover door fasteners, also between the filler neck and nacelle and from the fuel cell inter-connectors. After due consideration of all testimony obtained, examination and tests conducted, the examination and test of all of the available parts of the wreckage of the aircraft itself, as well as study of an aircraft of similar make and model and of similar engines, the following sequence of events seems to be most probable:

It appears that at time of take off and for a period of approximately four minutes thereafter the airplane functioned normally. During this period the airplane was in a climb at approximate rated power, after this it is very likely that the airplane was leveled out and power reduced to 44 inches of manifold pressure and 2400 rpm. With the gas tanks nearly full this leveling off and reduction of power caused the fuel in the tanks to level out and possibly surge slightly forward. The filler neck assembly being located in the leading edge of the wing was in an area of greatly reduced air pressure--suction of approximately one pound per square inch. Since the filler cap cover and the filler cap itself are not sealed tightly, fuel could have been sucked out of the filler neck, through the leaks in the cap itself, into the filler neck drain well. The drain to this well extends to the bottom of the leading edge of the wing in an area of high pressure. Thus any fuel getting into the well would not drain out through this drain in any appreciable amount but rather would tend to find its way out over the leading edge of the wing through the leaks due to poor fit of the filler neck cover plate and into the leading edge through the cover plate Dzus fasteners.

On a check out flight with full tanks on February 17, it was noted that as power was reduced or the airplane leveled out, fuel came out from under the filler neck cover and out over the wing (see Exhibit 8).

Resuming the sequence of events, the fuel probably filled the filler neck well on number 1 and number 2 engines due to this pressure difference and started to seep into the leading edge of the wing. After approximately three minutes of such seepage, sufficient quantity of fuel had entered the leading edge to flow along the leading edge of the front spar and through seams and joints into number 1 engine nacelle. A water test was made on XB-29 airplane No. 41-2 whereby water was poured on the front edge of the front spar in the vicinity of the filler neck. This test was witnessed by all members of the Accident Classification Board, and showed that the water would flow along the spar into number 1 nacelle and collect in pockets in the vicinity of two small nacelle vents. These vents in turn exhaust to the outside in very close proximity to the engine exhaust outlet. Number 1 engine was the only engine configured on this airplane.

It is quite possible that since the nacelle is relatively closely cowled and has no vents except those mentioned above, the accumulation of fuel in the aforementioned section of the nacelle could have produced a combustible mixture. This mixture could have found its way through a vent into the flames and heat of the engine exhaust, thereby igniting it and causing a fire in the nacelle in the region of accumulated fuel. An examination of the available parts of number 1 nacelle that were not destroyed by fire discloses that a hot fire existed in the vicinity of one of the supercharger regulators. This location is one of the places at which water tests disclosed an accumulation. Parts in other locations in the nacelle showed no severe fire, only smoking up due to fire in another place.

This fire was noted by the crew and was considered extinguished, prop feathered, etc., at approximately 12:17, after which return to the field was started (see Exhibit 10).

Although members of the crew believed the fire was extinguished, or at least under sufficient control that an emergency down wind landing was not contemplated, (wind velocity 10 miles per hour from south) it is quite likely that the fire found its way into the leading edge from the nacelle through holes in the leading edge fire stop for either fuel lines, engine controls, or instrumentation manometer tube cluster and, due to the lack of sufficient

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oxygen within the leading edge, continued to burn in that location very slowly.

Smoke reported by witnesses as coming from number 2 nacelle indicates that the fire was progressing towards that point from the outboard motor nacelle. By the time the airplane had reached position number 8 on Exhibit 13, the fire was consuming a magnesium wing deicer valve casting which is located in the leading edge just out board of number 2 engine nacelle. The burning magnesium melted its way through the leading edge skin permitting air under ram to enter the inside of the leading edge. The addition of this oxygen immediately produced an explosion in the leading edge, which was observed by witnesses at positions 8 and 12, Exhibit 13.

This was the first indication to members of the crew that the fire was out of control as is evidenced by the absence of anything to the contrary in the sequence of radio contacts up to and including 12:24 PM, at which time position was reported over Lake Washington Bridge at an altitude of 1500 feet. There is some indication, however, that the radio operator was becoming alarmed at the time the 12:24 report was made. It is the opinion of the board that the pilot anticipated no trouble in returning to Boeing Field at any time up to the occurrence of the explosion in the leading edge of the left wing. Furthermore, radio reports (see Exhibit 4 and 5) indicate the pilot still hoped to land at Boeing Field after reporting his wing on fire. Attention is invited to the fact that a previous fire had occurred in an outboard engine and nacelle, which had been easily controlled and a safe return to Boeing Field accomplished with little difficulty. This undoubtedly influenced the pilot in his belief that he had the fire under control, and had adequate time to continue around to the northeast of Boeing Field and make a landing into the wind rather than land down wind from the south starting his final approach in the vicinity of a point just south of Renton.

The explosion in the leading edge permitted a spool, positively identified as a part of the magnesium wing deicer valve, and burned off clamps covered with magnesium oxide, to fall from the airplane at position 17, Exhibit 13. Burning pieces of magnesium fell at positions 18 and 19, Exhibit 13.

In addition, it is considered highly probable that the above mentioned explosion tore loose the number 2 filler neck well and assembly, thereby releasing huge quantities of gasoline which, with the large quantity of air pressure at this time, produced an inferno in the leading edge and which probably caused a failure of number 2 engine. Number 1 and number 2 engines were observed by witnesses at positions 24, 27, 29, and 31, Exhibit 13, to be inoperative or at least turning very slowly.

At approximately position 24 Exhibit 13, it is believed the pilot abandoned all hope of getting back to Boeing Field for it was not his standard practice to lower the landing gear of this airplane until he was almost to the edge of the field. Having possibly two dead engines, climbing or even maintaining altitude with wheels down under these conditions was next to impossible, the gross weight of the airplane being approximately 105,000 pounds.

The gear was lowered probably to permit emergency exit of the crew members prior to an attempted crash landing and to throw out what records were available prior to crash. Exhibit 10, Copy of Plan of Test, and papers of small consequence were thrown out of the airplane at approximately position number 30, Exhibit 13.

In order to open the emergency door in the forward cabin it is necessary to reduce the pressure in the cabin by opening the forward bomb bay pressure bulkhead hatch. It is believed this pressure hatch was opened by Mr. Wersebe as he was the last of the three to jump. A Coroner's Autopsy Report (Exhibit 15) shows Mr. Wersebe was the only one of the three persons that jumped who suffered burns. It is very likely that, since the leading edge of the wing is like an open tunnel leading into the bomb bay, the bomb bay was burning fiercely due to the ram effect on the fire in the leading edge, and that when Mr. Wersebe opened the hatch he suffered burns whereas Mr. Ralston and Mr. Blaine, who were away from the hatch, did not. This influx of flame and smoke into the cabin unquestionably filled it with heat and impossible visibility so that the pilot and co-pilot could not see to control the airplane further. This probably occured at approximately position 27 or 28, Exhibit 13. From this point on it is believed that the airplane was out of control.

Mr. Blaine jumped between positions 30 and 31. Mr. Ralston jumped at position 31, his body striking high tension lines. Mr. Wersebe jumped at position 32, his body striking the outer edge of the Frye Packing plant.

The flight path of the XB-29 flight as determined by witnesses and falling parts (which is the line shown on Exhibit 13) was reflown in a B-17 airplane simulating the believed XB-29 flight conditions and the time interval between positions 8 and the Frye plant was found to be 45 seconds.

(B)

The committee recommends that the following changes be performed on all XB-29 and B-29 airplanes, which in the opinion of this board will prevent the recurrence of the above accident.

1. Relocate the filler necks so that they would not be in the leading edge of the wing. The filler caps should be so designed that even under internal pressure, there would be no leakage of fuel from or through the caps. The fuel tank siphon relief vent formerly incorporated in the filler neck is to be incorporated as part of the vent system. 61 I

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2. Eliminate fuel lines wherever possible so as there would be the minimum of fuel lines into the nacelles.

3. Provide means of shutting off fuel from any tank or groups of tanks by means of solenoid shut off valves, in transfer system as well as main lines to prevent flow of gas from tanks in the event of line breakage.

4. Install fire stops so as to isolate the leading edge from each nacelle. Such fire stops or walls are to be made tight and leak proof at seams, tube fittings, controls, and instrument leads.

5. Add fire stops in the leading edge of the wing at outboard side of each nacelle.

6. Add fire stops between wing and body for both leading and trailing edges.

7. Seal front and rear spar at fuel outlets and fuel transfer outlets.

8. Remove pockets or flat surfaces from the nacelles or provide drainage for such places where fuel or oil might collect, special attention being given to areas in the vicinity of turbos and exhaust shrouds.

9. Provide positive drainage for the leading edge of the wing as well as from the center section. Such drainage to be arranged so that no accumulation of fuel would get into the nacelles or in close proximity to the turbos, shrouds or any other heated parts.

10. Provide positive leading edge ventilation within each compartment.

11. Close off the louvers behind the flight hood in the nacelles.

12. Provide controlled ventilation of each nacelle, such ventilation to be positive and controlled for all positions of the cowl flaps.

13. After a study had been made of the direction of air flow within the nacelle, the CO^2 fire extinguisher outlets should be relocated in an area close to the source of incoming air.

There is no evidence of negligence or carelessness in connection with this accident.

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FLIGHT AND AERODYNAMICS DIVISION

PLAN OF TEST

1st PILOT	E. T. Allen	SCHED. DATE	2-17-43 DAY Wednesday
2nd PILOT	R. R. Dansfield	READY TIME	12:00
ENGINEER	E. I. Wersebe	TAKEOFF TIME	13:00
G.W. 105,000 lbs.	C.G. 25%	PLACE	Boeing Field

OTHER CREW MEMBERS & DUTIES:

Station:		Station:	
2	M. O. Hansen - Flight Engineer	3	E. R. Denton - Powerplant Rep.
2	A. G. Leonard - Ass't. Flt. Engr.	4	D. C. Whitworth - R.H. Photo-Rec.
3	A. Peterson - Radio Operator	4	V. W. North - L.H. Photo-Recorder
3	R. W. Maxfield - Brown Recorder	4	T. Lankford - Observer

CONFIGURATION:

1. Powerplant - Wright R-3350-13.
   a. Item

Item	No. 1	No. 2	No. 3	No. 4
Engine Serial No.	56721	56700	56722	56706
Carburetor Serial No.	1231	1239	1369	1374
Internal Torque Chamber	Yes	Yes	No	No
Enlarged Nose Section Oil Passages	Yes	Yes	Yes	Yes
Revised Exhaust Valve Guides and Machine Valve Seats	Yes	Yes	Yes	Yes
Floating Pinion Bushings	Yes	Yes	Yes	Yes
New Type Piston Rings	Yes	No	No	Yes
Master Rod Indexing	1 & 4	1 & 2	1 & 2	1 & 2

   b. Carburetors - Ceco 58 CPB-2, Throttle stops 66°.
   c. Flame suppression hoods - Outboard 15-10841, inboard - Dwg. No. 15-10842.
   d. Nose pressure line from the fitting behind distributor nose pressure adjusted to approximately 70 pounds.
   e. Rear breathers installed on all engines.
   f. 1-1/4" external supply line to front pumps.
   g. Exhaust stack tunnel shrouds removed on engine Nos. 2, 3, and 4; shrouds installed on No. 1. Bypass cooling tube installed on No. 1 exhaust system.
   h. Baffle ahead of governor - all engines.
   i. Torquemeter lines serviced with water-glycol solutions.
   j. "Dishpan" nose shield installed on Engine #2.
   k. Rear oil pressure adjusted to 75 psi.
   l. Check valve in oil line from front pump to propeller shaft channel removed all engines. (m) Oil tanks pressurized to approximately 2 psi. - all eng.
   n. Solenoid pressure relief valve installed on oil tank #2.

PREPARED	AGL 2-10-43	PLAN Powerplant Performance and Cooling;	MOD. XB-29 NO. 2
TYPED	on 2-10-43	Propeller Governing; Airplane Performance -	REQ. #AF 41-3
CHECKED	EIW 2-16-43	Two-Engine Ceiling FLIGHT NO. 1 TEST NO. 5-1	D-4521
APPROVED	EIW 2-16-43	BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-1

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2. Propellers.

   a. 16.5 blades No. 6497A-6 hydromatic full feathering (HUB No. 23F60).
   b. Governor Model 3G8-A15D.
   c. Electric head - H.S. type 493, Model 5, Style B.
   d. Low pitch setting 20°.
   e. Positive high angle stop at full feather on all propellers - 84°.
   f. External governor supply lines not installed.
   g. Two piston bleed holes in all propellers.
   h. Feathering cutoff switches shimmed .036" with two .018" shims.
   i. 3/8" shims in distributor valve.
   j. Propeller governor cutoff valve, feathering pump relief valve #68 bleed.
   k. No. 1 feathering line lagged from governor to cylinder baffle.

3. Ignition

   a. Spark plugs - LS87R, Engine No. 2 & 4; C35S, Engine No. 1 & 3.
   b. Harness un pressurized.

4. Miscellaneous

   a. Revised heating system.
   b. No turret domes.
   c. Airplane in stripped condition per D-3547.
   d. No camouflage.
   e. No deicer boots.

TEST: (W.O. 9140-098-04)

1. Takeoff.

RPM	=	2600	Wing Flaps	=	25°
BMEP	=	208	Throttle	=	Full
Mixture	=	AR	Turbo	=	As Required.
Cowl Flaps	=	10°			

2. Rated Power Climb to 25,000 Feet.

Purpose: To indicate the climb performance of the XB-29 Airplane.

Data: Flight Engineer - Continuous complete readings, photos at 10-second intervals at recorders, recording of critical altitudes.

Ass't. Flt. Engr.- Continuous complete readings.

Potentiometers - Continuous complete readings.

Following the takeoff, the following conditions shall be set up and maintained throughout the climb:

RPM = 2400	IAS = 170 MPH	
BMEP = 197	Wing Flaps = 0°	
TRPM = As required	Cowl Flaps = 10°	(minimum when trend is established)
Throttle = Full		

PREPARED	2-10-43	AGL	PLAN: Powerplant Perf. & Cooling; Prop.	MOD. XB-29 NO. 2
TYPED	2-10-43	ea	Gov.; Airplane Perf. - Two Eng. Ceiling	REQ. # AF 41-3
CHECKED			FLIGHT NO. ______ TEST NO. 5-1	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-2

3. Level Run at 25,000 Feet

Purpose: 1. To obtain preliminary information on the operation of the engine-turbo combination at altitude and preliminary airplane performance indication.

2. To observe the airflow over the wing.

Data: Flight Engineer - Complete readings. Operation of recorders at two-second intervals at stabilized conditions.

Ass't Flt. Engr.- Complete readings.

Potentiometers - Complete readings.

Photo-Recorders - Readings of special engine instrumentation.

Procedure: The airplane shall be flown at constant altitude and power conditions until the airspeed stabilizes for the following:

Cond.	RPM	BMEP	M.P. "Hg	Mixt.	Cowl Flaps
a.	2400	197	42	AR	Min. for Army Hot Day
b.	2600	200	47	AR	" " " " "
c.	1900	119	26	AL	" " " " "

Intercooler - 10° (not to exceed 38°C. CAT)
Oil cooler - automatic

During the above condition, observers in the rear compartment shall observe the airflow over the wing by means of tufts fastened to the upper surface of the left wing.

4. Preliminary Turbo Performance - 140 BMEP - 170 MPH - Engine No. 2

Purpose: To obtain preliminary information on the dual turbo installation.

Data: Flight Test Engineer - Photo-recorder, 1 frame per second, turbo RPM, engine RPM, BMEP at each cond.

Ass't Flt. Test Engr. -General engine data

Procedure: At 25,000 feet, from 140 BMEP, 2000 RPM, auto lean, the RPM shall be reduced in 100 RPM increments at constant BMEP, until closed waste gate or instability is reached on engine No. 2.

PREPARED	2-10-43	AGL	PLAN: Powerplant Performance and Cooling	MOD. XB-29 NO. 2
TYPED			Prop. Governing, Airplane Performance	REQ. # AR 41-3
CHECKED			FLIGHT NO. Two Engine Ceiling TEST NO. 5-1	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-3

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5. Propeller Governing Check - 170 MPH - Propeller No. 2

Purpose: To determine the necessity of external governor lines.

Data: Flight Engineer - Governing times, photo-recorders at one-second intervals.

L.H. Photo Rec. - RPM, special engine instrumentation.

Engine No. 2 will be set to 2600 RPM, 165 BMEP. The switch will be thrown to decrease RPM and the times to initial response, 2000 RPM and 1500 RPM or minimum will be noted.

6. Wing Flow - 25,000 Feet

Purpose: To observe the airflow over the wing at various airspeeds.

Data: Observers - Observe airflow over left wing by means of tufts fastened to upper and lower surfaces. Sketch airflow pattern.

Procedure: At 25,000 feet, the airplane shall be flown at indicated airspeeds from rated power level flight to 140 MPH in increments of 10 MPH. Data shall be obtained at each airspeed.

7. Descent to 15,000 feet

8. Two-Engine Ceiling - 160 MPH

Purpose: To determine the two-engine ceiling of the XB-29

Data: Flight Engineer - Complete readings. Operation of recorders at ten-second intervals.

Ass't Flt. Engr. - Complete readings including cylinder head temperatures of cylinder heads No. 1, 2, 7, 8, 13, and 14 on engines Nos. 3 and 4.

Brown Recorder - Complete readings on engines 3 and 4.
Photo-Recorders - Readings of special engine instrumentation.
Power Conditions on Engines Nos. 3 and 4:

RPM - 2400 Mixture - AR Turbo - As required
BMEP - 197 Cowl Flaps - As required

Procedure: With props. 1 and 2 feathered, the airplane shall be flown at an indicated airspeed of 160 MPH until a rate of climb of 50 feet per minute is attained. If 160 mph does not yield best rate

PREPARED	2-10-43	AGL	PLAN: Powerplant Performance and Cooling	MOD. XB-29 NO. 2
TYPED	2-10-43	mh	Prop. Governing, Airplane Performance	REQ. # AF 41-3
CHECKED			Two-Engine Ceiling FLIGHT NO. ____ TEST NO. 5-1	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-4

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of climb, adjust airspeed to that speed and determine ceiling. After the run is completed, the propellers will be unfeathered.

Alternate

9. Sawtooth Climbs - 5,000 Feet to 10,000 Feet - Gear Up.

Purpose: To establish the performance of the XB-29 airplane and determine if the performance guarantees will be met.

Data: Same as Part 2 except Assistant Flight Engineer will not be required to obtain all cylinder head temperatures.

Procedure: The airplane shall be climbed from 5,000 feet to 10,000 feet with the landing gear retracted and the following power conditions:

BHP = 2400
BMEP = 197
Mixture = AR

The climb conditions shall be as follows:

Cond.	IAS	Cowl Flap
a	140	20°
b	160	15°
c	200	10°
d	220	5°
e*	Maximum Speed Level	5°

* To be run at 7500 feet, or the average altitude.

10. Sawtooth Climbs - 5,000 Feet to 10,000 Feet - Gear Down.

Purpose: Same as Part 9.

Data: Same as Part 9.

Procedure: Same as Part 9 except the landing gear shall be extended.

The climb conditions shall be as follows:

Cond.	IAS	Cowl Flap
a	140	20°
b	160	15°
c	180	10°
d	200	10°
e	Maximum Level	5°

PREPARED	2-10-43	GL	PLAN: Powerplant Performance & Cooling	MOD. XB-29 NO. 2
TYPED	2-10-43	lc	Prop. Governing Airplane Performance	REQ. # AF 41-3
CHECKED			Two Engine Ceiling FLIGHT NO. TEST NO. 5-1	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-5

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of climb, adjust airspeed to that speed and determine ceiling. After the run is completed, the propellers will be unfeathered.

Alternate

9. Sawtooth Climbs - 5,000 Feet to 10,000 Feet - Gear Up.

Purpose: To establish the performance of the XB-29 airplane and determine if the performance guarantees will be met.

Data: Same as Part 2 except Assistant Flight Engineer will not be required to obtain all cylinder head temperatures.

Procedure: The airplane shall be climbed from 5,000 feet to 10,000 feet with the landing gear retracted and the following power conditions:

RPM = 2400
BMEP = 197
Mixture = AR

The climb conditions shall be as follows:

Cond.	IAS	Cowl Flap
a	140	20°
b	160	15°
c	200	10°
d	220	5°
e*	Maximum Speed Level	5°

* To be run at 7500 feet, or the average altitude.

10. Sawtooth Climbs - 5,000 Feet to 10,000 Feet - Gear Down.

Purpose: Same as Part 9.

Data: ~~Same as Part 9.~~

Procedure: Same as Part 9 except the landing gear shall be extended.

The climb conditions shall be as follows:

Cond.	IAS	Cowl Flap
a	140	20°
b	160.	15°
c	180	10°
d	200	10°
e	Maximum Level	5°

PREPARED	2-10-43	AGL	PLAN: Powerplant Performance & Cooling	MOD. XB-29	NO. 2
TYPED	2-10-43	lc	Prop. Governing Airplane Performance	REG. # AF 41-3	
CHECKED			Two Engine Ceiling FLIGHT NO. ____ TEST NO. 5-1	D- 4521	
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-5	

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11. Sawtooth Climb - 5,000 Feet to 8,000 Feet - Wing Flaps.

Purpose: Same as Part 9.

Data: Same as Part 9.

Procedure: The airplane shall be climbed from 5,000 feet to 8,000 feet with the landing gear extended and the wing flaps extended 25°. The power conditions shall be as follows:

RPM = 2400
BMEP = 197
Mixture = AR

The following climb conditions shall be set up:

Cond.	IAS	Cowl Flaps
a	120	15°
b	140	15°
c	160	15°
d	180	15°

12. Descend and Land.

Checked [illegible] Approved E T Allen

Checked [illegible]

PREPARED	2-10-43	GL	PLAN: Powerplant Performance & Cooling	MOD. XB-29 NO. 2
TYPED	2-10-43	lc	Prop. Governing Airplane Performance	REQ. # AF 11-3
CHECKED			Two Engine Ceiling FLIGHT NO. ______ TEST NO. 5-1	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-1-6

FLIGHT AND AERODYNAMICS DIVISION

REPORT OF TEST

1st PILOT E. T. Allen	DATE 2-18-43	DAY Thursday	
2nd PILOT R. R. Dansfield	TIME AT START: GROUND	FLT. 12:09	
ENGINEER E. I. Wersebe	TIME AT END: GROUND	FLT. 12:28	
G. W. 105,000 lbs.	C. G. 25% W. U.	GROUND TIME:	FLT. TIME: 00:19
	PLACE: Boeing Field		

OTHER CREW MEMBERS & DUTIES:

Station:		Station:	
2	F. Mohn - Engineer	4	R.L. Basel - Obs.
2	C. E. Blaine - Ass't Flt. Test Eng.	4	V. W. North - Obs.
3	H. Ralston - Radio Operator	4	T. Lankford - Obs.
3	R. W. Maxfield - Potentiometer Op.		
3	B. J. Henshaw - Observer		

CONFIGURATION:

1. Powerplant - Wright R-3350-13

a. Item

Item	No. 1	No. 2	No. 3	No. 4
Engine Serial No.	56721	56700	56722	56705
Carburetor Serial No.	1231	1257	1369	1374
Internal Torque Chamber	Yes	Yes	No.	No
Enlarged Nose Section Oil Passages	Yes	Yes	Yes	Yes
Revised Exhaust valve Guides and Machine Valve Seats	Yes	Yes	Yes	Yes
Floating Pinion Bushings	Yes	Yes	Yes	Yes
New Type Piston Rings	Yes	No	No	Yes
Master Rod Indexing	1 & 4	1 & 2	1 & 2	1 & 2

b. Carburetors - Ceco 58 CPB-2, throttle stops 66°

c. Flame suppression hoods - Outboard 15-10841, inboard - Dwg. No. 15-10842 except inboard #2 which has hood Dwg. No. 14-3377.

d. Nose pressure line from the fitting behind distributor. Nose pressure adjusted to approximately 70 pounds.

e. Rear breathers installed on all engines.

f. 1-1/4" external supply line to front pumps.

g. Exhaust stack tunnel shrouds removed on engine Nos. 2, 3, and 4; shrouds installed on No. 1. Bypass cooling tubo installed on No. 1 exhaust system.

h. Baffle ahead and on sides of governor - all engines.

PREPARED	ABH	2/22/43	REPORT Powerplant Performance & Cooling; Prop. Gov.; Airplane Perf; Two Eng. Ceiling	MOD. XB-29 NO. 2
TYPED	jwk	2/24/43		MFG. # AF 41-3
CHECKED	WFM	2-25	FLIGHT NO. B TEST NO. 592	D- 4521
APPROVED	ACR	2-25	BOEING AIRCRAFT CO. SEATTLE, WASH.	5-2-1

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i. Torquemeter lines serviced with water-glycol solutions.
j. Rear oil pressure adjusted to 75 psi.
k. ~~Check valve in oil line from front pump to propeller shaft channel~~ removed - all engines.

2. Propellers

a. 16.5' blades No. 6497A-6 hydromatic full feathering (HUB No. 23F60).
b. Governor model 3G8-A15D.
c. Electric head - H.S. type 493, Model 5, Style B.
d. Low pitch setting 20°.
e. Positive high angle stop at full feather on all propellers - 84°.
f. External governor supply lines not installed.
g. Two piston bleed holes in all propellers.
h. Feathering cutoff switches shimmed .036" with 018" shims.
i. 3/8" shims in distributor valve.
j. Propeller governor cutoff valve, feathering pump relief valve #68 bleed.
k. No. 1 feathering line lagged from governor to cylinder baffle.

3. Ignition

a. Spark plugs - LS87R, engine No. 4, C35S, engine No. 1, 2 and 3.
b. Harness pressurized on engines 1, 2, and 3.

4. Miscellaneous

a. Revised heating system.
b. No turret domes.
c. Airplane in stripped condition per D-3547.
d. No camouflage.
e. No deicer boots.

TEST:

1. Takeoff
Takeoff was made with the following conditions prevailing:

RPM - 2600	Mixture - AR
BMEP - 200	Cowl Flaps - 13°
MAP - 47.5"Hg.	Wing Flaps - 25°

2. Fire in No. 1 Nacelle

At an altitude of 5,000 feet during a rated power climb, fire was reported in No. 1 nacelle. The fire was believed temporarily put out, and a return to the field commenced.

PREPARED	2-22-43	ARH	Report: Powerplant Performance & Cooling;	MOD. XB-29 NO. 2
TYPED	2-24-43	jwk	Prop Govr: Airplane Perf.: Two Eng.	REQ.# AF 41-3
CHECKED			FLIGHT NO. 8 TEST NO. Ceiling 5-8	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-3-1

3. Spread of Fire and Crash

On the approach to the field; fire was reported in one of the wings. Shortly thereafter the airplane crashed.

Checked A. L. Limard Approved

Checked W. P. Millikan Jr.

PREPARED	2-22-43	ABH	Report: Powerplant Performance & Cooling;	MOD. XB-29 NO. 2
TYPED	2-24-43	jwk	Prop Gov; Airplane Perf; Two Eng. Ceiling	CFR. # AF 41-3
CHECKED			FLIGHT NO. 9 TEST NO. 5-2	D- 4521
APPROVED			BOEING AIRCRAFT CO. SEATTLE, WASH.	5-4-1

BOEING AIRCRAFT COMPANY
SUMMARY REPORT - INVESTIGATING COMMITTEE
ACCIDENT TO XB-29 SERIAL NO. 1003

Based upon evidence examined by the Investigating Committee, it is believed that the following summary outlines the sequence of events during the flight of XB-29 airplane, Serial No. 1003, on February 18, 1943, which flight was terminated when the airplane collided with the Frye Packing plant.

A. Flight Plan and Radio Reports

1. The purpose of the flight, as stated on the flight plan, was as follows:

   "Local Flight - Power Plant Performance and Cooling - Propeller Governing - Airplane Performance - Two-Engine Ceiling."

2. The airplane left the ground at Boeing Field at 12:09 p.m. The take off was from north to south, into a 10-mile per hour south wind which condition prevailed at the time the airplane [illegible] for an emergency landing.

3. The airplane reported its position to Boeing Operator at [illegible] p.m. to be over [illegible] Lake at 2,000 feet altitude, southbound. [illegible] comment in this report.

4. The airplane reported its position to Boeing Operator at [illegible] p.m. to be over Lake Tapps at [illegible],000 feet altitude, southbound. [illegible] comment in this report.

5. The airplane reported to Boeing Operator at 12:[illegible] p.m. [illegible] "Fire in No. 1 engine —— Coming in —— [illegible] the CO_2 bottle and think we have it under control."

6. The airplane reported its position to Boeing Operator at [illegible] p.m. to be south of Kent at 3,500 feet altitude northbound, [illegible] also "No. 1 feathered."

7. The airplane reported its position to Boeing Operator at 12:2[illegible] p.m. to be south of Renton at 2,500 feet altitude northbound. No other comment in this report.

8. The airplane reported its position to Seattle Tower at [illegible] p.m. to be over Renton at 2,400 feet altitude, [illegible] this report stated: "Request immediate landing clearance. No. 1 engine on fire, propeller feathered and trouble [illegible]. Order crash equipment to stand by."

9. The airplane reported its position at 12:24 p.m. to be over the Lake Washington bridge at 1,500 feet altitude. No direction given, and no other comment in this report. However, Boeing Operator stated, "The operator did not sound excited until reporting his position over Lake Washington bridge. At that time he first reported an altitude of 2,500 feet and then amended it to 1,500 feet."

At approximately 12:2[illegible] p.m. the airplane attempted to communicate with Seattle Tower, but transmission was blocked by other airplanes.

10. At 12:25 p.m. the airplane reported to Boeing Operator, "Have fire equipment ready as am coming in with a wing on fire." No position reported. Boeing Operator stated, "When radio operator asked for fire equipment, his voice sounded strained and rather hoarse, but perfectly coherent."

    Also at approximately 12:25 p.m. the Seattle Tower overheard an inter-phone conversation addressed to Allen by one of the airplane crew members as follows: "Allen, better get this thing down in a hurry, the wing spar is burning badly." There was no further radio contact with either the Boeing Operator or the Seattle Tower.

11. At 12:26 p.m. the lights at the Boeing radio room flickered and then switched to standby power.

    At approximately 12:28 p.m. the radio in the Seattle Airways Control Tower went off the air due to power failure.

B. Probable Sequence of Events.

1. It is believed that the fire as first reported originated in the nacelle to the rear of the engine and forward of the firewall. This is believed probable since the use of one CO_2 bottle apparently put the fire under control. This is substantiated by the radio reports, Mr. Blaine's log, and by reports from observers of the Interceptor Command, which check with the radio reports as to time and position. From the evidence available it is not possible to determine the exact cause of the first reported fire.

2. It is believed that:

   (a) The nacelle fire spread to the wing leading edge prior to the extinguishing of the nacelle fire and without the immediate knowledge of the crew members; or---

   (b) The leading edge fire ignited independently of the first reported fire, by contact of gasoline or gasoline fumes and heated nacelle skin in the rear portion of either the inboard or outboard nacelles.

   It is believed that in either case, the leading edge fire began with the ignition of gasoline and/or gasoline fumes. It is probable that the gasoline was supplied to the leading edge by overflow of the fuel tank filler necks (through vent holes) and subsequent leakage around the filler cover plates and their fastenings into the leading edge, and around the junction of the filler neck drain and the lower leading edge surface.

3. The normal gravity flow of any overflow gasoline, and the flow of any ventilating air in the leading edge would both be in an inboard

direction. It is believed therefore that the leading edge fire progressed through the leading edge to the inboard nacelle (wheel well to rear of firewall) and to the fuselage (bomb bay).

4. Radio reports, testimony of witnesses, and location and condition of parts which fell from the airplane, indicate that the intensity of the fire increased greatly at approximately 12:24 to 12:25, or shortly after the airplane passed over the Lake Washington bridge and turned from a north course to a southwest course, and that the seriousness of the fire was then realized by the crew. It is probable that at this time the fire had traveled to the bomb bay and was readily visible to the crew in the forward compartment. This increase in intensity could have been caused by a failure of the leading edge, a failure of a fuel line or fuel filler neck, ignition of magnesium parts in the leading edge, or failure of oxygen lines in the bomb bay, or a combination of failures due to the heat of the fire. The intensity of the fire could have also been increased by an increased leakage of fuel from the left hand filler necks and drains during the turn from North to Southwest with the left wing down.

5. The hose clamps and the internal parts of a deicer valve, which were found near 17th and Jefferson, indicate that sufficient damage had been done to the leading edge at that time to permit these parts to fall clear of the airplane.

6. With an intense fire burning and with the crew members apparently aware of the seriousness of the situation, three possible alternatives faced the pilot: (1) To attempt to reach the field, risking a further increase in intensity of the fire or risking a structural failure, either of which results would cause loss of control over the city; (2) To maintain altitude and abandon the airplane; (3) To stay with the airplane, attempting to make a crash landing in a lightly inhabited district of the city.

7. It is believed that the third alternative was chosen because the pilot felt that the intensity of the fire would prevent his reaching the field and thus required a crash landing in the nearest open area if a landing was to be made before complete loss of control. Although it is possible that power was lost on Number Two engine as well as Number One engine, due to failure of fuel lines or other causes, and such loss of power would require an eventual landing soon after lowering of the landing gear, the rate of descent during the last minute of flight was greater than could be accounted for (at the existing gross weight) by this loss of power or increase in landing gear drag.

8. It is believed that following the increase in intensity of the fire and prior to the time the three crew members left the airplane, the fire found its way to the forward compartment. This could have taken place as a result of burning through of the magnesium tunnel

wall or as a result of opening the bomb bay access door, or both. It was common practice to open the bomb bay access door to relieve the pressure differential on the nose wheel escape hatch, so that this hatch could be more readily opened.

9. It is believed that the intensity of smoke and heat in the cockpit increased during the last stages of the flight, and that the impairment of vision caused by the smoke may have caused collision with the building rather than continuation of a normal flight path and contact with the ground.

SUMMARY: --

It is believed that the following are the principal factors contributing to the fire:

1. Leakage of fuel and/or oil in the engine nacelle, ignited by contact with exhaust pipe or exhaust shroud, or by operation of electrical equipment, or by failure of the Accessory section of the engine or failure of an engine accessory.

2. Leakage of fuel into the leading edge, primarily around the filler neck cover and drain, ignited by contact with heated nacelle skin, or by fire through nacelle firewall openings, or by operation of electrical equipment in or adjacent to leading edge.

3. Spread of fire, following natural course of leading edge ventilation to wheel well and bomb bay, and finally to cockpit.

C. M. Weaver Assistant to Plant Manager	Glenn V. Dierst Plant Protection Manager
E. C. Wells Assistant Chief Engineer	George Schairer Chief Aerodynamicist
Charles S. Rankin Chief Inspector	G. W. Newton Power Plant Unit Chief
Harvey Kent Assistant Superintendent	D. W. Finlay Assistant Project Engineer

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→ 05/10/43
XB-32
"Domenata"

09/7/42 05/10/43

to be delivered within 18 months of the contract date, the second 90 days later, and the third 90 days after that.

The Consolidated XB-32 was assigned the designation of Model 33 by the company. It was similar in overall layout to the twin-finned B-24 Liberator, with a high-mounted Davis-type wing, twin tails, and a twin bomb-bay covered over by a set of roll-up doors. It differed from the B-24 in having a larger wing, a cylindrical fuselage, and a rounded, B-29-type nose. However, the rounded nose was replaced by a more conventional stepped windshield before the first prototype flew. The engines were the same as those of the XB-29 -- four turbosupercharged Wright R-3350 Duplex Cyclone air-cooled radials. Like the Boeing B-29, the XB-32 had pressurized crew compartments and remotely-controlled turrets. However, the turrets on the XB-32 were retractable.

The B-32 mockups were built in late December of 1940. They were modified to incorporate changes suggested by a Wright Field report on wind tunnel testing of a 1/35th scale wooden model. The revised mockups were reinspected and finally approved on January 6, 1941. Thirteen service test YB-32s were ordered in June of 1941. These would be developed in parallel to the construction of the three XB-32s.

The first XB-32 (41-141) was rolled out at San Diego on September 1, 1942, nearly six months behind schedule. At this stage in the war, the B-32 was still an important part in the USAAF's war planning. The August 1941 plan was based on precision bombing of German industrial targets with 98 groups of bombers, 48 of them equipped with B-29s and B-32s. The USAAF was already unhappy about the delays in both the B-29 and B-32 programs, and since the B-32 had actually been the first to be completed, the Army wanted flight tests to begin at once. Because of problems with the pressurization system and the gun turrets, these items had been left off the first XB-32 so that it could begin flight testing right away.

The first XB-32 took off on its maiden flight on September 7, 1942 from San Diego's Lindbergh Field, with test pilots Russell Rodgers and Richard McMakin at the controls. Problems with one of the rudder trim tab actuating rods forced an emergency landing at nearby NAS North Island after only 20 minutes in the air.

The XB-32 had R-3350-13 engines inboard, and R-3350-21 engines outboard, all of which drove three-bladed Hamilton Standard Hydromatic propellers. The XB-32 was later fitted with four 0.50-inch machine guns in each of its top and lower turrets, plus a pair of 0.50-inch machine guns and one 20-mm cannon mounted in the rear of each outboard engine nacelle firing rearward and controlled by aiming stations in the fuselage and tail. In addition, two fixed 0.50-inch guns were carried in the wing leading edges, outboard of the propellers.

Development problems continued, and in February 1943 the YB-32 contract was cancelled. However, a month later a contract for three hundred B-32s was placed, although some USAAF officers were in favor of cancelling the B-32 program outright since the B-29 program was now proceeding forward rapidly. The B-32s were to built at the Fort Worth Consolidated plant, although the prototypes had been built at San Diego. The popular name *Terminator* was assigned. On May 10, 1943, XB-32 41-141 crashed just after takeoff because of a flap malfunction, injuring six crewman and killing Consolidated test pilot Richard McMakin. This was a major setback for the B-32 program, since some vital test records had been destroyed in the crash, which meant that several tests had to be repeated.

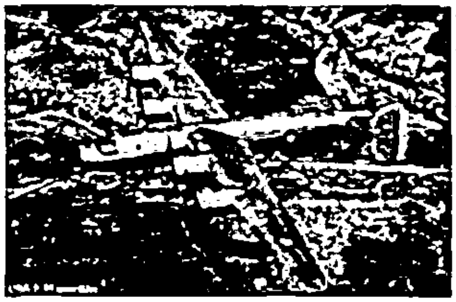
The second XB-32 (41-142) flew for the first time on July 2, 1943. The second XB-32 sported the same type of twin fin and rudder assembly but with modified rudder tabs. It was also pressurized and had remotely-controlled retractable gun turrets in the dorsal and ventral positions, with a manned tail "stinger".

5/10/43

USAF Museum
Archives Gallery
1940s US Bombers

◄ Douglas XB-31
► Consolidated B-32

Consolidated XB-32 "Dominator"



The Model 33 was the Consolidated submission for the US Army's Very Long Range bomber competition. A Request for Data was issued in January 1940 to all the major aircraft manufacturers. In April, four preliminary design studies were received from Boeing, Lockheed, Douglas and Consolidated. In June, the Army ranked the designs and assigned bomber designations in order of preference. The Consolidated design was ranked last and assigned XB-32. Both Lockheed and Douglas withdrew from the competition later in the summer and the final Consolidated design was approved in September. A contract for two prototypes was issued and amended in November to include a third aircraft.

The XB-32 was based on an enlarged B-24 but was essentially an entirely new design. The initial prototype (S/N 41-141) was completed in September 1942 and first flew on the 7th; however, after 30 test flights the plane was destroyed in a crash on 10 May 1943. The second prototype first flew in July 1943 followed by the third's first flight in November.

The third prototype (S/N 41-13886) was completed with same double tail as the first two prototypes, but early in the flight test program was retrofitted with a single tail taken from a B-29. The single tail was an attempt to solve directional stability problems but it wasn't large enough and the aircraft was fitted with an even larger vertical stabilizer. This tail assembly, designed by Consolidated engineers, would be used on all production B-32s (retrofitted to the first B-32 S/N 42-108471).

The XB-32 program (like the XB-29 program) was plagued by continual problems and delays. Although the XB-32 started out as insurance against failure of the B-29 and actually flew first, the delays caused the program to lag significantly behind B-29 development. The pending cancellation of the entire program was avoided after a number of recommended changes were incorporated into the B-32 production version. The single tail of the third prototype was retained along with many performance enhancements and changes to make maintenance easier.

TYPE	Number Built/Converted	Remarks
XB-32	3	B-29 competitor

Notes:

- Serial numbers: 41-141, 41-142, 41-18336
- The XB-32 was initially known as "Terminator" while the B-32 was the "Dominator"
- 41-141 first flew on 7 September 1942 and crashed on 10 May 1943
- 41-142 first flew on 2 July 1943
- 41-18336 first flew on 9 November 1943 and was later retrofitted with a single tail

05/19/1943

N-9M

Small Flying Wing

05/19/43

covering was of wood and metal panels, with the outer wing panels being of wood with metal wing slots and wing tips. The four N9Ms were later called N9M-1, N9M-2, N9M-A, and N9M-B respectively. They were initially powered by a pair of 290 hp Menasco C65-4 six-cylinder air-cooled engines each driving a pusher two-bladed propeller by means of an extension shaft via a fluid-drive coupler. The engines were cooled by air admitted by large under-wing scoops. The N9M-B was later fitted with two air-cooled 400 hp Franklin engines. Provisions were made for a pilot and one passenger, both housed underneath a single transparent bubble canopy. It was provided with a retractable tricycle landing gear, and a rear outrigger tail wheel was fitted. These 4 aircraft flew with neither civil registrations nor military serials. The design details worked out in the N9M were incorporated into the design of the XB-35.

The first N-9M flew for the first time on December 27, 1942. It crashed on May 19, 1943, killing its pilot. On the maiden flight of the second model on June 24, 1943, the cockpit canopy of the aircraft flew off while in flight, but the pilot was able to land successfully. Nearly all the flight tests of the N-9M were shortened by mechanical failures of one kind or another, particular with failures in the Menasco engines. The fourth and last N9M (the N9M-B) flew for the first time on September 21, 1943.

The N9M-B (the last of the four) managed to survive all these years, and was restored to flying condition over a period of 12 years by volunteers at the Chino 'Planes of Fame Museum' and flew again, for the first time after about 45 years, on November 11, 1994. The new civil registration of the N9M-B is 'N9MB'.

The wingspan of the B-35 was 172 feet, and the leading edges were swept back at an angle of 27 degrees. The wing of the B-35 was 37 1/2 feet wide at the center, tapering to 9 feet wide at the tips. Because of the wing sweep, the overall length of the aircraft was slightly over 53 feet.

The lateral control that was normally provided by conventional rudders was provided on the B-35 by a set of double split flaps located on the trailing edges of the wingtips. These operated by having the split flaps open up in butterfly fashion to provide a braking effect. When the left rudder pedal was depressed, the left flaps would open up, forcing a turn to the left. If both pedals were depressed, both split flaps would open up to increase the gliding angle or reduce the air speed. These double split flaps could also act as trim flaps, and could be adjusted as a unit either up or down to trim the airplane longitudinally.

Elevons were located along the trailing edge of each wing inboard of the trim flaps. When deflected together in the same direction (by the pilot moving the control column fore or aft), they could cause the airplane to descend or climb. When operated differentially (by having the pilot move the control wheel left or right), they caused the airplane to bank left or right in a fashion similar to the function of conventional ailerons. For landings and results with the N-9M aircraft had indicated that the range of the XB-35 would most likely be 1600 miles shorter than anticipated. In addition, the maximum speed was estimated to be 24 mph slower than anticipated. Consequently, General Arnold began to question the wisdom of any extensive B-35 production program. In the meantime, the Martin company was experiencing severe shortages of trained engineers (many had been drafted) who could work on the B-35 project and had encountered delays in setting up the necessary tooling. These problems had forced Martin to push back the delivery date of the first B-35 to 1947. As a result, the USAAF concluded that it was unlikely that the B-35 would be ready in time to contribute to the war effort, and cancelled the Martin B-35 production contract on May 24, 1944.

However, this did not spell the death of the B-35 project, since the Air Technical Service Command felt that the XB-35 flying wing project was worthwhile for test purposes even if it never achieved operational status. In December of 1944, the USAAF decided that Northrop should go ahead and build the XB-35 and YB-35 aircraft as test vehicles. The first six of the YB-35s would be built on the XB-35 pattern, but with certain individual differences. On June 1, 1945, orders were issued to have two of the YB-35 airframes fitted with Allison J35-A-5 jet engines. The jet-powered flying wing was initially assigned the designation YB-35B, but this was later changed to YB-49. In 1945, after two more YB-35s had been added to the first YB-35 lot to replace the two that were earmarked for jet conversion, the USAAF told Northrop to manufacture the remaining 5 airplanes on the YB-35 contract to more advanced specifications, which resulted a redesignation to. YB-35A.

The first XB-35 (serial number 42-13603) took off on its maiden flight on June 25, 1946, with Max Stanley as pilot and Dale Schroeder as flight engineer. On this first flight, the aircraft was flown from Hawthorne to Muroc Dry Lake, a flight lasting 45 minutes. Almost immediately, the flight test program ran into difficulties. Gear box malfunctions and propeller control difficulties caused the XB-35 to be grounded on September 11 after only 19 flights.

The second XB-35 (serial number 42-38323) took to the air for the first time on June 26, 1947. Only eight flights took place before Northrop was forced to ground this plane too.

The dual counter-rotating propellers and their gearboxes proved to be totally unsatisfactory, and both XB-35s had to be grounded in September of 1947 so that their dual-rotating propellers could be replaced by single-rotation propellers. Following the fitting of the new single-rotation propellers and the mounting of simpler gearboxes, flight testing of the first XB-35 was resumed in February of 1948. Seven more flights were made by the first XB-35 from February 12 to April 1, 1948. The new propeller installations operated without any particular mechanical difficulties, but there was considerable vibration and the performance of the aircraft was reduced.

06/16/1943

XB-38

B-17 w/ diff engines

12/16/45
06/16/43

Vega XB-38

Last revised July 16, 1999

As part of its participation in the Boeing-Vega-Douglas manufacturing pool for the Fortress, the Vega division of Lockheed had been requested by the USAAF to explore the feasibility of adapting the basic B-17E airframe to the 1425 hp Allison V-1710-89 liquid-cooled V-12 engine.

Negotiations for development of the new design, known as Vega Model V-134-1, began in March of 1942 and a contract was signed on July 10. The project was considered sufficiently different from the stock B-17E that a new series number was assigned--XB-38. The ninth production B-17E (serial number 41-2401) had been turned over to Vega for study during the initial formation of the B.V.D. manufacturing pool, and this plane was selected for the first XB-38 conversion.

The basic airframe of the XB-38 was essentially that of the B-17E, with a few revisions necessitated by the installation of the new powerplants. For example, the oil coolers of the B-17E were mounted in the leading edges of the wings, but they were moved to positions underneath the propellers in the XB-38. Also, the coolant radiators for the Allisons were mounted in the wing leading edges between each pair of engine nacelles.

The XB-38 made its first flight on May 19, 1943. As a result of the increased power of the Allison engines, the XB-38 was slightly faster than its radial-powered B-17E counterpart. However, the XB-38 prototype was destroyed on June 16, 1943 as a result of an engine fire which could not be extinguished, and a full comparison with the Wright-powered B-17E could never be made. In any case, the performance improvement offered by the XB-38 was only marginal, and since the liquid-cooled Allisons were in great demand for the P-38 Lightning and P-40 Warhawk fighters, the USAAF decided to abandon further work on the XB-38, and plans for two additional XB-38 conversions were cancelled.

Specification of Boeing XB-38:

Four Allison V-1710-89 liquid-cooled V-12 engines, rated at 1425 hp at 25,000 feet. Performance: Maximum speed 327 mph at 25,000 feet. Cruising speed 226 mph. Service ceiling 29,700 feet. Range 2400 miles with 3000 pounds of bombs, 1900 miles with 6000 pounds of bombs. Maximum range 3600 miles. Dimensions: Wingspan 103 feet 9 3/8 inches, length 74 feet 0 inches, height 19 feet 2 inches, wing area 1420 square feet. Weights: 34,748 pounds empty, 56,00 pounds gross, 64,000 pounds maximum. Armament: Armament was the same as that of the standard B-17E, namely one 0.30-inch machine gun which could be mounted on any one of six ball-and-socket mounts in the extreme nose, one Sperry No. 645473E power turret in the dorsal position with two 0.50 Browning M2 machine guns with 500 rounds per gun, a remotely-controlled power turret in ventral position with two 0.50-inch Browning machine guns with 500 rounds per gun, one 0.50-inch Browning M2 machine gun is each of the two waist windows, 400 rounds per gun, and two 0.50-inch M2 Browning machine guns in the tail position, with 500 rounds per gun.

10/08/93

XP-56

Garber facility in Suitland, Maryland. I saw it there in November of 1992. It seems to be in pretty good shape.

On June 22, 1940, Northrop Aircraft, Inc. received a contract for preliminary engineering data and a powered wind tunnel model. The designation P-56 was reserved for the project. On September 26th, 1940, a single prototype was ordered as the XP-56. The serial number was 41-786.

However, shortly after development of the XP-56 began, Pratt & Whitney abandoned all work on its X-1800 liquid-cooled engine. This left the XP-56 (and the competing XP-54 and XP-55 along with it) out on a limb, without an engine. Northrop's design team reluctantly decided to switch to the less-suitable Pratt & Whitney R-2800 air-cooled radial engine. Although the R-2800 engine was more powerful (2000 hp as opposed to 1800 hp), it was also wider. The larger diameter of the radial engine required in turn that the fuselage be widened in order to accommodate it. These changes resulted in an increase in the weight.

The fuselage was stubby and rounded, with an unpressurized cockpit situated well forward. The plane had a short and stubby dorsal fin and a very large ventral fin, so large, in fact, that it very nearly scraped on the ground when the aircraft stood on its landing gear. The cantilever mid-mounted wing had elevons which functioned both as ailerons and wingflaps mounted on the trailing edge of the drooping wing tip. Air ducts for cooling of the radial engine were located on the wing leading edge. The mainwheels retracted into the wing, and the nosewheel retracted into the fuselage. Proposed armament was to be two 20-mm cannon and four 0.50-inch machine guns, all mounted in the nose.

On February 13, 1942, a USAAF contract was issued for a second XP-56 prototype. The serial number was 42-38353. The name *Black Bullet* has been attached to the project, but I don't know if this name was official.

The first XP-56 (41-786) was ready in April of 1943. It was shipped out to Muroc Dry Lake (later Edwards AFB) for tests. During initial ground handling trials, it was found that the aircraft tended to yaw sharply and dangerously while taxiing at high speeds. It was thought that this problem was caused by faulty wheel brakes, and trials were halted until the aircraft was re-equipped with manual hydraulic brakes. This delayed the first flight until September 30, 1943, when test pilot John Myers took the XP-56 into the air for the first time. An altitude of five feet was maintained, and the XP-56 appeared to fly normally. Several additional flights were undertaken, during which somewhat greater altitudes were attained. These test flights were not particularly encouraging. Nose-heaviness was a persistent problem, and lateral control was difficult to maintain in all flight regimes. However, before any of these aerodynamic problems could be

10/08/43 @ Muroc

addressed, the port mainwheel tire blew out during a high-speed taxiing run and the aircraft somersaulted over onto its back. It was totally wrecked.

In an attempt to correct the deficiencies encountered with the first XP-56, the second XP-56 (42-38353) underwent some major changes. The center of gravity was moved further forward. There was a major increase in the size of the upper vertical surface--it was enlarged from a mere stub into a surface larger in area than the ventral fin. A new form of rudder control was fitted which made use of air bellows at the wing tips which operated a set of split flaps for directional control. The control of the bellows was achieved by valving air to or from the bellows by means of wingtip venturis.

On March 23, 1944, test pilot Harry Crosby took the second XP-56 up for the first time. However, Crosby found it impossible to lift the nosewheel off the ground at speeds below 160 mph, and the test flight lasted only a few minutes. The second flight went better, and it was found that the nose heaviness went away after the landing gear was retracted. However, the aircraft was severely underpowered for its weight, and only relatively low speeds could be attained, much less than the projected maximum speed of 465 mph at 25,000 feet.

On May 39, 1944, it was decided that NACA would use their wind tunnel at Moffett Field, California to look into the causes of the XP-56s low performance. However, the higher priority of other projects led to postponement of the XP-56 wind tunnel tests until late October of 1944.

While awaiting the beginning of the wind tunnel testing, further flight test trials were undertaken with the XP-56. On the tenth test flight, the pilot complained of extreme tail heaviness on the ground, low power, and excessive fuel consumption. After consultations, it was concluded that the XP-56 was basically not airworthy , and that it was just too dangerous to continue flight tests with it. Shortly thereafter, the whole project was abandoned. The further development of higher-performance piston-engined fighters was futile in any case, since the advent of jet propulsion would soon bring the era of propeller-driven fighters to a close.

Although the XP-56 project was a failure, it was not a total loss for Northrop, since the company had learned a lot about flying wing designs. This data gained during the XP-56 project was put to good use in later Northrop designs such as the XB-35 piston- engined bomber, the YB-49 jet-powered bomber, and the B-2 stealth bomber.

Specs of the XP-56:

One 2000 hp Pratt & Whitney R-2800-29 eighteen-cylinder air-cooled radial engine. Proposed armament was to be two 20-mm cannon and four 0.50-inch machine guns, all

11/15/1943

XP-55
"Ascender"

11/15/43

was fixed.

After completion, the CW-24B was shipped out to the Army flight test center at Muroc Dry Lake (later Edwards AFB) in California. It made its first flight there on December 2, 1941. Although the maximum speed was only 180 mph because of the low engine power, the CW-24B proved out the basic feasibility of the concept. However, early flights indicated that there was a certain amount of directional instability. The original auxiliary wingtip fins were increased in area and moved four feet farther outboard on the wings, which enhanced the directional stability. The wingtips were made longer, and further improvements were obtained by adding vertical fins to both the top and the bottom of the engine cowling. 169 flights with the CW-24B were made at Muroc between December 1941 and May 1942. After that, the airplane (having been assigned the USAAC serial number 42-39347) was transferred to Langley Field, Virginia, for further testing by NACA.

During the flight testing of the CW-24B, work on the CW-24 fighter project continued. On July 10, 1942, a USAAF contract was issued for three prototypes under the designation XP-55. Serial numbers were 42-78845/78847. Since the Pratt & Whitney X-1800 engine was experiencing serious program delays (it eventually was cancelled outright before attaining production status) Curtiss decided to switch to the Allison V-1710 (F16) liquid-cooled inline engine for the sake of reliability and availability. Armament was to be two 20-mm cannon and two 0.50-inch machine guns. During the mockup phase, it was decided to switch to the 1275 hp Allison V-1710-95 engine, and the 20-mm cannon were replaced by 0.50-inch machine guns.

The first XP-55 (42-78845) was completed on July 13, 1943. It had essentially the same aerodynamic configuration as did the final CW-24B. It made its first test flight on July 19, 1943 from the Army's Scott Field near the Curtiss-Wright St Louis plant. The pilot was J. Harvey Gray, Curtiss's test pilot. Initial flight testing revealed that the takeoff run was excessively long. In order to solve this problem, the nose elevator was increased in area and the aileron up trim was interconnected with the flaps so that it operated when the flaps were lowered.

On November 15, 1943, test pilot Harvey Gray was flying the first XP-55 through a series of stall tests when the aircraft suddenly flipped over on its back and fell into an uncontrolled, inverted descent. Recovery proved impossible, and the plane fell out of control for 16,000 feet before Gray was able to parachute to safety. The aircraft was destroyed in the ensuing crash.

At the time of the crash, the second XP-55 (42-78846) was too far advanced in construction for its configuration to be conveniently modified to incorporate any changes resulting from an analysis of the cause of the loss. The second XP-55 was essentially similar to the first one, apart from a slightly larger nose elevator, a modified elevator tab system, and a change from balance tabs to spring tabs on the ailerons. It flew for the first time on January 9, 1944, but all flight tests were restricted so that the stall zone was carefully avoided until the third XP-55 had been satisfactorily tested.

The third XP-55 (42-78847) flew for the first time on April 25, 1944. It was fitted with the designed complement of four machine guns. It incorporated some of the ideas learned from the investigation into the cause of the loss of the first XP-55. It was found that stall characteristics could be improved by adding four-foot wingtip extensions of greater area and by increasing the limits of nose elevator travel. However, the first flight revealed that the increased elevator limits resulted in the pilot being able to hold such a high elevator angle during takeoff that the elevator could actually stall. After modifications, stall tests were performed satisfactorily, although the complete lack of any warning prior to the stall and the excessive loss of altitude necessary to return to level flight after the stall were undesirable characteristics.

An artificial stall warning device was introduced to try and correct some of these problems, and between September 16 and October 2, 1944, the second XP-55 (42-78846), which had been modified to the same standards as that of the third aircraft, underwent official USAAF trials. The trials indicated that the XP-55 had satisfactory handling characteristics during level and climbing flight, but at low speeds and during landings there was a tendency on the part of the pilot to overcontrol on the elevators because of a lack of any useful "feel". Stall warning was still insufficient, and stall recovery still involved an excessive loss of altitude. Engine cooling was also a problem.

The performance of the XP-55 was not very impressive and was in fact inferior to that of the more conventional fighters already in service. In addition, by 1944, jet-powered fighter aircraft were clearly the wave of the future. Consequently, no production was undertaken, and further development was abandoned.

The name *Ascender* had originated as a joke on the part of a Curtiss engineer. The name stuck, and eventually became official.

One XP-55 survives today. Its fuselage is on display at the Paul Garber facility in Suitland, Maryland. Perhaps it will someday be restored to better condition. I don't know its serial number.

Specs of the XP-55:

One 1275 hp Allison V-1710-95 (F23R) twelve-cylinder liquid-cooled Vee engine. Four 0.50-inch Colt-Browning M2 machine guns with 200 rpg. Maximum speed 390 mph at 19,300 feet, 377.5 mph at 16,900 feet. Normal range was 635 miles at 296 mph.

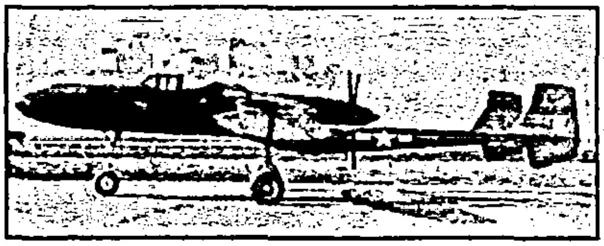
USAF Museum
WW II History

A Push For Performance

When war broke out in Europe in 1939, the Army Air Corps was substantially behind German and Great Britain in fighter aircraft development. It began an informal competition among aircraft designers and received a variety of fighter design proposals. Some never existed except on paper, but prototypes of other concepts were flight tested.

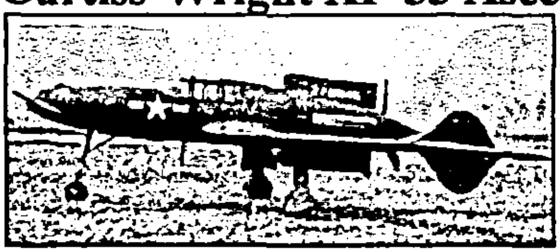
Among the most unusual designs were those single seat pusher-type fighters, in which the propeller was mounted behind the pilot. They appeared to offer better visibility, lower drag (air resistance), and the opportunity to carry more guns in the nose. Three such pusher designs actually were flight tested, the Vultee XP-54, Curtiss XP-55, and Northrop XP-56. None went into production, however. Performance generally was disappointing and due to the success of conventional fighters, the need for further testing of such unusual designs vanished.

Vultee XP-54 Swoose Goose



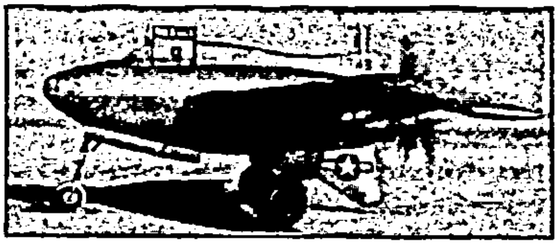
Designed as a fast climbing interceptor, its planned role was changed to that of bomber destroyer. One unconventional feature was the emergency system which ejected the pilot and seat downward out of the aircraft below the propeller arc. The Army Air Corps ordered two test aircraft in January 1941. The first made 86 test flights in 1943; the second only flew once. Although Vultee hoped it would reach a top speed of 510 mph., its maximum was 381. Engine development problems hindered the program and design revisions increased weight and dramatically reduced expected performance, causing program cancellation.

Curtiss-Wright XP-55 Ascender



The XP-55 tested a "canard" feature in which the tail assembly was eliminated and the elevators were mounted in the nose. The vertical tail surfaces were placed on the wing tips. A handle in the cockpit allowed the pilot to jettison the propeller if bail out became necessary in an emergency. Three XP-55s were built and the first one made its initial flight on July 13, 1943. Performance was disappointing, stability problems persisted, and the program was canceled.

Northrop XP-56 Black Bullet



The Northrop XP-56, was a tailless interceptor with a short fuselage mounted on a swept-back wing. It had two contrarotating propellers, each turning in the opposite direction. Other unusual features were its all magnesium, all welded airframe and the pilot's escape system. If he were forced to jump, he set off an explosive cord which blew away the propellers and the rear of the aircraft.

The first XP-56 made its maiden flight on September 6, 1943. It was destroyed later when a tire blew out. The second aircraft first flew on March 23, 1944, with a much larger dorsal vertical stabilizer to improve directional stability. The design still needed improvement and the program was canceled. By then the Army Air Forces was looking toward the introduction of jet propelled fighters.

USAF Museum Info — Driving Directions

1/?/1944

XP-80

First Flight

:teor. During its final check flights before being handed over to an
nerican test team, Grierson had one close call when he encountered se-
e aileron flutter during a high-speed dive. Fortunately, he was able to
d the plane safely, and eventually it was delivered to the Army Air
rces. Before returning across the Atlantic, however, Grierson was able
secure permission for a flight in a new experimental jet, one that he
sequently characterized as "the most delightful machine I had
vn":[8] the Lockheed XP-80.

'lo: SYLPH FROM THE "SKUNK WORKS"

XP-80 grew out of an AAF search for a combat-worthy jet fighter of countering any aircraft the Axis might come up with. In mid- they selected the Lockheed Aircraft Corporation to design the e, stipulating that the company use a British-designed De Havilland 'ord H-1B turbojet of 2,460 pounds thrust. Lockheed entrusted the enge to their chief research engineer, Clarence Johnson, known : popularly as "Kelly" Johnson. Kelly Johnson had received ad- ed degrees in aeronautical engineering from the University of Mich- before joining Lockheed in 1933. He had flown as a flight test engi- with many of the prewar aviation greats, including famed aviatrix lia Earhart, Wiley Post, and long-distance pioneer Sir Charles sford-Smith. Already Johnson had an enviable reputation, first as re- nt of the Lawrence Sperry Award for 1937 for "Important im- :ments of aeronautical design of high speed commercial aircraft," d while flight testing the original Lockheed Electra, and secondly he design and development of the twin-engine and twin-boom heed P-38 Lightning. With characteristic energy, Johnson as- ed a design team and set to work in strict secrecy—the origins of became the legendary "Skunk Works." The development contract ated that Lockheed would deliver a prototype of the plane ready for testing in 180 days. Working ten hours per day, six days per week, on and his small team completed the prototype XP-80 in only 143

'y in November 1943, Lockheed trucked the first XP-80 to Muroc's ke for flight testing. Dubbed *Lulu-Belle* by Lockheed engineers, st XP-80 was a trim, compact airplane with a low wing and ly faired engine intakes for the H-1B engine. By January 1944 nach-green plane was ready for flight. On the morning of January 1, Lockheed president Robert Gross, Kelly Johnson, and a small of Lockheed engineers gathered at the north end of Rogers Dry

e, heavily dressed against the bitter winds that swept across the bed from the surrounding hills. During the night, rains had flooded lakebed to a depth of several inches, but the winds had blown an- r section of the lake clear, and now, standing on the firm, hard clay the lake, Kelly Johnson and his design team awaited the moment of h. After a last-minute discussion, Lockheed's veteran chief test pilot, o Burcham, a renowned aerobatic pilot, climbed up into the XP-80, ed the bubble canopy, ran up the Halford engine, and took off. Sud- ly the pilot canceled the flight, landed, and taxied back to the tense group. In the excitement of the moment, mechanics had failed to ove a safety pin that prevented the landing gear from being retracted the ground, and Burcham had been unable to retract the gear after off.

Hurriedly, technicians removed the offending pin, and Burcham taxied for another try. The XP-80 lifted off smoothly, Milo Burcham held w until it built up speed, and then he pulled back on the stick. *Lulu-* e shot skyward and disappeared. At 20,000 feet, the pilot applied full ttle, and the XP-80 accelerated swiftly to 500 mph. Then he dived k to Muroc and put on an impromptu air show that left no doubt the Shooting Star had the performance of a winner. Using the Hal- engine, *Lulu-Belle* could climb at 3,000 feet per minute, hit 502 mph an 480 feet, and fly and fight up to 41,000 feet.

But events conspired to stop the XP-80 from entering service with the ford engine. Allis-Chalmers, supposed to produce the engine for the ted States, encountered production delays, forcing the Army Air rces to look for another engine as a substitute. At this critical juncture, a substitute engine not been available, the XP-80 might have dropped m the pages of aviation history, never to reappear. Instead, Lockheed already studied an advanced XP-80, using a General Electric engine lily at hand. This was the G.E. I-40, better known subsequently as reliable J33. The I-40 completed its first trial run on January 13, 4, shortly after the Halford-powered XP-80. Immediately recognizing potential, the Army Air Forces dropped plans to produce the XP-80 h the H-1B, and selected instead the more powerful I-40, authorizing kheed to build a prototype with the I-40 engine.

Once again, Kelly Johnson and his team set to work. In 132 days, a nomenal record, they constructed a similar-looking airplane, but ger and heavier: the XP-80A, known informally as the *Gray Ghost* use of its light gray external finish. It weighed 25 per cent more than original *Lulu-Belle* and featured a redesigned landing gear, longer fu- ge, revised internal equipment arrangement, pressurized cabin, and a er wingspread to keep down the wing loading. It could hit over 550 h at sea level, climb to 5,000 feet in slightly over a minute, and attain

XP-80 1/7/44

12/8/1943 & ?/?/1944
Summer

McDonnell XP-67

two prototypes were 42-11677 and 42-11678.

By the time that detailed design of the XP-67 got underway, the armament was changed to six 37-mm cannon with 45rpg in the inboard wing sections. The pair of Continental XI-1430-1 engines were fitted with General Electric D-1 turbosuperchargers and drove four-blade propellers. A unique idea was to use the engine exhaust to augment the thrust. The increased armament and other changes caused the estimated gross weight to rise to 20,000 pounds.

With the exception of armament, cabin pressurization equipment, and the oxygen system, the first XP-67 (42-11677) was ready by December 1, 1943. The aircraft had conventional ailerons rather than the planned drooping ailerons. By this time, the engines were XI-1430-17/19s, with D-23 turbosuperchargers. The Continental engines were rated at 1350 hp for takeoff and 1600 hp at 25,000 feet.

The initial flight tests of the XP-67 were delayed by fires in BOTH engines that broke out during a high-speed taxiing run at Lambert Field in St Louis on December 8, 1943. After being repaired, the XP-67 was trucked to Scott Field in Illinois. The first flight of the XP-67 took place there on January 6, 1944 with test pilot E. E. Elliott at the controls. However, this flight had to be abruptly terminated after only six minutes owing to engine problems.

The XP-67 was grounded while modifications were made to the engine compartments. A stainless-steel bulkhead was installed to seal off the turbosupercharger compartment from the rest of the engine, improvements were made to the cooling air circulatory system, and the aft ends of the engine cowlings were shortened. With these modifications, two test flights were completed successfully. However, on the fourth flight (on February 1, 1944), the Continental engines were deliberately overspeeded and the bearings burned out, forcing yet another emergency landing.

This mishap had damaged the Continental engines beyond repair, and since replacements were not immediately available, the XP-67 was returned to McDonnell in St Louis for modifications. Wind tunnel testing had suggested that the tailplane should be raised one foot in order to improve longitudinal stability, and this was done while the aircraft was awaiting replacement engines.

Test flying resumed on March 23, 1944, and five more successful flights were made during the month of May by USAAF test pilots. During this time, some problems were encountered with engine roughness, with improper aileron balance, and with unsatisfactory main undercarriage door closure. However, the USAAF pilots reported that the cockpit layout was adequate and that ground handling was satisfactory. Handling in the air was considered as being satisfactory and the roll rate was deemed to be good at high speed. The fighter was stable longitudinally, but it was neutrally stable laterally and tended to "Dutch roll".

However the performance of the XP-67 fell quite short of that which was promised. The takeoff run was excessively long, the initial climb rate was poor, and the acceleration was slow. The aircraft was clearly underpowered with its troublesome Continental engines, which failed to develop their design rating of 1350 hp, barely reaching 1060 hp.

Test flights continued throughout the summer of 1944. A dorsal fin and an additional two degrees of dihedral were added to the tailplane to improve lateral stablity. The XP-67 was scheduled to begin official performance tests in September, but before they could get underway a fire broke out in the right engine nacelle while test pilot E. E. Elliott was taking the XP-67 for a test flight. Elliott safely landed the aircraft, but the wind blew the flames over the fuselage and caused major damage to the structure.

The XP-67 was deemed to have been damaged beyond economical repair. This accident, plus the seemingly endless series of problems caused by the temperamental Continental engines, caused the USAAF to recommend that work on the XP-67 project be halted. On September 13, both McDonnell and the USAAF agreed that the project should be terminated. The contract was formally cancelled six weeks later.

The second prototype (42-11678) was cancelled before it could be completed. This prototype was to have been powered by I-1430 liquid-cooled engines with war emergency power ratings increased to 2100 hp. Contrarotating propellers were to be fitted in place of the handed propellers of the first prototype. There was even some talk of fitting a mixed powerplant arrangement to later production P-67s, with either a Packard V-1650 or an Allison V-1710 engine with two-stage supercharger in front of each engine nacelle and an I-20 turbojet in the rear of each nacelle. However, nothing ever came of these plans, since the USAAF requirement for long-range escort fighters was more than adequately satisfied by the North American P-51H Mustang, the Republic P-47N Thunderbolt, and later by the North American P-82 Twin Mustang.

The maximum speed attained by the XP-67 during tests was 405 mph at 15,000 feet and 357 mph at 10,000 feet. Initial climb rate was 2600 feet per minute, and service ceiling was 37,400 feet. Maximum range was 2385 miles. Weights were 17,745 pounds empty, 23,114 pounds loaded, 15,400 pounds maximum. Dimensions were wingspan 55 feet 0 inches, length 44 feet 9 1/4 inches, height 15 feet 9 inches, and wing area 415 square feet. The planned armament of six 37-mm cannon was never actually fitted.

Sources:

1. McDonnell Douglas Aircraft Since 1920: Volume II, Rene J. Francillon, Naval

04/24/1994

North American NA-98X

(Modified B-25H)

North American B-25 Mitchell - *Chapter 16* 04/24/44

NA-98X

Last revised: 29 May 1998

North American B-25 Mitchell
North American B-25 Mitchell - Chapter 15: B-25H
North American B-25 Mitchell - Chapter 17: B-25J

In early 1944, North American submitted a proposal to the Army Air Forces for an improved attack bomber, one which would provide the firepower of the B-25 strafers but with substantially improved performance. It was given the designation NA-98X by the company. Since it was not designed for any USAAF requirement, it never carried a USAAF designation. It was apparently intended as a lower-cost alternative to the heavily-armed Douglas A-26B Invader.

Power was to be provided by a pair of Pratt & Whitney R-2800 air-cooled radials, housed inside new low-drag cowlings and driving a pair of three-bladed propellers with large conical-shaped spinners. Armament improvements were to include a computing gunsight and a new North American-designed low-drag canopy for the top turret. A compensating sight was to be used in the tail turret, and illuminated reflector optical sights were to be used on the waist guns. The wing tips were square-cut rather than rounded, permitting the ailerons to be extended further outboard to provide better roll control.

The proposed aircraft was to be built in two different versions -- a medium bomber version and a strafer version. As a strafer, a solid nose with eight 0.50-inch guns with 400 rpg was to be fitted. In addition, two 0.50-inch upper turret guns with 400 rpg, two 0.50-inch tail guns with 600 rpg, and two 0.50-inch waist guns with 200 rpg were to be carried. A second strafer option involved the addition of four guns mounted in blisters on the side of the fuselage, for a total of no less than 18 guns. As a medium bomber, the solid nose was replaced by a transparent nose containing a bombardier, two fixed nose guns with 300 rpg and one flexible nose gun with 300 rounds.

The 302nd B-25H (serial number 43-4406) was chosen as a testbed for the modifications. The new aircraft was powered by a pair of Pratt & Whitney R-2800-16 engines with Bendix Stromberg carburetors. Large conical propeller spinners were used, and high-speed inlets for the carburetors were added at the top of the engine cowlings. The wing tips were square cut. Except for the removal of the fuselage blister gun pack, the aircraft had the same armament fit (including the 75-mm cannon) as the B-25H.

The first flight of NA-98X took place on March 31, 1944, test pilot Joe Barton being at the controls. He reported better speed and acceleration, reduced vibration, and a higher roll rate. War emergency power could bring the aircraft to 10,000 in 4.9 minutes and in 5.3 minutes at military power. A maximum speed of 328 mph could be achieved at sea level with war emergency power.

It was recognized that the increased power of the R-2800 engine, acting in concert with the increased aileron area and reduced stick forces, might make it possible to operate the aircraft in performance regimes where excessive bending moments could be imposed on the wings, maybe even leading to catastrophic failure and loss of the aircraft. Consequently, during flight testing, the maximum airspeed was restricted to 340 mph and a normal acceleration of no greater than 2.67g.

On April 24, 1944, the NA-98X was taken up for a test flight by Maj. Perry Ritchie and Lt. Winton Wey. During a low speed pass over Mines Field, the aircraft disintegrated in mid-air and crashed, killing both pilots. An investigation showed that both outer wing panels had been ripped off the aircraft during the low-speed pass, the plane having been flown beyond its structural limitations by its crew. Following the crash, all further work on the NA-98X project was abandoned.

North American B-25 Mitchell
North American B-25 Mitchell - Chapter 15: B-25H
North American B-25 Mitchell - Chapter 17: B-25J

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Maintained by Carl Pettypiece

07/?/1944

Republic XP-72

07/ 144

Republic XP-72

Last revised March 12, 2000

The Republic XP-72 was Alexander Kartveli's proposal for a replacement for his fabulously successful P-47 Thunderbolt. It was evolved in parallel with the XP-69 escort fighter project.

The XP-69 was a completely new design, whereas the XP-72 was a more-or-less straightforward progressive development of the P-47 Thunderbolt. The XP-72 was the first fighter to be designed around the huge 28-cylinger Pratt & Whitney R-4360 Wasp Major, the most powerful piston engine produced during World War 2. The engine was close-cowled and was fan-cooled. The Wasp Major was to have driven a pair of three-bladed Aeroproducts contrarotating propellers. The wing and tail of the P-47D were to be retained, but the airframe was enlarged and strengthened. The turbosupercharger was still located aft of the cockpit as it was in the P-47, but the turbosupercharger intake was moved to a position just underneath the cockpit rather than in the extreme nose. The lower fuselage was modified to allow for the larger air intake for the turbosupercharger. The XP-72 was to have been fitted with a bubble-type canopy, similar to that used by the late production blocks of the P-47D. Compressibility recovery flaps were fitted. Armament was to consist of six wing-mounted 0.50-inch machine guns, and two 1000-pound bombs were to be carried on underwing shackles.

The greater promise displayed by the XP-72 caused the USAAF to cancel the XP-69 project in favor of the XP-72. Two XP-72 prototypes were ordered on June 18, 1943. Serial numbers were 43-36598 and 43-36599. Some sources have these serials as being 43-6598 and 43-6599, but these appear to be in error since they conflict with a batch of P-51 Mustang serials.

XP-72 Ser No 43-36598 flew for the first time on February 2, 1944. Power was provided by a 3450 hp Pratt & Whitney R-4360-13 Wasp Major air-cooled radial engine. Since delivery of the planned Aeroproducts contrarotating six-bladed propeller had been delayed, the first XP-72 was equipped with a single four-bladed propeller as a temporary stop-gap measure. Nevertheless, the performance was excellent, a maximum speed of 490 mph being reached in flight tests. The second XP-72 (43-36599) flew for the first time on June 26, 1944. It was fitted with the Aeroproducts contrarotating propellers, which had finally been delivered. Unfortunately, the second XP-72 was written off in a takeoff crash early in its test flight program.

In spite of the loss of the second prototype, the USAAF was so impressed with the performance of the XP-72 that they ordered one hundred P-72 production variants. These P-72s were to have the R-4360-19 engine and were to be provided with an optional choice of four 37-mm cannon as an alternative for the six 0.50-in machine guns. It was anticipated that speeds in excess of 500 mph would be attained.

However, the changing character of the war created a greater need for long-range escort fighters than for high-speed interceptors, and the USAAF rapidly lost interest in the XP-72 project. The order for the one hundred P-72s was cancelled. The advent of jet-powered fighters which promised even more spectacular performance was undoubtedly also a factor. The surviving XP-72 (43-36598) is thought to have been scrapped at Wright Field at about the time of V-J Day.

Specification of Republic XP-72:

Powerplant: One 3450 hp Pratt & Whitney R-4360-13 Wasp Major air-cooled radial engine. Performance: Maximum speed was 490 mph at 25,000 feet. Normal range was 1200 miles at 300 mph and maximum range was 2520 miles at 315 mph with two 125 Imp. gall. drop tanks. Initial climb rate was 5280 feet per minute, and climb rate at 25,000 feet was 3550 feet per minute. An altitude of 15,000 feet could be reached in 3.5 minutes, 20,000 feet in 5 minutes. Service ceiling was 42,000 feet. Weights were 11,476 pounds empty, 14,433 pounds normal loaded, 17,490 pounds maximum. Dimensions were wingspan 40 feet 11 inches, length 36 feet 7 inches, height 16 feet 0 inches, and wing area 300 square feet.

Sources:

1. Fighters of the United States Air Force, Robert F. Dorr and David Donald, Temple Press Aerospace, 1980.
2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion, 1987.
3. American Combat Planes, Third Enlarged Edition, Ray Wagner, Doubleday, 1982.
4. War Planes of the Second World War, Fighters, Volume 4, William Green, Doubleday, 1964.

10/02/1944

XP-77

10/2/44

requested by the USAAF. At that time, it was decided to install the unsupercharged XV-770-6 engine (which offered the same power up to 12,000 feet altitude) as a temporary measure for initial flight test trials, pending the availability of the supercharged XV-770-9.

It soon became apparent to the Bell design team that the XP-77 as originally planned would be seriously overweight, which if left uncorrected would result in an aircraft which offered no appreciable advantage in performance over aircraft already in production. Consequently, the Bell engineers undertook a drastic reduction program to cut the weight of the aircraft down to 3000 pounds. This rework caused costs to rise and the date of delivery of the first prototypes to be delayed. Because of the incessant delays and cost overruns, the USAAF cut the XP-77 order back to only two examples on August 3, 1943. The USAAF agreed that the engine was to be the V-770-7, the AAF designation for the Navy's V-770-6. No further consideration was given to the supercharged V-770-9.

Since Bell was already heavily committed to the P-39, P-63, and P-59 programs, the company began to request more and more delays in the XP-77 program. There were delays in the delivery of the wooden wings from the Vidal Research Corporation subcontractor, and there were problems with undercarriage retraction.

The two XP-77s were finally delivered in the spring of 1944. Serial numbers were 43-34915 and 43-34916. The low-mounted cantilever wing had a single-spar structure with stressed skin. The wing and the fuselage were largely constructed of resin-bonded laminated wood. The tricycle landing gear was electrically-operated. The nosewheel retracted rearwards into the fuselage, and the main landing gear retracted inwards into wheel wells in the wing. The flaps were manually controlled.

Test pilot Jack Woolams took the first XP-77 on its maiden flight on April 1, 1944 (April Fool's Day, no doubt a portent of things to come). Test flights showed that the performance was disappointing, a speed of only 330 mph at 4000 feet being attained. The takeoff run was excessively long, and test pilots complained that there were some unfavorable vibrations at certain engine rpm because of the total lack of engine support vibration-damping mounts.

The second XP-77 went to Elgin Field for fuel consumption and operational suitability trials. On October 2, 1944, this aircraft crashed after getting into an inverted spin as the result of a botched Immelmann maneuver. The pilot was forced to parachute to safety, and the aircraft was destroyed.

Flight trials continued with the first XP-77, but the USAAF was disappointed by the aircraft's relatively poor performance. The performance of the XP-77 was actually inferior to that of aircraft already in service. In addition, by that time in the war, any danger of an

12/16/1944

Douglas XB-42
"Mixmaster"

fire was rather limited, but it was assumed that the bomber's high speed would prevent any enemy fighter attacks except from the extreme rear.

The crew consisted of three, with a navigator/bomb-aimer in the glazed nose section, and a pilot and co-pilot/gunner in a side-by-side cockpit with small separate canopies.

The first XB-42 aircraft (43-50224) was completed in May of 1944. The XB-42 took off for the first time on May 6, 1944, with test pilot Bob Brush at the controls. As a safety measure, the initial flight was carried out entirely over Palm Springs Army Air Base. The performance of the XB-42 was outstanding. Speed was within a percent of that predicted, and range and rate of climb exceeded expectations. The XB-42 was as fast as the Mosquito B. Mk. XVI but carried twice the maximum bombload (8000 pounds versus 4000 pounds over short ranges or a bombload of 3750 pounds versus 1000 pounds over a range of 1850 miles). Moreover, the XB-42 carried a defensive armament of four 0.50-inch machine guns in two remotely-controlled turrets whereas the Mosquito was unarmed. However, the twin "bug-eye" canopies of the XB-42 were found to interfere with pilot/co-pilot communication, and the aircraft suffered from yaw, excessive propeller vibration (especially when the bomb-bay doors were open), poor harmonization of control forces, and from poor efficiency of the cooling ducts.

The second XB-42 prototype (43-50225) flew on August 1, 1944. It was powered by V-1710-129 engines. Shortly after its first flight, the twin bug-eye canopies were replaced with a single canopy as was proposed for production versions of the aircraft. In early December of 1945, 43-50225 was flown from Long Beach, California to Bolling Field near Washington, D.C. at an average speed of 433.6 mph. However, on the 16th of December, the aircraft crashed near Bolling Field and was destroyed. Fortunately, the crew managed to parachute to safety.

By this time, the USAAF had decided that the XB-42 would not be put into production, since the end of the war had made it possible to wait for the more advanced, higher-performance jet-powered bombers that should soon be forthcoming. The surviving XB-42 was allocated to various test purposes.

One of these modifications resulted in the replacement of the -125 Allisons by a pair of 1375 hp Allison V-1710-133 engines. In addition, two 1600 lb.s.t. Westinghouse 19XB-2A axial-flow turbojets were installed underneath the wings. With these changes, the aircraft was redesignated XB-42A, and flew for the first time at Muroc Dry Lake, California on May 27, 1947. A total of 22 flights with the XB-42A were carried out by Douglas flight test crews, accounting for a total of 17 hours in the air. A maximum speed of 488 mph was achieved during the tests. On August 15, 1947, the XB-42A made a hard landing in the tail-low position, damaging the lower vertical stabilizer and lower rudder, and the aircraft was returned to Santa Monica late in 1947 for modifications of the jet nacelles.

The remainder of the XB-42 modification program was canceled in August of 1948, and the XB-42A was struck off charge on June 30, 1949. It was turned over to the National Air and Space Museum. For several years thereafter, it was kept at the National Air Museum Storage Facility in Park Ridge, Illinois. In April of 1959, the fuselage of the XB-42A was moved to the Paul Garber restoration facility at Suitland, Maryland, where I assume it still remains. Has anyone seen it?

Specification of Douglas XB-42 Mixmaster:

Powerplant:

Two Allison V-1710-125 liquid-cooled V-12 engines, each rated at 1325 hp for takeoff and 1800 hp war emergency.

03/20/1945

LOCKHEED XP-80A

"TONY LAVIER"

03/20/45

Lockheed XP-80A Shooting Star

Last revised July 16, 1999

In September 1943, even before the XP-80 had made its first flight, Lockheed had proposed a larger and heavier L-141 version powered by the more powerful General Electric I-40 "Whittle" turbojet engine (later produced by both General Electric and Allison as the J33). The USAAF was sufficiently impressed that they issued a contract for two examples under the designation XP-80A. Serials were 44-83021 and 44-83022.

The General Electric I-40 engine that powered the XP-80A had a thrust of 4000 pounds, and was fed by intakes relocated a bit further aft to a position just below the cockpit windshield. The XP-80A was significantly larger and about 25 percent heavier than the XP-80 prototype in order to accommodate the larger engine. The wingspan was 39 feet 0 inches, two feet greater than that of the XP-80, but wing area was reduced to 237.6 square feet by using a narrower chord. Length was increased from 32 feet 10 inches to 34 feet 6 inches. Height increased to 11 feet 4 inches. Weights were considerably greater than those of the XP-80, being 7225 pounds empty, 9600 pounds gross, and 13,780 pounds maximum takeoff. The increased weight required a stronger undercarriage. Ammunition capacity increased from 200 to 300 rounds per gun, and internal fuel capacity increased from 285 to 485 US gallons. In contrast to the XP-80, the XP-80A was fitted with a pressurized cockpit.

XP-80A 44-83021 flew for the first time on June 10, 1944. It was followed on August 1 by XP-80A 44-83022. 44-83022 was fitted with a second seat which could carry an engineering observer. Early in the test program the XP-80A experienced excessively-high cockpit temperatures due to a faulty cabin pressurization valve. This problem was easily fixed, but there were more serious problems encountered with an unstable airflow through the intake ducts. Kelly Johnson took a ride in the rear seat of 44-83022 in order to try and figure out what was causing the problem. Kelly Johnson was an extremely talented aeronautical engineer, and he correctly diagnosed the cause as being boundary layer separation along the walls of the duct. The problem was solved by adding a series of boundary layer bleeds along the upper edges of the ducts. This feature was added to all subsequent production aircraft.

The second XP-80A became the first in the Shooting Star series to carry a 165 US-gallon drop tank underneath each wingtip. When carried, these tanks actually lowered rather than increased the drag. They could be brought home empty with no penalty in aerodynamic drag. The tanks also improved aileron effectiveness and wing loading.

6 mi SE of Rosemond

The first XP-80A crashed after an engine failure on March 20, 1945, but test pilot Tony LeVier managed to parachute to safety and escaped with only back injuries. The second XP-80A was later used as a testbed for the Westinghouse J34 axial-flow turbojet in support of the XP-90 program.

Serial numbers:

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44-83021/83022  Lockheed XP-80A Shooting Star
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However, the J36 program ran into difficulties and ultimately failed to produce anything useful. In September 1943, Lockheed proposed as an alternative a larger and heavier L-141 version, to be powered by a General Electric I-40 (later produced by both General Electric and Allison as the J33). The USAAF was sufficiently impressed that they issued a contract for two XP-80As. Serials were 44-83021 and 44-83022.

A flyable Halford engine was delivered to Lockheed in mid November of 1943. The de Havilland-built Halford H.1B turbojet had a bench thrust of 3000 pounds at 10,500 rpm and an installed thrust of 2460 pounds at 9500 rpm. On November 17, 1943, while the H.1B engine installation in the XP-80 was undergoing ground testing, both intake ducts collapsed, and the ingestion of debris damaged the engine. While waiting a replacement engine, the ducts were strengthened. The British selflessly rushed over a replacement engine which had been intended for the number 2 Vampire fighter. The replacement engine arrived on December 28 and was promptly installed in the XP-80. The XP-80 was finally ready for its maiden flight.

The first flight of the XP-80 took place on January 8, 1944 with test pilot Milo Burcham at the controls. The first flight had to be cut short after only five minutes because of undercarriage retraction failure and the pilot's concern over boosted aileron sensitivity. These problems were quickly fixed. Subsequent test flights reached a top speed of 502 mph at 20,480 feet, the XP-80 becoming the first USAAF aircraft to exceed 500 mph in level flight. However, the flight tests also disclosed a number of problems including bad stall and spin characteristics, an excessively-high stick force, unsatisfactory fuel management systems, and poor engine reliability and performance. At low speeds, it had a tendency to stall and roll sharply to the right with little or no warning. These problems were addressed one-by-one. The original blunt-tipped wing and tail surfaces were replaced with rounded tips after the fifth flight, and sharp leading edge fillets were added at the wing roots. The tailplane incidence was increased by 1 1/2 degrees.

The XP-80 weighted 6287 pounds empty and 8196 pounds loaded. Dimensions were wingspan 37 feet 0 inches, length 32 feet 10 inches, height 10 feet 3 inches, and wing area 240 square feet. During tests, the XP-80 reached a top speed of 502 mph at 20,480 feet, becoming the first USAAF aircraft to exceed 500 mph in level flight. Service ceiling was 41,000 feet, and initial climb rate was 3000 feet per minute. The aircraft was armed with six 0.50-inch Browning M2 machine guns with 200 rounds per gun.

The XP-80 was eventually transferred to the 412th Fighter Group for tactical evaluation. Following that, the aircraft was returned to Muroc before being assigned to the AAF Training Command at Chanute Field in Illinois. The XP-80 survived all of these evaluation trials, and on November 8, 1946, it was transferred to the Smithsonian ~~Institution for eventual display. Restoration work was completed in May of 1978. I~~ presume that it is now sitting somewhere at the Paul Garber Restoration Facility, awaiting the availability of a suitable location for its display.

XP-80 Serial Number:

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44-83020        Lockheed XP-80 Shooting Star
                  c/n 140-1001
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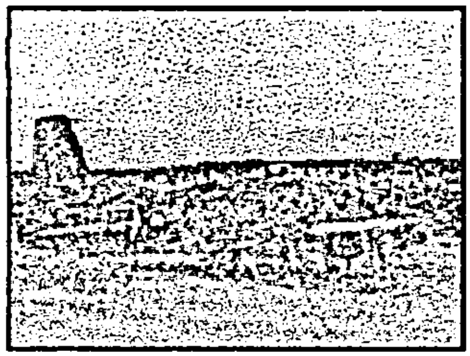
Sources:

1. War Planes of the Second World War, Fighters, Volume 4, William Green,
2. The Ameri

ABOUT EDWARDS – HISTORY

Lockheed XP-80 and XP-80A



Of all the tests conducted at Muroc (later Edwards Air Force Base) during the war years, none was more important than those which got underway on Jan. 8, 1944, as a small group of people assembled on the lake bed to witness the first flight of a new single-engine jet prototype.

Brainchild of Clarence L. "Kelly" Johnson, the top secret XP-80 (photo) had been designed and built by Lockheed's fledgling "Skunk Works" in just ***143*** days. Test pilot Milo Burcham put on an impressive display that morning, as the aircraft accelerated to a speed of 490 mph and, during official Army Air Force (AAF) acceptance tests flown by Maj. Wally Lein just over a month later, the XP-80 became the first American airplane to exceed 500 mph in level flight. Nicknamed "Lulu Belle" by Lockheed personnel, the small airplane was configured with a British-built DeHavilland Halford H-1B centrifugal-flow turbojet which provided 2,460 pounds of static thrust.

The XP-80, however, was really just an aerodynamic test bed for a much larger airplane, the XP-80A (photo) which was powered by a General Electric I-40 centrifugal-flow turbojet providing more than 4,000 pounds of thrust.

With famed Lockheed test pilot Tony LeVier at the controls, this airplane completed its maiden flight at Muroc just six months later, on June 10, 1944. The XP-80A achieved a top speed of more than 550 mph and, in operational suitability tests conducted at Muroc in late 1944, proved that it could successfully attack bomber formations even when outnumbered 6-to-1 by the very best prop-driven fighters of the day. The AAF knew it had a winner and thus the aircraft served as the prototype for America's first combat-worthy jet fighter, the P-80 *Shooting Star*.

Delivery of production-model P-80s got under way as early as February 1945. Although it was not produced in sufficient quantities to enter combat before the end of World War II, the P-80 was capable of speeds approaching 600 mph and it was arguably the finest jet fighter in the world at that time. It convincingly demonstrated just how far and how fast the United States had come in the three short years since the initial flight of America's first jet, the XP-59A (photo). With the development of the *Shooting Star*, the AAF had moved from the back of the pack into the forefront of the turbojet revolution and it was the compelling requirement to continue to accelerate turbojet development that, more than anything else, virtually guaranteed that Muroc would become the center of American flight research in the postwar period.

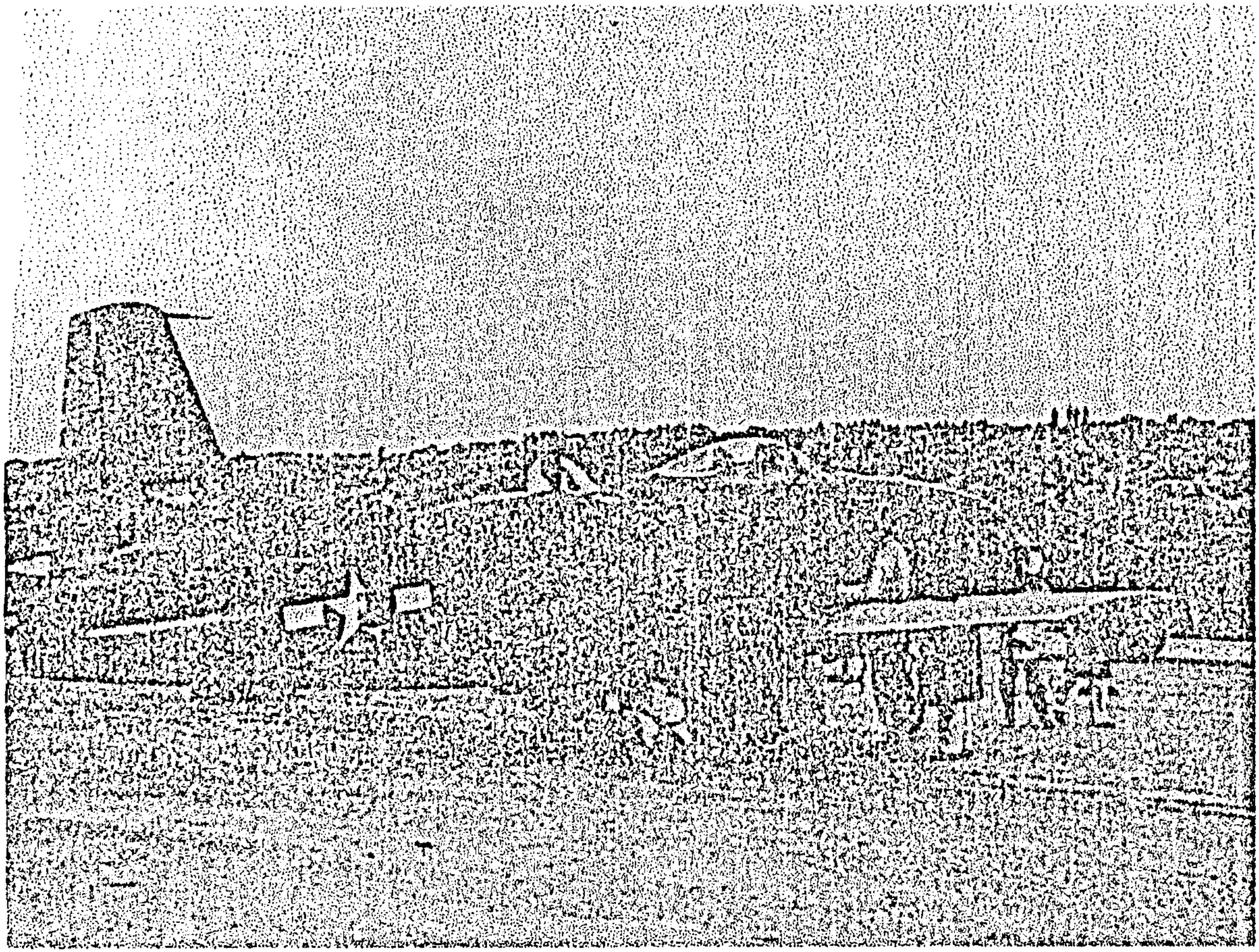
Flight Test Program:
1 XP-80 and 2 XP-80As were tested at Muroc from January 1944 through early 1945. The aircraft served as concept demonstrator and prototypes for the first U.S. single- engine jet fighter.

Airframes:
XP-80: Length = 32'10"; Wingspan = 37'; Max. gross weight = 8,916 lbs; Empty weight = 6,287 pounds.

Powerplant: DeHavilland Halford H-1B providing 2,460 pounds of static thrust.

Max. Speed = 502 mph. Max. Altitude = 41,000 feet.

XP-80A: Length = 34'6"; Wingspan = 39'11"; Max. gross weight = 13,780 lbs; Empty weight = 7,225 lbs.



11/14/45
10/20/44

Lockheed YP-80A Shooting Star

Last revised July 16, 1999

Thirteen YP-80A service test aircraft were ordered on March 10, 1944. Serials were 44-83023 through 44-83035. They were generally identical to the XP-80A and were powered by the General Electric I-40 turbojet, the production model of which was designated J33-GE-9 or -11. Armament was increased to six 0.50-in machine guns in the nose.

The USAAF wanted a photographic reconnaissance aircraft with the performance of the P-80, and, on September 23, 1944, they ordered that the second YP-80 (44-83024) be completed as an unarmed photo-recon ship. It was assigned the designation XF-14, the F designation being in the pre-1948 F-for-photographic reconnaissance series. In converting the aircraft to XF-14 configuration, the six 0.50-in machine guns in the nose of the YP-80A were taken out and replaced by a set of cameras. A window for the camera was built into the lower nose section in front of the nosewheel. The sides of the nose were left unblemished, unlike later P-80 reconnaissance models which had cameras on the side of the nose ahead of the air intakes. The career of the XF-14 was rather brief--it was destroyed on December 6, 1944 in a midair collision with a Lockheed-owned B-25 Mitchell during a test flight.

The first YP-80A took off on its maiden flight on September 13, 1944, beginning the manufacturer's trials. The trials got off to a horrible start. The third YP-80A (44-83025) crashed on its maiden flight on October 20, 1944, killing the well-known test pilot Milo Burcham.

In spite of the loss of the third YP-80A, four YP-80As were deployed to Europe in order to demonstrate their capabilities to combat crews and to help in the development of tactics to be used against Luftwaffe jet fighters. YP-80As 44-83026 and 44-83027 were shipped to England in mid-December 1944, but 44-83026 crashed on its second flight at Burtonwood, England, killing its pilot, Major Frederick Borsodi. 44-83027 was modified by Rolls-Royce to flight test the B-41, the prototype of the Nene turbojet. On November 14, 1945, it was destroyed in a crash landing after an engine failure. 44-83028 and 44-83029 were shipped to the Mediterranean. They actually flew some operational sorties, but they never encountered any enemy aircraft. Both of them fortunately managed to survive their tour of duty in Europe, but one of them crashed on August 2, 1945 after returning to the USA. The other one ended its useful life as a pilotless drone.

The remaining nine YP-80As were used for a variety of purposes, including operational evaluation and service trials. The first YP-80A was specially instrumented and was used by NACA at the Ames Aeronautical Laboratory at Moffett Field in California for high-speed diving trials. The tenth, eleventh, and twelfth YP-80As were delivered in 1945 to the 31st Fighter Squadron of the 412th Fighter Group at Bakersfield Municipal Airport in California for service tests.

Serial numbers:

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44-83023        Lockheed YP-80A Shooting Star
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07/09/45 @ P-80 crashed in dead stick landing failure
08/06/45 R Bong crash Burbank

08/06/1945

F-80A

Richard Bong

ARMY AIR FORCES

REPORT OF MAJOR ACCIDENT

Use this form in accordance with AAF Reg. 62-14 and "Aircraft Accident Investigator's Handbook" issued by Office of Flying Safety, Headquarters, AAF.

Fill in all spaces except where otherwise indicated.

If additional space is needed, use additional sheets and identify by proper section letter and subsection number.

	Date
	8-6
	8-17

46-8-6-2 / 1-8-6-1

Section A—GENERAL INFORMATION

1. Place of Accident	2. Nearest Army Airfield
California, Los Angeles, Burbank	Glendale, AAF

3. Was Collision With Other Aircraft?	4. AF No. of Aircraft Involved	Date	Hour and Time Zone
☐ Yes ☒ No	44-85048	6 Aug. 45	14:30 PWT

Section B—AIRCRAFT

1. Aircraft No.	2. Type	Model	Series	3. Home Station
44-85048	P-80A	1	LO	Lockheed Aircraft Corporation, Burbank, Calif

4. Air Force or Command	Subcommand	Wing	Group No. and Type	Squadron
WD/ATSC	AAFPR, Lkd. Aircraft			

5. Date of Manufacture	Total Hours	Date Last Overhaul	Overhauling Depot or Facility	Hours Since Overhaul
New	45 Min.			

Section C—OPERATOR (Person at controls at time of accident)

1. Last Name	First Name	Middle Initial	Grade	Branch	ASN		Age
BONG	RICHARD	I.	Major	Air Corps	O-433784		24

2. Assigned Station	AF or Command	Subcommand	Wing	Group No. and Type	Squadron
AAFPR Lockheed Aircr.					

4. Aeronautical Rating	Personnel Rating	Date Rated	
☒ Yes ☐ No	Pilot	1-9-42	4038th B.U.

Section D—OPERATOR'S FLYING EXPERIENCE

Flying Time		
1. Total Hours	1158:20	
2. Hours This Type	4:15	
3. Hours This Model	4:15	
4. Hours Last 6 Months	20:40	
5. Hours Last 90 Days	17:15	
6. Hours Last 30 Days		
7.	200 Combat Missions 500 Combat Hours	

Primary Flight Training, Tulare, Calif. Completed; Basic Fl. Tr. Gardner Fld. Cal.; Comp. Advanced Flight Tr., Luke Field, Ariz. Comp.; Aerial & Ground Gunnery, Matagorda Peninsula, Tex.

11. INSTRUMENT RATING	
Type: Wh.	Date: 1 May 1945

☐ Yes ☒ No

Section E—PERSONNEL INVOLVED

	Name		ASN	Grade and Branch		Assignment		
P.	Bong, Richard I.	Jr.	O-433784	Major, A.C.	01	4038th BU/ATSC Lkd. Airc. Corp.	Fatal	X

1272.00

Section F—DAMAGE

1. To Aircraft	Fuselage - total destruction, wings - total destruction, stabilizer partially in tact, rudder - total destruction.

	1	2	3	4
2. To Engines	Major 3	-	-	-
3. To Propellers	No Propellers /	-		

4. To Private Property (Explain on Attachment)

None

Section G—POWER PLANT FAILURE

	(1)	(2)	(3)	(4)
2. Engine Model	J33-9			
3. Engine No.	Allison #070757			
4. Engine-Hours Since Last Major Overhaul	New			
5.	None			
6. Total Engine-Hours	45 Min.			
7. Propeller Model	None			
8. Propeller-Hours Since Major Overhaul	None			

9. Statement of Overhaul, if Available, on Records of Power Plant and Malfunctioning or Operating Instruments

Destroyed

10. Statement of Engineering Officer, Mechanics, and Others as to What Failed and Probable Reason Why

Power Plant Malfunction, See Section M - Description of the Accident

11. Octane Rating of Fuel	Engineering Officer
None - Kerosene	MARVIN R. JONES, 1st Lt., Air Corps, [illegible] (ATSC)

Section H—AIRFRAME, LANDING GEAR, OR OTHER MATERIEL

(Use this section if materiel failure was a contributing cause factor in the accident. This must be signed by engineering officer)

1. Describe the Materiel Failure, Including Subsequent or Kind of Part at the Time of Failure and Any Reasons Which Might Have Contributed Toward the Failure

None

Section I—SPECIAL EQUIPMENT

None

Section J—AIRPORT AND FACILITIES AND AIRWAYS

1. Remarks

None

Section K—WEATHER (This must be signed by weather officer of the reporting station)

1. What Was the Weather at the Time and Place of the Accident

CAVU - Wind Negligible 5 Miles S

2. If Weather Was a Factor in this Accident, State How and Attach Copy of Weather Reports

Was Not a Factor

WEATHER OFFICER (Name, Grade, and Station)

Section L—GENERAL INFORMATION

1. If Error on the Part of Someone Other Than the Operator Was a Factor, State How

Not a Factor

2. What Was the Mission

Routine Acceptance Flight

3. Did Pilot Carry Out Mission: ☒ Yes ☐ No

4. Were There Any Violations or Orders or Regulations (Explain)

None

5. Disciplinary Action Taken or Contemplated

None

6. Kind of Clearance (Attach Form 23): C.F.R.

From: Lockheed Air Terminal, Burbank

7. If UR Form 54 Has Been Submitted on Any Factors Involved in this Accident, State No. and Date

No.: None

Remarks Fully and Attach Copy

None

8. Are Copies of AAF Forms 1, 1A, Attached: ☒ Yes ☐ No

9. Are Photos Attached: ☒ Yes ☐ No

Section [illegible]—DESCRIPTION OF THE ACCIDENT

A. 1. At 14:15 P-80A Airplane Serial 44-[illegible] was towed to the starting line, external power was plugged in and pilot was in cockpit. An Army Inspector observed the start and [illegible]. All instruments and engine operated normally. The [illegible] towed the airplane to taxi strip and released it. Pilot [illegible] power to end of Runway 17 calling [illegible] a flight clearance at that time. Flight Clearance was obtained and take-off was started. It appeared that full power was obtained from engine prior to pilot releasing brakes. A normal ground run was observed becoming airborne after approximately a 2500 to 3000 foot run. [illegible] appeared normal and ship continued the average climb on out of field for that type aircraft.

2. Some witnesses state fuel was seen leaving in vapor form from right wing, while others state light smoke was seen leaving tail cone of subject aircraft during early portion of take-off run. At south end of field [illegible] take-off path aircraft appeared to be approximately 150 feet high. Approximately 500 feet beyond south end of field power was heard to drop off and aircraft settled slightly. A large puff of white smoke was seen to leave the tail cone. An instant later the resumed of power was heard and the ship pulled up slightly climbing and making shallow turn to right. Continued on in a general climb for approximately ½ mile forward obtaining an altitude of approximately 400 feet, at which point the hatch was released and seen to fall to the ground. At the time hatch was released, ship appeared to rock wings slightly and continued on for approximately three (3) to five (5) seconds, nose still slightly high and then moved over abruptly with right wing dropping simultaneously at which time it is believed the pilot attempted to abandon ship. The aircraft continued on down making approximately ½ turn before impact with ground, exploding and disintegrating almost completely with instant fire starting over a radius of approximately 300 feet.

3. From witnesses statement near scene of crash, it is the opinion of the board that the pilot cleared the cockpit shortly after aircraft began its downward dive, following the ship very close. Evidence of shroud lines parachute attached to some leading edge portion of tail surface and rip cord being pulled indicate chute fouled in tail surface.

B. Partial power plant failure is the contributing factor.

C. In view of the facts, this board is of the opinion the J-33 power plant accessories and fuel system is not completely through the experimental stage of development and should not be considered for production aircraft until extensive tests have proven its safety for service operations. In view of the foregoing statement it is recommended that two P-80 production aircraft be released for experimental flight test [illegible] Flight Test Base and only to be flown at that base until the attached recommended test program (Exhibit [illegible]) has been completed and satisfactory results obtained. It is believed the subject test program will determine some of the unknown [illegible] power plant [illegible] fuel system continues to fail with the cause being undetermined by the power plant manufacturer, the aircraft manufacturer, and in most cases the Army Aircraft Accident Committee.

Action Taken: (1) All P-80 type aircraft grounded.
(2) Test program submitted.

ACCIDENT INVESTIGATING BOARD FROM REPORTING STATION, EACH MEMBER MUST SIGN		Station: 4035th B.U. (ATSC)			
Name: Charles J. Langmack		Name: Phillip R. Cook		Name: William [illegible] Butler	
Grade: Lt. Col. A.C.	Organization: 4035th B.U. (ATSC)	Grade: Capt. A.C.	Organization: 4035th B.U. (ATSC)	Grade: 1st Lt.	Organization: 4035th B.U. (ATSC)
Name: Marvin R. Jones		Name—Medical Officer:		Name: Marvin R. Jones	
Grade: [illegible] Lt. A.C.	Organization: 4035th B.U. (A[illegible]	Grade:	Organization:	Grade: [illegible] A.C.	Organization: 4035th B.U. (ATSC)

DATE	STATION	AIRCRAFT MODEL
8-6-45	Lockheed Aircraft Corp.	P-80A-1-LO

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CREW CHIEF OR AERIAL ENGINEER	SQUADRON NO. & TYPE	AIRCRAFT SERIAL NO.
D. Haughton		44-85048

PERS. CLASS	— PRINT PLAINLY — NAME — ASN. — GRADE — ORGANIZATION	USE AS DIRECTED LOCALLY	ALWAYS ENTER DUTY SYMBOLS. WHEN APPLICABLE, ENTER N - NIGHT OR I - INSTRUMENT. ENTER TIME FLOWN THEREUNDER	FLIGHT DATA — TERMINALS AND MISSION	NO. OF LANDINGS	
1	2	3	4 / 5 / 6 / 7	8		9
01	BONG, RICHARD I. Major, Air Corps. 0-433784		1.5	FROM: BU		14 : 20
				TO: BU		14 : 215
				MISSION: A	1	00 : 015
	This is Certified True Copy:			FROM:		:
	Marvin R. Jones			TO:		:
	MARVIN R. JONES 1st. Lt., Air Corps			MISSION:		:

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RESTRICTED

WAR DEPARTMENT A. A. F. FORM NO. 1 REV. (1 JAN. 44)

AIRPLANE FLIGHT REPORT - OPERATIONS

CHECKED: LEGIBLE AND CORRECT — OPER. CLERK

TRANSCRIBED: TOTAL FLIGHT TIME ENTERED ON FORM 1A — CREW CHIEF

TOTAL FLIGHT TIME

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WAR DEPARTMENT
A. A. F. FORM NO. 1 A
REV. (1 JAN. 44)

AIRPLANE FLIGHT REPORT — ENGINEERING

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INSPECTION STATUS	DATE OF OR HOURS DUE	INSPECTED TODAY BY	STATION
PREFLIGHT	8-6	DH	Lockheed
DAILY	8-6	DH	Aircraft
25 HOURS	25		Corp.
50 HOURS	50		
100 HOURS	100		

SERVICING AT STATION OF TAKE-OFF (CHECK IMMEDIATELY BEFORE TAKE-OFF)

SERVICE	FUEL (GALLONS) SERVICED	FUEL IN TANKS	OIL NO. 1 SERVICED	OIL NO. 1 IN TANKS	NO. 2 SERVICED	NO. 2 IN TANKS	NO. 3 SERVICED	NO. 3 IN TANKS	NO. 4 SERVICED	NO. 4 IN TANKS	RADIATOR CHECKED
1ST	300	420	0	14							
2ND											
3RD											
4TH											
5TH											

INSPECTION OF AUXILIARY EQUIPMENT

EQUIPMENT	SYMBOL	INSPECTED BY	STATION
BOMBARDMENT			
GUNNERY			
CHEMICAL			
COMMUNICATIONS	OK	DH	Lodkheed
PHOTOGRAPHIC			Aircraft
NAVIGATION	OK	DH	Corp

STATUS TODAY: 1. DH 2. 3. 4.

EXPLANATION:

EXCEPTIONAL RELEASE
WHEN THE "STATUS TODAY" IS INDICATED BY A RED SYMBOL, AND AN "EXCEPTIONAL RELEASE" HAS NOT BEEN GRANTED BY AN AUTHORIZED MAINTENANCE OFFICER, THE PILOT OF THE AIRCRAFT WILL SIGN THIS RELEASE BEFORE FLIGHT.

RELEASED FOR FLIGHT 1. 2. 3. 4.

REMARKS; PILOTS AND MECHANICS. SEE INSTRUCTIONS INSIDE FRONT COVER.

Serviced by D. Houghton at Lockheed

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BY AUTHORITY OF CG AAF
BY JSC DATE 16 Aug 45

This is a Certified True Copy

Marvin R. Jones

Marvin R. Jones
1st Lt., Air Corps

AIRCRAFT AND ENGINE TIME RECORD (ENTER IN HOURS AND MINUTES)

ENGINE	NO. 1	NO. 2	NO. 3	NO. 4
HOURS TO DATE	0:45			
HOURS TODAY				
TOTAL				
OIL CHANGE DUE				
COMB. CLEANING DUE				

AIRCRAFT	
HOURS TO DATE	0:45
HOURS TODAY	
TOTAL	

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DATE	AIRCRAFT ORG. DATA	AIRCRAFT DATA	ENGINE DATA
8-6-45	AIR FORCE	COMPONENT	ENGINE MODEL: J-33-9
STATION: Lockheed	COMD., SERV. COMD. OR DEP'T		SERIAL NO.: C7C757
CREW CHIEF OR ENGINEER: D. Houghton	GROUP NO. & TYPE	P-80A-1-LO	SERIAL NO.
	SQUADRON NO. & TYPE	AIRCRAFT SERIAL NO.: 85048	TOTAL FLIGHT TIME: 0:46.5

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Exhibit "C"

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JOINT STATEMENT OF M. F. GARRETT & M. J. JERONIMUS
(Standing Near Runway Between Take-Off Position and Intersection)

(Mr. Garrett)

We, Mr. Jeronimus and I, were standing on the cross strip to the taxi strip between the compass roses 240 and 241. He passed us at that point and was barely airborne. At the take-off end of the runway he run up for approximately thirty (30) seconds, started rolling and rolled for 100 to 150 yds. when the motor started acting up. We both noticed that the engine sounded rough. When it got directly opposite us, we saw vapor coming off the right wing. As he got near the intersection there was a muffled explosion and smoke came out the rear. We saw smoke as he was gaining altitude and then we saw the hatch go and we tried to see him. We saw the airplane all the time until it dove in. We didn't know whether it exploded before or after the crash because the trees obscured our line of vision.

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BY J. E. C.

Q: Did he seem to have sufficient power?
A: Yes.

Q: It started to lose power soon?
A: Yes. He lost power over the intersection, wheels were going up; the gear was up when white smoke appeared.

Q: What was the speed after the explosion?
A: It was a gradual climb; there was no sharp climb at any time.

Q: How high was he?
A: At no time over 500 ft. He lost very little altitude, still climbing as he went into his turn.

Q: How high did he get?
A: Was 300 to 400 ft. He mushed a couple of times then went into his turn, fell off, and dived in.

Q: Could you see black smoke coming out all of the time?
A: No.

Q: Vapor?
A: It appeared to us like vapor was coming from the entire length of the right wing. That was our first impression that it was fuel. It could very possibly be smoke or vapor. He had no trouble going out on the taxi run; no engine trouble as we were very close and could hear the engine distinctly.

Q: Was the ship airborne when you heard the explosion?
A: Yes. It sounded like he had a rough engine.

Q: How does a rough engine sound?
A: I would say that it was missing, backfiring, etc. - an uneven roar.

Q: Just what is an uneven roar?
A: Unsteady. Two (2) other 80's took off just before this that sounded differently.

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Joint Statement of R. E. Garrett
and M. W. Jeronimus. (Cont'd.)

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Q: He was airborne when you heard the explosion?
A: Yes, about 20 ft.

Q: Were there any other airplanes warming up in the vicinity?
A: No. There were no other ships on the ground anywhere around.

Q: Did you see an airplane take off just ahead of him?
A: There were several. There were two (2) 80's and another that could have been an AT-6 or something.

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(Mr. Jeronimus)

Q: Would you say there was an explosion and was it a sound ~~like he had~~ lost power?
A: There was a sharp explosion.

Q: Did the explosion occur with the roar continuous or was there a drop?
A: It had a steady roar and had an explosion on top of that. His tail was directly where we could see and hear it without any mistake.

Q: You did not hear any drop-off in roar and on top of that you heard an explosion?
A: Yes Sir. What made it seem different to me was the fact that another P-80 had just taken off, two of them in fact, and we were standing in the same place, but this one sounded to me to have a lower and heavier roar.

Q: Was the ship airborne at about the same spot as the other 80's?
A: Yes, almost. Take-off was about the same. It was a normal take-off to about the time of the explosion, except for the noise of the engine and the throwing of this vapor.

Q: Did you notice any black smoke from the 80's that had taken off?
A: No.

Q: Have you ever seen exhaust smoke on the P-80?
A: On one of them. I guess we have seen almost every P-80 take off from this field, but this one sounded different from any other I have heard. It sounded like small backfires. It just wasn't a smooth engine.

Q: Did he have tip tanks on the airplane?
A: No Sir. The hatch was closed when he passed us.

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R. E. Garrett
R. E. Garrett

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J E Barton
Witness

M. W. Jeronimus
M. W. Jeronimus

Exhibit "L"

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STATEMENT OF C. E. GARWOOD

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I was standing just west of the Compass Rose at the time the ship taxied onto the runway. I watched the airplane and everything about it looked and sounded normal until it reached the intersection of the runways at which time the plane was approximately 50 ft. off the ground. At that point the power unit "quit cold", immediately after which a puff of white vapor appeared to come out of the stack. There was a "dull wuff" sound. The power unit immediately took hold again but at reduced power, and the plane made a slow climb to a height of approximately 450 to 500 ft. when I saw the hatch fall off and the plane make a right turn with the right wing down and immediately thereafter saw it nose into the ground.

C. E. Garwood

C. E. Garwood

J. E. Batton

Witness

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Exhibit "M"

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STATEMENT OF THOMAS E. CLELAND

I was standing on the field and didn't see the ship start on its take-off but after he had gotten 1/4 way down the runway, I saw him. Nothing appeared to be abnormal at that time. After he was in the ~~After he was in the~~ air about 50 ft. I saw some white vapor trailing behind the airplane. I watched him from then on and particularly as soon as the white puff came out.

Q: Was that still over the runway?
A: Yes, he was about at the end of the field when I first noticed the black smoke.

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J.E.C. DATE 18 Aug 41

Q: Was white smoke coming out of the tailpipe?
A: I think it was kerosene vapor.

Q: That is all you saw of fuel?
A: Yes, that is all, just one little puff. He ~~climbed on up then in~~ pretty much of a normal take-off. I have noticed his take-offs in the past quite a lot and this seemed very high for him. He did a fairly fast climb out of take-off. After he was out over the field, he started into a right turn and the ship didn't seem to be performing right at that time. That was the first I noticed of anything being abnormal.

Q: Was there any loss of power or any black smoke?
A: At that time it looked like a loss of power; I don't know for sure.

Q: Couldn't you tell by the sound?
A: No. Just after that he spilled his hatch and from that time on it was pretty much down hill. He dropped a wing sharply and just went right on in.

Q: Did you see him get out of the airplane?
A: No. Just after he pulled his hatch he was in a stalling position.

Q: His ship fell off to the right after he pulled his hatch?
A: Yes, maybe a half a second afterwards, not exactly steep but after that very sharply.

Q: How high was he above the ground?
A: 700 ft.

Q: Could you see him above the Hollywood Hills?
A: Yes. He was trailing smoke; I could see it against the sky. He had reached above the hills before I noticed the black smoke. A steady stream of black smoke until he spilled his hatch.

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Thos E. Cleland
Thomas E. Cleland

J E Barton
Witness

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Exhibit "N"

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STATEMENT OF BOB DOWSE
(Standing near R.R. Tracks at South-end of Runway)

After the airplane came up it seemed to be approaching O.K. except that it was slightly slower and wasn't making as much racket. As the ship went by I remarked that the airplane looked like it was in trouble and the take-off did not seem normal and it was throwing out smoke which had a light brownish-white color. This smoke seemed to be coming from the outer shell of the exhaust. It didn't seem to be a steady stream and he went into a sliding right turn skidding sideways. My first thought was that he was trying to catch the PV-2 that took off ahead of him. He seemed to be climbing at a very gradual rate. As he got over the cemetery, at the south-end of the field, he started out in a South Westerly direction and his canopy came off. The airplane seemed to wobble and he went a little further on and up a little and then down at a steep angle.

Q: Was there any indication of the engine cutting out?
A: No, the roar was continuous; I wasn't sure he was in trouble. He continued to climb until the time the canopy left the ship. He appeared to settle but climbed although he did slip.

Q: How high do you think he was?
A: Between three and four hundred ft. When he released his canopy, I thought the ship wobbled. It seemed to me that the left wing held up a little.

Q: Was that almost simultaneous with the canopy floating off?
A: Almost simultaneous. He did not go into his dive immediately upon release of the canopy. It seemed that the ship settled and then went into a dive. It was the right wing that fell off.

Q: That was after the canopy left?
A: Yes.

Bob Dowse
Bob Dowse

J E Batton
Witness

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BY J.E.C. DATE 14 Aug 45

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Exhibit "O"

STATEMENT OF MR. FRED LOGAN
6106 Denny Avenue
North Hollywood
(Witness at Scene of Crash)

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I was standing on my driveway in front of my house, facing West. I heard the ship coming but I could not see it. The first thing I knew it was over the house; I faced to the North and looked directly up at it. I thought something was wrong because of the sound. There was vapor or smoke coming out of the tailpipe. He was in a slight right bank for a moment, apparently traveling in a straight line. The right wing tip dropped lower and lower. It suddenly dropped and about the same time the pilot came out the right-hand side of the ship; parachute opened, approximately one-half full capacity. He was dropping fast and I ran next door so that I could follow the flight. The nose apparently dropped and the right wing dropped perpendicular to the ground. About that time he came out of the airplane. I could not see if the parachute caught on the airplane or whether he was free. I was at the scene in a matter of seconds and tried to find the pilot, but the place was too hot. In three or four minutes all the weeds had burned off and by that time several people were around, and the pilot was in the middle of the burned off area. From the point where the airplane hit, it appeared to me that he was not clear of the ship. He was about 150 ft. above my head when he passed over. He went over the domestic power line and crashed approximately under the high power line. I don't believe ...

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Q: Did he have power and speed?
A: About landing speed. I don't say he had power.

Q: Have you had experience with the sound of the P-80?
A: I worked at Oxnard with the P-59 and am familiar with the sound of jet engines.

Q: Where would you say he had maximum altitude?
A: I don't know because vision was blocked by the house. He was in a low bank when he passed over my house.

Q: Was it just a small wisp of white (smoke) or did it look big?
A: One P-80 had gone over a few minutes before which I noticed left a slight wisp, but this was bigger. It vaporized like fuel and I noticed some substance coming from the left wing.

Q: Tell us more about the sound; you said it didn't sound right.
A: I couldn't tell very well, but just at the time I thought it didn't sound the same as a normal flight.

Q: Did you notice any cutting off of the sound; did you ever hear one go that low before?
A: Yes, sometimes, but not quite that low.

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Q: Did it look like it was under control until the pilot jumped?
A: A couple of seconds before the pilot came out the right wing dropped.

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J E Burton
Witness

Fred Logan
Fred Logan

Exhibit "P"

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STATEMENT OF MR. IKE ISAACSON
Dispature
(On duty in the Lockheed Tower)

I saw him when he started out. It seemed like a normal take-off until he broke ground at which time I saw white smoke. The smoke cut out at the runway intersection, but it smoked again as he went over the tracks at the south-end of the field. Then he lost altitude but it appeared his power came back in and it looked like he gave it throttle, and I saw more white smoke then I saw him climb. He got up and just as he started to climb he banked pretty steep. I figure he got up about 500 ft. The hatch flew up and he continued upward. It looked as though it stalled out, fell over on one wing and made about a half turn on the way down. I saw it go behind the trees. I figured his maximum altitude between 700 and 800 ft.

Q: Where did the white smoke come from?
A: Just as he broke ground; from the tail cone.

Q: Was it fuel vapor?
A: I've never seen any take-off like that; I have never seen white smoke come out on take-off, but I have seen black smoke. The gear was up and he had partial flaps. I definitely heard the power cut and come back in. I was inside the Tower with the windows open so that I could both see and hear the plane.

Q: How much time between the power cut-out and when it came in?
A: One or maybe two seconds. It definitely cut-off and came back in.

Q: Can you estimate his speed in the turn?
A: I don't know; it appeared to be normal moreorless.

Q: From your position in the Tower where did you first hear the thing?
A: Well, I hear it when it gets past the Fire Station. I can hear it roar.

Q: How was the roar?
A: Continual at all times.

Q: Are you definite about the power chop-off?
A: I am.

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BY J. E. C DATE 18 Aug 43

Q: What kind of smoke when the power chopped off?
A: Just after it left the runway, it was smoking but at the intersection the smoke quit. It was always white smoke, no black smoke at any time.

Q: Where did the ship break ground?
A: Just a little bit past the Fire Station.

Q: Did the climb look normal?
A: A little steep right at first.

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Q: After the engine cut out, did he continue to climb?
A: Yes.

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Exhibit "Q"

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Q: You watched him all the time?
A: Yes, and at the top of flight he was well above the Hollywood Hills.

Q: Did it appear to stall?
A: Yes, and then turned up and turned to the right.

Q: On his way down did you notice if there was much decrease in the speed?
A: He was headed up and it sortof stalled and fell in; looked like almost straight.

Q: Did it look like a stall?
A: Yes it did.

Q: Did you see him get out?
A: No.

Q: About how long after the hatch came off did it stall?
A: Three to Four seconds.

Q: Could you tell whether the flaps were extended or not?
A: It looked as though they were down.

Verlen A. Isaacson
Ike Isaacson

J E Burton
Witness

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STATEMENT OF HOWARD E. McNEALY

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I was with Major Bong at the time he entered the cockpit and I hooked on the tractor and towed him out to the end of Building 332 where he plugged in the rectifier and started the power unit. The ship made a "nice start" and I particularly noted that it was not a "hot start". After the pilot had started the engine, I got on the right wing and rode out to the taxi strip where the tractor was unhooked from the airplane and I remained at this spot and watched the take-off. Previously, Bong had inquired as to whether there was an outside air temperature gage on the ship, which was the only question that he asked. While the ship was at the North-end of the runway, I could not tell whether there was anything unusual about the sound of the engine in view of the fact that the ship was facing me and there were other interfering sounds. When it passed me going down the runway, it sounded "good" until it arrived at the intersection of the runways, when I saw a puff of white smoke. There was no fire in evidence nor did I hear any unusual noise. I cannot say where the puff of white smoke came from except that it appeared to be at the rear of the ship. It is my opinion that the ship reached an altitude of between 400 and 500 ft. when he made a right bank, the wings seemed to flutter, and the ship nosed down to the right.

H.E. McNealy
Howard E. McNealy

J.E. Barton
Witness

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Exhibit "B"

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IN REPLY REFER TO

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WAR DEPARTMENT
ARMY AIR FORCES
MATERIEL CENTER
OFFICE OF THE ARMY AIR FORCES REPRESENTATIVE
LOCKHEED AIRCRAFT CORPORATION

BURBANK, CALIFORNIA

8 August 1945.

Subject: Aircraft Accident to Ship P-80, AAF No. 44-85048 (Mfg. 1071)

To: Aircraft Accident Investigating Board, Lockheed Aircraft Corporation.

Attention: Marvin R. Jones, Lt. A.C.

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JEC DATE 18 Aug 45

Review of discrepancies reported on subject aircraft prior to the time of the accident by Contractor's Inspection revealed a series of fuel leaks and other related fuel equipment that potentially could cause the starving of the engine for fuel. Other items listed below are for the consideration of the Board to bring out various important items that could have become a major problem in flight had they not been corrected. All discrepancies reported herein are clearly written in the Inspection flight book by the Inspector and were properly cleared by Production and the Inspection Department prior to the final flight of the airplane in which the accident occurred.

Following is an extract of the actual items taken from the Inspector's flight report book:

1. Left spring-loaded elevator tab lacks clearance. (Reported 7-21-45 and cleared 7-27-45 by Inspector 42.)

2. Hose clamps not re-torqued throughout ship. (Cleared by Inspector 42.)

3. Bolts not safetied forward engine support below joint cap. (Cleared 7-27 by Inspector 42.)

4. Fuselage tank sump plate bolts leak fuel. (Reported 7-25, cleared 7-26 by Inspector 42.)

5. I-16 fuel pump relief valve in dive flap area installed backwards. (Cleared 7-26 by Inspector 42.)

6. Right hand fuel transfer valve leaks. (Cleared 7-27 by Inspector 42.)

7. Open witness hole on aft end of push-pull tube. (Cleared by Inspector 42. No date.)

Note: This indicates insufficient thread engagement of the throttle rigging.

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Exhibit "V"

8. Spare washer and two screws one loose jam nut on monotrol push-pull tube behind cockpit trim. (Cleared 7-27 by Inspector 42.)

9. Elevator stop and control stick in cockpit has 1/4 inch gap. (Cleared "OK as is" on 7-27 and bought off by Inspector 42.)

10. Left hand fuel transfer valve leaked during power run. (Reported on 7-27, cleared 7-30 by Inspector 42.)

11. Fuel leak at "B" nut on line to right of by-pass valve. (Reported 7-27, cleared 7-30 by Inspector 42.)

12. Barometric removed and replaced with new barometric. Manufacturer - Bendix, Serial No. 6. (Removed 7-30 and inspected 8-7 by Inspector 42.)

13. Governor removed, tested on bench, reset and sealed on bench and reinstalled in airplane 8-7-45 by Inspector 42.)

14. Pipe threaded fitting connections in the aft end of manual shut-off valve loose. (Reported 8-5, cleared 8-7.)

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Pilot's squawks on First Production flight as reported by Pilot Ray Meskimen:

1. Needs left rudder. (Have to hold left rudder to keep airplane straight.)

2. Aileron stick will not stay centered.

Note: Attention is called to previous Item No. 9 which possibly will have some bearing on this squawk but on which no rework was accomplished.

Barometric installed on the airplane at the time of the crash was in the original state of setting as received from the vendor's factory. No adjustments or tampering had been done to this barometric at this facility.

Governor installed on the airplane at the time of the crash had been removed and bench-tested, sealed and re-installed in accordance with instructions as received here for the proper setting of this unit. Inspection reports on these two items are available at this office for further scrutiny.

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This airplane had received Company as well as A. A. F. Acceptance inspection prior to its final flight. No evidence of any major item can be found in the Historical Records of these two Inspections that would indicate any serious flight item that could contribute to the un-airworthiness of the airplane during its final flight. All records of inspections performed and the accomplishment of discrepancies reported can be obtained from the writer upon request. These records will be kept in the CONFIDENTIAL file until the entire investigation is completed.

G. A. Forrester

G. A. FORRESTER, Supervisor,
Army Flight Inspection,
Lockheed B-6

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RESU... OF ACCELERATED SERVICE TESTS (__) 5-2-45
(By Lockheed Aircraft Corporation
Johnny Margwarth)

032 - The fuel system malfunctioned again during the second flight today. The wing tanks emptied completely in 15 minutes. The pilot noticed that fuel was being pumped out of the fuselage tank. The tanks were refilled after landing and a fuel system check was made. The system operated normally; i.e., the fuselage tank did not overflow with the wing tank pumps on. The stuck float valve evidently was jarred loose on landing. This ship has the new steel float cans of smaller diameter. The reason for the malfunctioning of the valve was not determined.

RESUME OF ACCELERATED SERVICE TESTS FOR 4-19-45

032 - During the take-off of the last flight, the governor dumped the engine cold. The pilot had only gone about 100 yards, so he did not get into any trouble. The I-16 pump switch and light were on but the pump was not running. The pump itself was frozen and had caused the motor to burn out. This may have been a contributing factor to the failure of the reverse current relay in a previous flight. The governor was stuck open (main valve spring broke) and was replaced by G.E.

RESUME OF ACCELERATED SERVICE TESTS FOR 5-3-45

032 - T.O. and landing tests were run on the last flight. On the fifth take-off at 11500 rpm, the engine quit cold at 300'. The pilot quickly pumped the gear down by the emergency system and landed on the Lake. During the approach, he moved the throttle forward and saw white smoke (raw fuel) coming out of the tail. The fire warning light came on for several seconds. When the engine quit, the I-16 auxiliary pump was on. The fuselage tank switch was on and the tank had 190 gallons. The wing tanks were empty. The fuel system was thoroughly checked after the landing. The I-16 pump ran normally; the fuselage tank pump ran O.K., and the governor and barometric were O.K. The pilot reported that he checked all switches before the takeoff. He held the brakes to 11500 rpm. The fire evidently went out due to a momentary starvation of fuel to the burners. The cause of the starvation has not been determined. The pilot made no attempt to start in the air because he was so busy. The engine was removed for a check up. Generator was found to be completely burned out.

WEEKLY PROGRESS REPORT - P-80A, 1015 - 8-6-45

The inner stainless steel air shroud on the Syracuse and Allison engine is very poorly attached and cracks after only a few hours of flying due to vibration. The baffle not only cracks but pieces break off and go into the bearing cooling fan where they are broken into pieces possibly small enough to damage the bearing. This shroud will last long enough for production to deliver airplanes--but a few hours later, it will probably crack, and the engine will have to be replaced. This situation exists on all new engines, and if not corrected immediately, will probably result in considerable loss of flying time.

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TO RESTRICTED
BY AUTHORITY OF CG AAF
DATE 16 Aug 45

THIS IS A CERTIFIED TRUE COPY:
Marvin R. Jones 1st Lt.
MARVIN R. JONES, 1st. Lt., Air Corps

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TO ~~RESTRICTED~~

BY AUTHORITY OF CG ADC

BY J E C DATE 18 Aug 41

P R I O R I T Y   U R G E N T

FR AAFPR LOCKHEED BURBANK CALIF 100220Z
TO CG WF DY O
ATTN PROD DIV TSBPR3F4

ATTN MAJOR GEORGE H SELVIN

GRNC

L-ENG-80-8-280 CONT W33-038-AC-2527 P80-A APS - AIRPLANE SERIAL 44-85048 /LAC 1071/ -J33-9 ENGINE SERIAL A 070757 PD RE FONE CONV MAJOR GEORGE H SELVIN/ PERRY M BANTER THIS OFC 9 AUGUST 1945

AS RESULT OF A MEETING TODAY REFERENCE SUBJ AIRPLANE A PRELIMINARY TEST PROGRAM HAS BEEN DERIVED AS OUTLINED BELOW PD AT THE PRESENT TIME ALL AIRPLANES ON SUBJ CONTRACT ARE GROUNDED AND IT WILL BE NECESSARY TO OBTAIN ATSC CLEARANCE TO FLY PRODUCTION AIRPLANES CMA AT MUROC CMA TO MAKE SEVERAL OF THE INVESTIGATIONS INDICATED BELOW PD THE PROGRAM OUT- LINED IS TENTATIVE BUT IS THE BEST THAT CAN BE ARRIVED AT ON THE DATA AT HAND AT THIS TIME PD

FOLLOWING STALL TESTS TO BE RUN ON SUBJECT PRODUCTION AIRCRAFT COMPLETE WITH LEADING EDGE TANKS CMA ALL TANKS TO BE FULL OF FUEL COLON

STALLS TO BE ACCOMPLISHED IN THE FOLLOWING MANNER COLON

/1/ MINIMUM POWER SETTING - A DEFINITE ALTITUDE TO BE MAINTAINED AS THE AIRCRAFT SPEED IS LOST UNTIL THE STALL IS ACCOMPLISHED PD

/2/ STALL TO BE ACCOMPLISHED WITH FLAPS AND LANDING GEAR RETRACTED PD

/3/ THE SAME STALLS REPEATED WITH GEAR RETRACTED AND 75 PER CENT FLAPS PD

/4/ THE SAME STALLS REPEATED WITH DROP TANKS IN STALL AND FULL OF FUEL PD

IT IS RECOMMENDED THAT EXTREME ACCURACY BE MAINTAINED SO THAT NO LOSS OR GAIN OF ALTITUDE TAKES PLACE UNTIL AIRCRAFT STALLS PD

STALL TESTS BE RUN ON UNCOORDINATED TURNS OF 20 DEGREES AND 40 DEGREES WITH FLAPS AND GEAR UP CMA AND GEAR UP WITH 75 PER CENT FLAPS PD

DETERMINE POWER REQUIRED TO MAINTAIN FLIGHT WITH GEAR UP AND 75 PER CENT FLAPS PD

IT IS REQUESTED THAT AUTHORITY BE GRANTED TO FLY PRODUCTION AIRPLANES CMA SERIAL NUMBERS 44-85027 AND 44-85039

A REPLY BY FONE WILL BE GREATLY APPRECIATED PD

CE

L-ENG-80-8-280 W33-038-AC-2527 P80-A 44-85048 LAC 1071 -J33-9
A 070757 9 AUG 1945 ENGINE NO 761 I-16 11500 RPM I-16
18 POINT 5 INCH ENGINE NO 756 I-16 I-16 11500 RPM - 11500 RPM
11700 RPM 75 PER CENT 20 DEGREES AND 40 DEGREES 75 PER CENT
75 PER CENT 44-85027 44-85039 PD

END
CE..
..

EXHIBIT "S"

1273566

.20 -

ENGINE NO 761 WHICH HAS DEVELOPED A SUBSTANTIAL ROUGHNESS SHUD BE CHECKED IN AN AIRPLANE AT LOCKHEED BY REPRESENTATIVES OF GENERAL ELECTRIC TO DETERMINE WHETHER COMPRESSOR SURGING OR CRITICAL SHAFT SPEEDS ARE BEING ENCOUNTERED PD UPON COMPLETION OF THE TEST IN AN AIRPLANE CMA THE ENGINE SHUD BE TAKEN TO SAN BERNARDINO AIR BASE AND DISASSEMBLED BY GENERAL ELECTRIC TO DETERMINE THE CAUSE OF THE DIFFICULTY PD RUDY THOREN SHUD MAKE ARRANGEMENTS FOR THE ENGINE TEAR-DOWN WITH MAJOR JUNK AT SAN BERNARDINO PD

THE EFFECT OF THE BAROMETRIC SETTING ON THE RPM OBTAINABLE WITH THE I-16 PUMP WITH THE THROTTLE SET TO GIVE 11500 RPM ON THE NORMAL FUEL SYSTEM SHUD BE DETERMINED BY DUMPING THE GOVERNOR PD MEASUREMENTS SHUD BE TAKEN OF THE RPM OBTAINABLE UNDER THE ABOVE CONDITIONS AND THE NEW THROTTLE SETTING REQUIRED TO GIVE MAXIMUM POWER WITH THE I-16 PUMP PD DURING THIS TEST THE MAXIMUM RPM OBTAINABLE ON THE GROUND WITH THE 16 POINT 9 INCH TAILPIPE NOZZLE SHUD BE CHECKED PD

THE REASON FOR THE BURNING OUT OF THE INTAKE GUIDE VANES TO THE REAR COMPRESSOR AND BURNING OF THE UPPER SECTION OF THE FUEL MANIFOLD MUST BE COMPLETELY INVESTIGATED THIS INVESTIGATION IS BEING CARRIED ON BY GENERAL ELECTRIC AND LOCKHEED PD

A PRODUCTION AIRPLANE AT MUROC SHUD BE FITTED WITH MEANS FOR EJECTING WATER COLORED BY ANILINE DYE FROM A POSITION CLOSE TO THE MAIN FUEL TANK VENT LINE AND ALSO FROM THE RIGHT WING TANK FILLER CAP PD TWO SEPARATE FLIGHTS [illegible] BE USED WHILE EJECTI[illegible] TO DETERMINE THE [illegible] ENTERING THE PLENUM [illegible] LOCATIONS PD [illegible] RESULTS PD THE TESTS SHUD BE CONDUCTED AT MUROC CMA AFTER APPROVAL IS OBTAINED CMA TO USE ONE OF THE PRODUCTION AIRPLANES NOW THERE PD IT IS REQUESTED THAT COLONEL LANGMACK PROVIDE THIS PERMISSION PD

INVESTIGATE ENGINE NO 756 BY CAREFULLY CHECKING OVER THE COMPLETE FUEL SYSTEM TO DETERMINE WHY CMA WITH THE I-16 PUMP OPERATING CMA THE ENGINE STOPPED--GENERAL ELECTRIC AND LOCKHEED TO CORRELATE ON THIS TEST PD

SIMULATE DUMPING A GOVERNOR DURING A FAST TAXI AT LOCKHEED AIRPORT WITH THE I-16 PUMP ON AND WITH IT OFF AND TURNED ON SHORTLY AFTER DUMPING THE GOVERNOR PD THE WITNESSES WHO HEARD THE ENGINE CUT OUT SHUD BE PRESENT DURING THIS TEST TO NOTE ANY SIMILARITY IN OPERATION TO THAT WHICH OCCURRED DURING MAJOR BONG'S ACCIDENT PD THIS AIRPLANE WILL NOT BE FLOWN SO IT IS ACCEPTABLE TO USE A TEST AIRPLANE ALREADY ASSIGNED TO LOCKHEED PD

SET 11500 RPM ON THE AIRPLANE USED FOR THE WATER TESTS AT MUROC AND FLY AROUND THE FIELD PD NOTE THE RPM INCREASE AT VARIOUS AIRSPEEDS THROUGH THE TAKE-OFF RUN WITH THE THROTTLE LOCKED TO GIVE 11500 RPM STATIC PD THE GOVERNOR AND BAROMETRIC SETTING AND THE TAILPIPE EXTENSION SHUD BE THOSE USED ON MAJOR BONG'S AIRPLANE PD IT IS DESIRED TO SEE WHETHER RPM WILL BE OBTAINED DUE TO AN INCREASE OF RAM WHICH WOULD ALLOW THE ENGINE TO REACH A SPEED WHERE THE GOVERNOR COULD DUMP WITH THE 11700 RPM SETTING NOW BEING USED PD

STALL TESTS COLON

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BY J. E. C. DATE 14 Aug 45

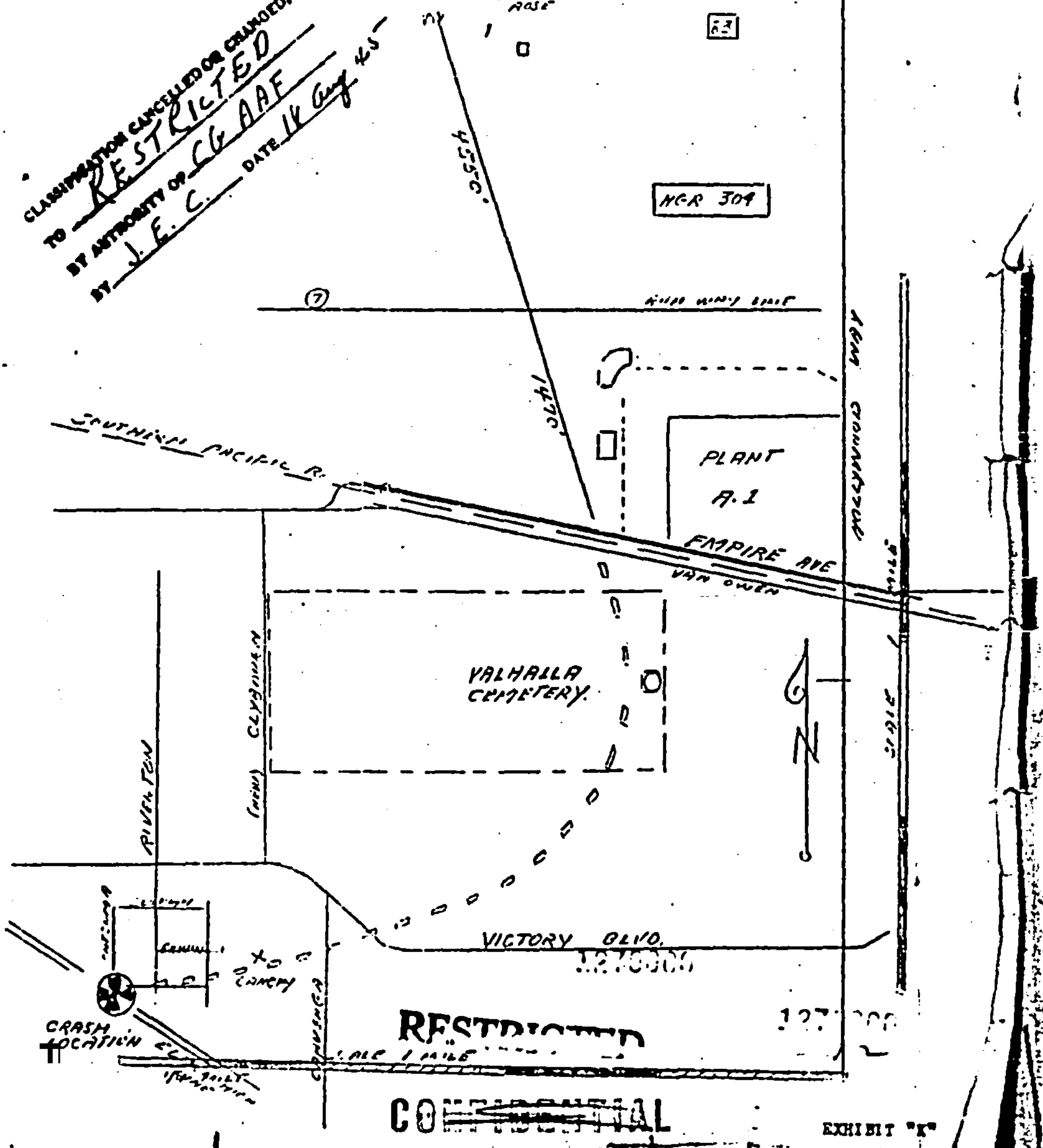

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EXHIBIT "K"

BUY WAR BONDS AND STAMPS

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SAVE

HEADQUARTERS ARMY AIR FORCES

OFFICE OF FLYING SAFETY Capt Byrne/rs

WINSTON-SALEM 1, NORTH CAROLINA

18 August 1945

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FLYING SAFETY OFFICER'S REPORT OF
AIRCRAFT ACCIDENT INVESTIGATION

1. DATE AND TIME OF ACCIDENT: 6 August 1945, 1420 PWT.

2. LOCATION OF ACCIDENT: One mile SW of Lockheed Air Terminal, Burbank, Calif.

3. AIRCRAFT TYPE, MODEL, SERIES AND SERIAL NUMBER: P-80A-1LO, ACSN 44-85048.

4. AIRCRAFT HOME STATION AND ORGANIZATION: Lockheed Air Terminal, Burbank

5. RESULTS TO AIRCRAFT: Disintegrated and burned after contact with ground.

6. HISTORY OF AIRCRAFT AND ENGINES: Aircraft was a new production model which had made one production test flight of 45 minutes duration.

   Engines: Engine was an Allison-built J-33 installed new.

7. PILOT'S NAME, HOME STATION AND ORGANIZATION: Bong, Richard I, Major, Air Corps, ATSC., attached to the Army Flight Office at Lockheed Aircraft as Operations Officer.

8. PILOT HISTORY: Major Bong had made eleven flights in P-80 aircraft totaling 4 hours 15 minutes. Entire pilot history sufficiently well known to make listing here unnecessary.

9.---11. Not applicable.

12. RESULTS TO CREW: Pilot - Major Richard I. Bong - Fatal

13. NARRATION OF EVENTS: On 6 August 1945 at 1420 (Approximately), Major Bong took off on a routine Army acceptance flight in a production P-80A-1LO aircraft. Almost immediately after breaking ground the aircraft began to lose power. The pilot began a climbing turn shortly after crossing the fence and a moment later jettisoned the canopy at an altitude estimated by most witnesses to be 400 feet. Three or four seconds later, the aircraft dipped sharply and dove quite steeply into the ground where it broke up badly and burned. Major Bong was out of the cockpit before the crash but his parachute did not open.

14. INVESTIGATION DISCLOSED: a. Major Bong had attended the jet engine ground school at San Bernardino and was given a thorough cockpit familiarization and check-out by Army Personnel at Muroc Flight Test Base. He made one thirty minute flight at Muroc before returning to the Lockheed Factory. His next two flights were delivery flights to Long

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Beach, after which he began making acceptance flights.

b. Major Bong had made a total of eleven P-80 flights, ten in July and one in August. The flights averaged 23 minutes each for a total of 4 hours and 15 minutes.

c. Subject aircraft was a conventional production line P-80A-1LO with no experimental or test equipment aboard. It had made only one previous flight. This first production flight was performed by veteran Lockheed Test Pilot Ray Meskimen, who has a wealth of varied flying experience totaling 14,000 hours and is regarded as one of ablest test pilots in the business. Mr. Meskimen stated that the aircraft was very clean and had only two minor "squawks": The control stick was slightly off center and the rudder trim needed slight adjustment. No second production flight by Lockheed personnel was deemed necessary.

d. Due to a shortage of fuel governors, the governor was removed after the first flight and installed on another aircraft. Subject aircraft was powered with an Allison built jet unit which had been delivered equipped with a GE N-9073465 fuel governor. After this governor had been "loaned" to another aircraft it was replaced with a GE N-9018015. This latter is an earlier type and had been disapproved by Allison in its Special Instruction Bulletin J-5 dated 21 June 1945, for the reasons that it showed tendencies to "dump" too easily and had a habit of sticking in a by-pass condition.

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e. Throughout the recent history of the I-40, now known as the J-33 engine, the major cause of trouble has been the fuel system. On the ground, during take-off and during flight the unit has frequently lost power or stopped completely and in several cases no explanation was ever found. The engine simply stopped and, when started again, ran perfectly. Fortunately most of the failures in the air occurred at Muroc Flight test base where an engine failure on take-off was not serious due to the broad expanse of lake bed available.

f. P-80 take-off rpm is 11,500 and the governor is set to maintain a maximum of 11,700 rpm. That is, it begins to by-pass fuel at this setting.

g. Other pilots at the factory stated that it was Major Bong's practice to obtain take-off rpm of 11,500 before releasing brakes for the take-off run, and that he made no throttle reduction until well airborne, thus depending fully on the governor. Due to ram effect, lag in governor action, and slight variation in adjustment, a considerable increase in rpm will take place, as much as 500 rpm. Then when the governor catches up it will by-pass considerable fuel. Should it then stick in the by-pass position as the GE N-9018015 has been known to do, it would starve the normal fuel system. Major Bong had admitted neglecting to use the I-16 emergency fuel pump on several flights.

h. According to the most reliable witnesses, the subject aircraft did not catch fire, explode or disintegrate in the air.

P-80 Acc, Lockheed Air Terminal, Calif, 6 August 1945. (Cont'd)

i. Estimates of maximum altitude reached varied from 300 - 800 feet. The majority agreed on 400 feet however.

j. Maximum speed reached was probably not more than 145 mph. It was therefore impossible for the pilot to trim the airplane for level flight in order to bail out, as back pressure must be maintained on the stick at speeds below 190-200 mph with the forward CG in effect at take-off. The aircraft went into a dive three or four seconds after the canopy was jettisoned, or apparently as soon as the pilot released the controls to get out.

k. The degree to which the subject aircraft and particularly its accessory section broke up in the crash has made definite conclusions difficult to reach. However, an extensive investigation headed by C. L. Johnson, Lockheed's Chief Research Engineer, is still under way. All key men on Mr. Johnson's staff and special representatives from Allison and General Electric are devoting their full time conducting a detailed series of tests and experiments to get at the cause of this accident. The undersigned has arranged to be kept informed of their results.

l. Attached are copies of witness statements, photographs, and copies of Lockheed inter-office correspondence indicating to some degree the problems presented by the P-80 fuel system.

15. Probable Cause: Loss of power due to an as yet undetermined fuel system malfunction.

16. ALLIED PAPERS:

Incl 1 - Statement of Mr. Ike Isaacson
Incl 2 - Statement of Howard E. McNealy
Incl 3 - Statement of C. E. Garwood
Incl 4 - Resume of Accelerated Service Tests for 5-2-45
Incl 5 - Settings of Barometrics and Governos on P-80
Airplane
Incl 6 - Photo of crash

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BY AUTHORITY OF CG-AAF
DATE 22 Aug 45
BY J.E.C.

Robert H. Byrne
ROBERT H. BYRNE
Captain, Air Corps
Flying Safety Officer

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BY AUTHORITY OF CG AAF
DATE 27 Aug
BY LEC

August 4, 1945

J. A. Margwarth
cc: H. L. Hibbard
L. M. Bach
J. T. Gray
E. G. Hoskinson
Frank Kane
Clarence L. Johnson

Col. Price (via Myers) AAF (local)
W. P. Ralston
Joe Towle
General Electric
Contracts

SETTINGS OF BAROMETRICS AND GOVERNORS ON P-80 AIRPLANE

A great deal of confusion has been caused by improper barometric and governor settings on the I-40 engine of the P-80A during the last week. In addition to trouble with the engine fuel system, the engines are low in thrust. It is necessary to take the following action immediately before continuing flight on production airplanes.

1. The barometrics should be set carefully to the factory setting and not used to restrict engine speed.

2. The governors should be set so that the main piston starts to move at 11,700 rpm and the final governing speed measured on the test bench. Governors on engines 122 and up will be a new type set for 11,800 rpm. Flight Test will immediately evaluate these governors on flight test airplanes so that they can be cleared for installation at 11,800 rpm.

3. A prominent placard must be placed on the instrument board stating "Danger -- do not allow engine rpm to exceed 100% rpm." Colonel Price is calling the Air Ferry Command to insist on their careful observation of this limitation.

4. Both General Electric and Allison will be instructed by the AAF to use the above barometric and governor settings. When these come through in production they must not be touched at Lockheed in any way, except that it will be necessary to manually dump the governors to check the operation of the I-16 pump. No change must be made in the basic settings. If trouble develops it will be necessary to substitute other units.

5. General Electric will supervise and take the responsibility for making the above changes on their equipment and the Allison equipment.

6. A tailpipe extension furnished by Warwick will be installed on all airplanes once. Installation instructions will be given by Johnny Margwarth.

7. The tailpipe temperature limit will be 670° for continuous operation and may be 620° on take-off.

8. Mr. Rowland will provide equipment for ground checks on tailpipe temperatures for the use on production airplanes to get an accurate check with the new tailpipe rings installed.

9. The Project Office should furnish immediately drawings of the ring as actually installed without slots if possible. This is contrary to my last talk with Ralston.

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10. Flight Test will prepare immediately the information on flights made the last few days to determine the ring size showing variation of tailpipe temperature with altitude and the various factors affecting the barometric and governor settings. These must be sent to Wright Field by Tuesday, August 7th.

11. The Contract Section should take proper steps to be reimbursed for all the above items which are due to failure of GFE.

Clarence L. Johnson
Chief Research Engineer

CLJ:dl

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TO RESTRICTED
BY AUTHORITY OF C.G. AAF 27 Aug 45
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HqAMC Form No. 10-514 Rev. 1 Aug 45

SAVE

46-8-6-20

HEADQUARTERS
AIR MATERIEL COMMAND

IN REPLY ADDRESS BOTH COMMUNICATION AND ENVELOPE TO ATTENTION OF FOLLOWING OFFICE SYMBOL:
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WRIGHT FIELD, DAYTON, OHIO

APR 2 0 1947

SUBJECT: Major Aircraft Accident Report
AAF Form 14
Aircraft No. 44-85048

TO: Chief, Flying Safety Branch, AC/AS-3
Langley Field, Virginia

1. The following information is forwarded in compliance with AAF Letter No. 62-21, paragraphs 4 and 5, dated 12 December 1945:

a. The subject report was received by this Headquarters, 21 January 1947.

b. Type: P-80A-1-LO.

c. Place of Accident: Burbank, California, 2 Miles West.

d. Date of Accident: 6 August 1945.

e. Operator: Richard I. Bong, Major, Air Corps.

f. Although this Headquarters cannot give a definite answer as to the factor causing the crash of P-80 No. 44-85048, the following information is submitted:

(1) A review of the accident, the report, and especially Exhibit "V", indicates that discrepancies No. 2, 4, 5, 6, 8, 10, 11 and 14 could possibly have been attributing factors to the observance by witnesses of fuel vapor coming from various parts of the aircraft preceding the crash. Although the reference remarks indicate that the discrepancies were cleared by Inspector No. 42, it does not indicate that the discrepancies were remedied. If Item No. 5 was not connected, this could have been the factor causing the accident as no fuel would get to the engine under emergency conditions.

(2) Reference is made to Exhibit "W", subject: "Result of Accelerated Service Tests," wherein it was definitely indicated that the fuel system was not functioning properly. These tests indicate that the emergency I-16 fuel pump was a factor in engine stoppage on a previous flight and this could possibly have occurred and been the producing factor of the subject accident.

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WF-L-29 APR 46 30000

Subject: Major Aircraft Accident Report, AAF Form 14, AC No. 44-85048.
To: Chief, Flying Safety Branch, AC/AS-3, Langley Field, Virginia.

(3) After the accident, it was determined that the stop-cock design was a possible factor for the accident, in that a differential pressure in the stop-cock valve or a breakage of the stop-cock linkage would permit the stop-cock valve to close, completely shutting off fuel from the engine. A stop-cock design change was immediately incorporated in production engines and the retroactive change was made for aircraft in service.

(4) Another contributing factor to the accident may have been caused by the washer on the positioning stud of the low pressure fuel filter entering the main fuel pump, causing breakage of the gears or seizure of the pump, thus partially or completely starving the engine of fuel. Technical Order 01-75FJA-2F-11 has since been published to correct the possibility of this washer being a contributing factor to accidents of this nature.

(5) The dumping of the governor could possibly have caused a flame-out, if the emergency fuel system was not functioning properly, as indicated in Item No. 5 in Exhibit "V". The AAF was experiencing excessive governor trouble at the time of subject accident.

e. All concerned personnel of AMC immediately investigated the accident and all possible corrective action was taken at that time.

FOR THE COMMANDING GENERAL:

Walter F. Kutschera
WALTER F. KUTSCHERA
Lt. Colonel, Air Corps
Administrative Assistant
Maintenance Division

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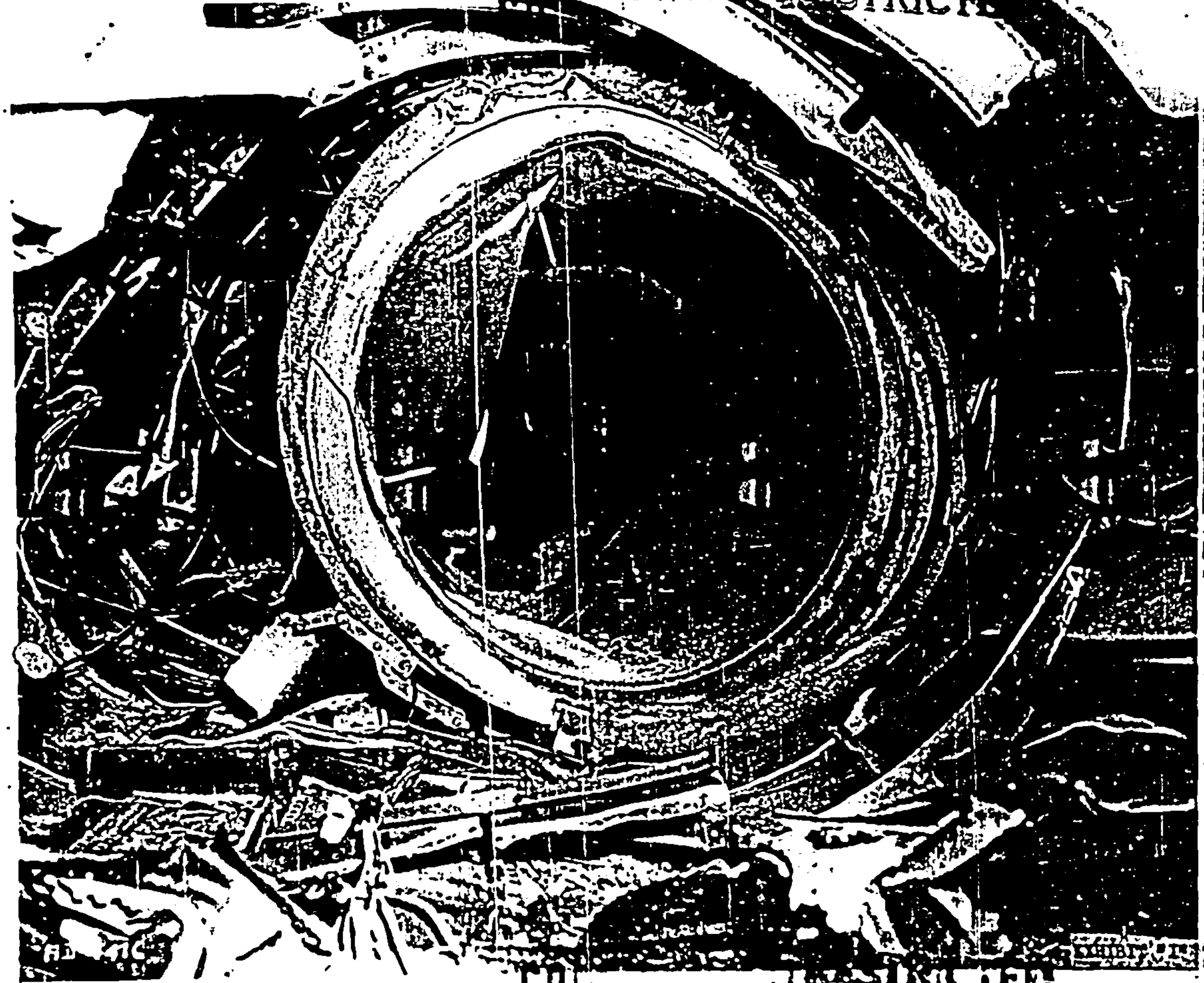

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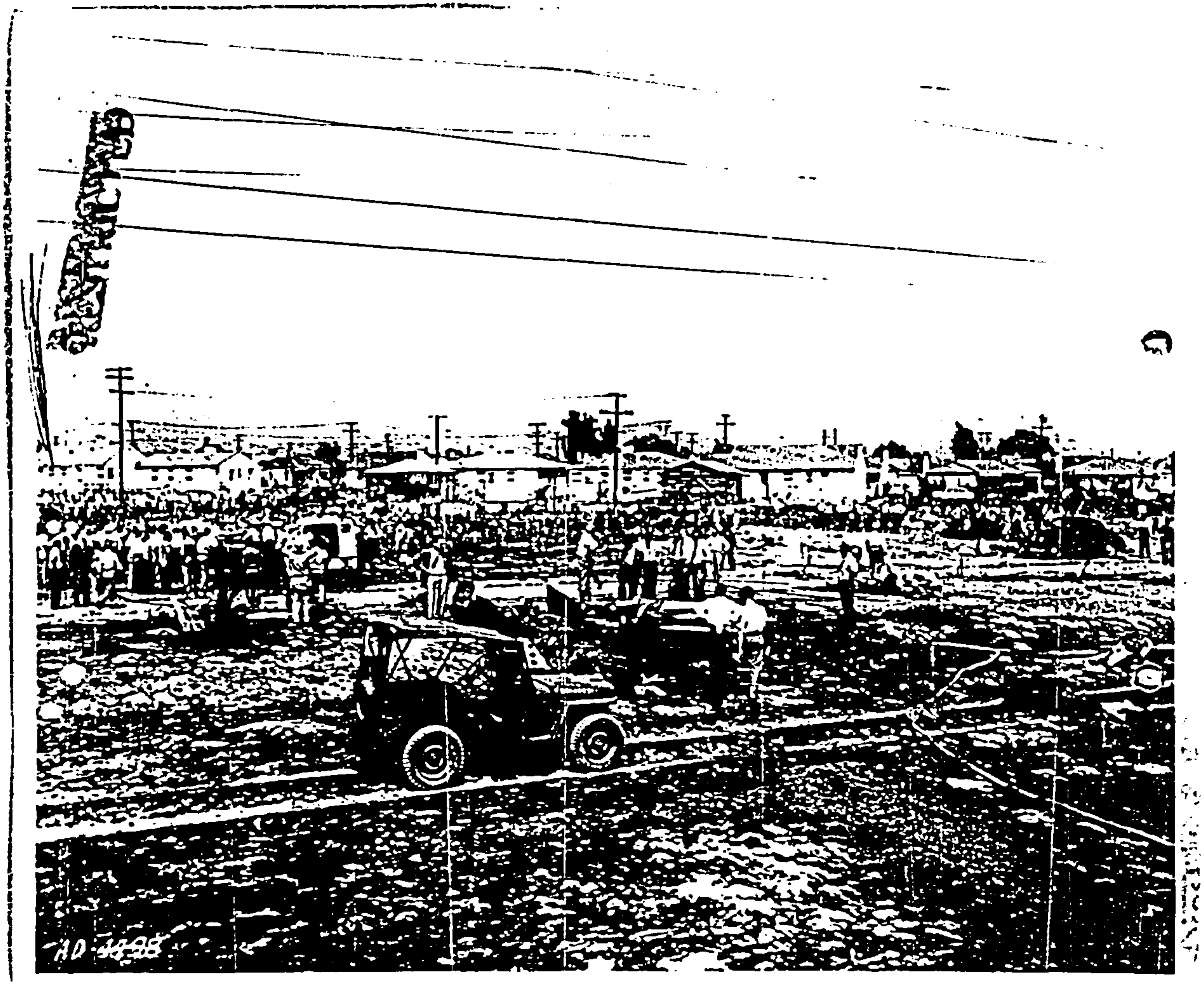

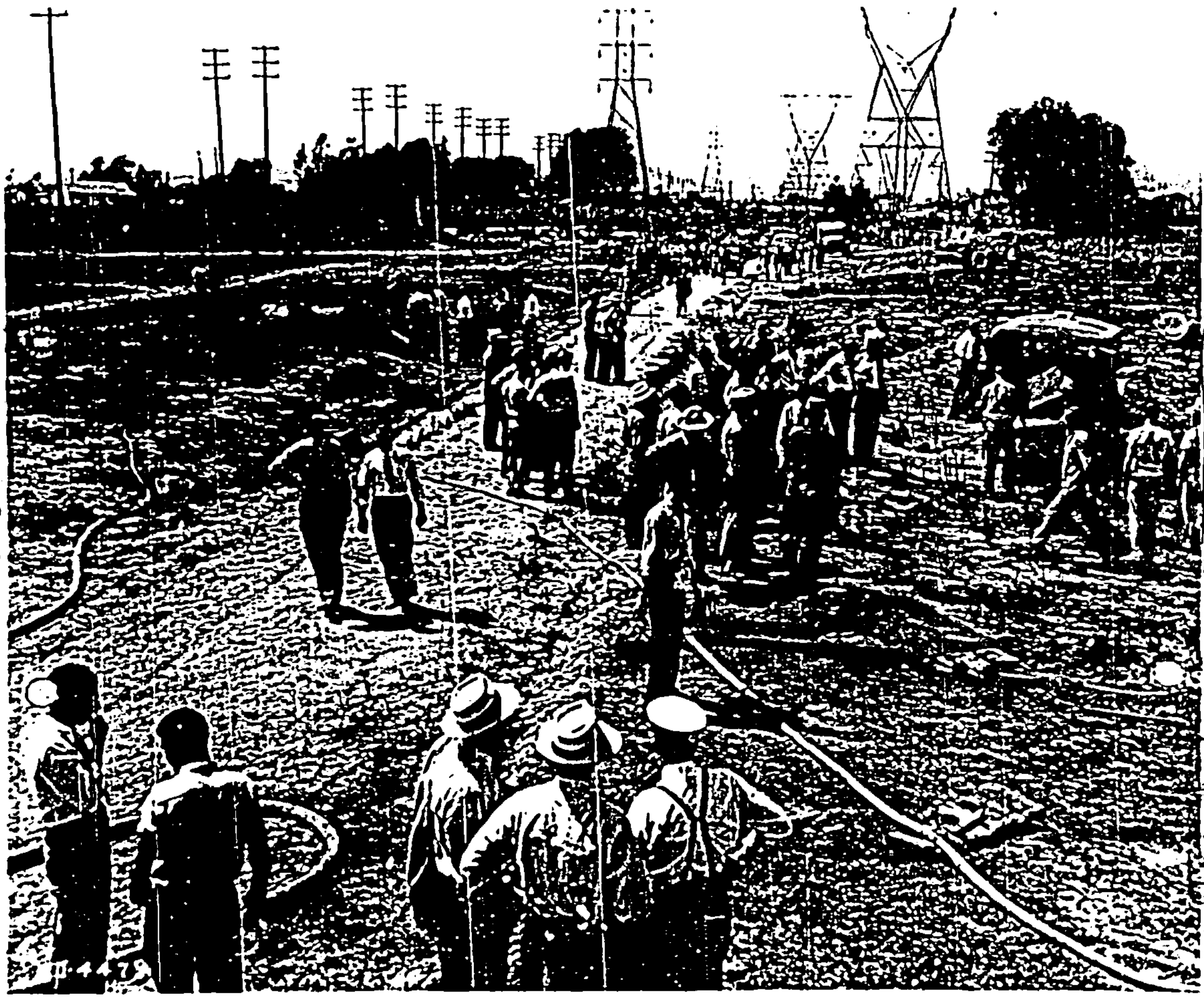

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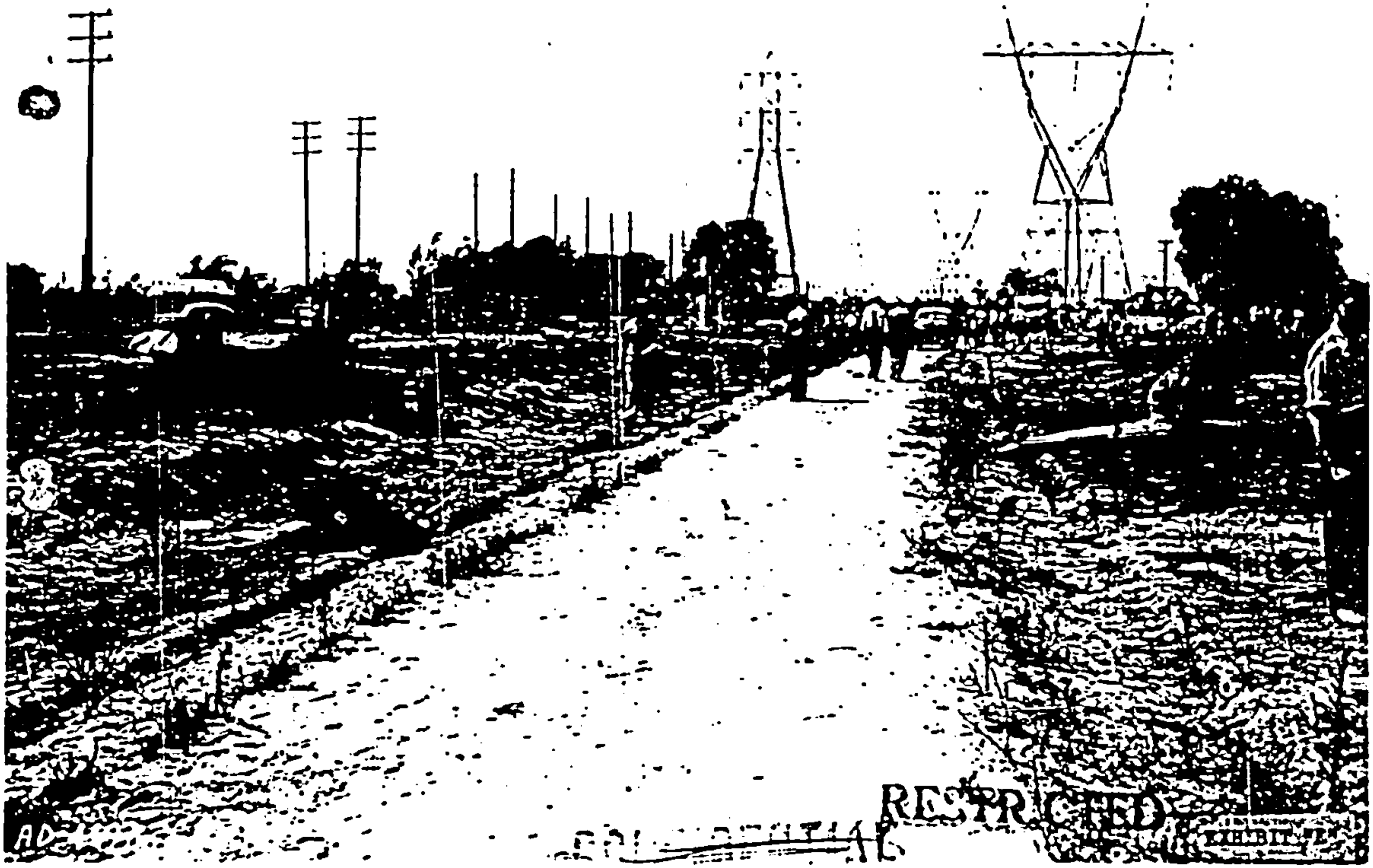

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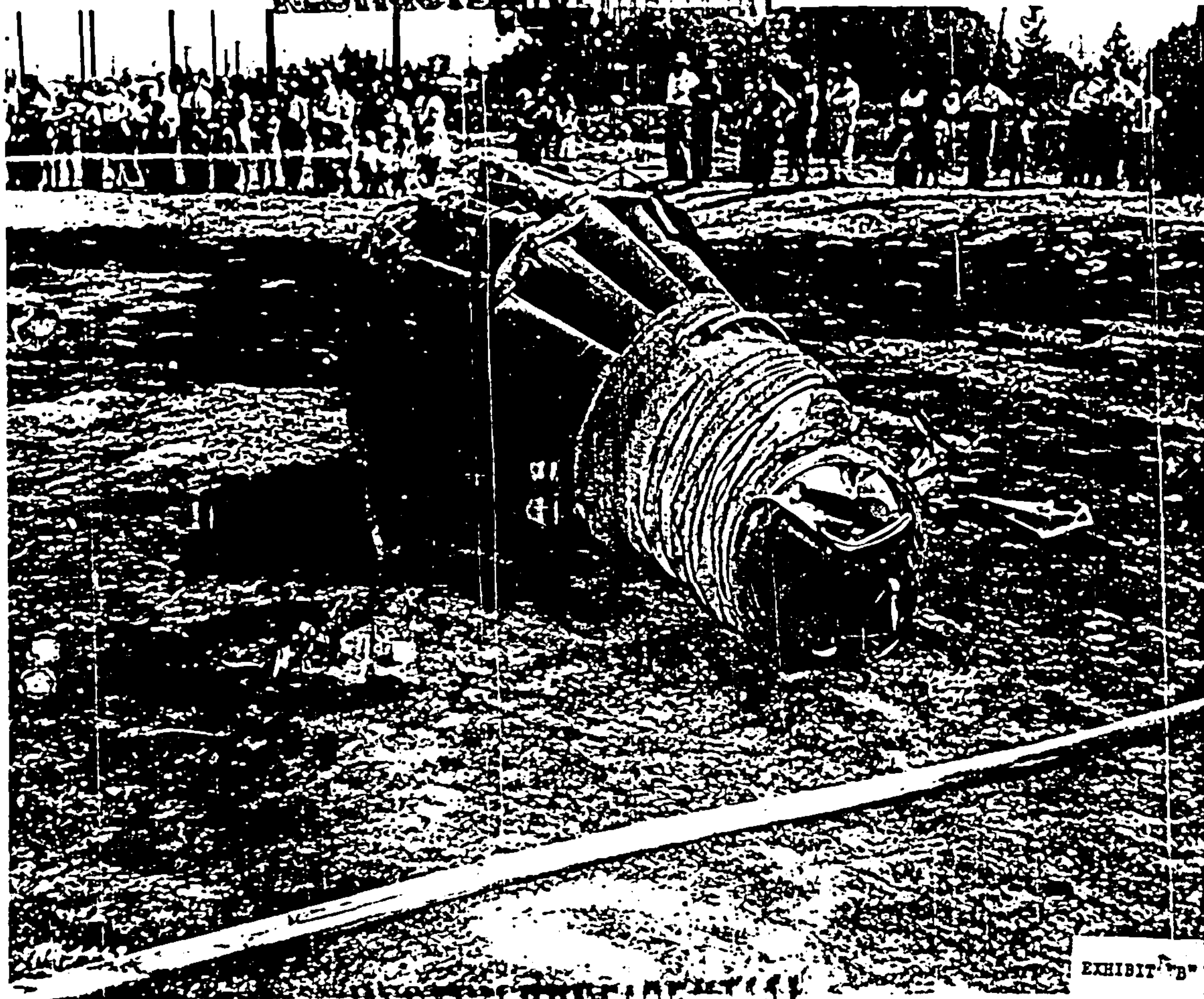

EXHIBIT "B"

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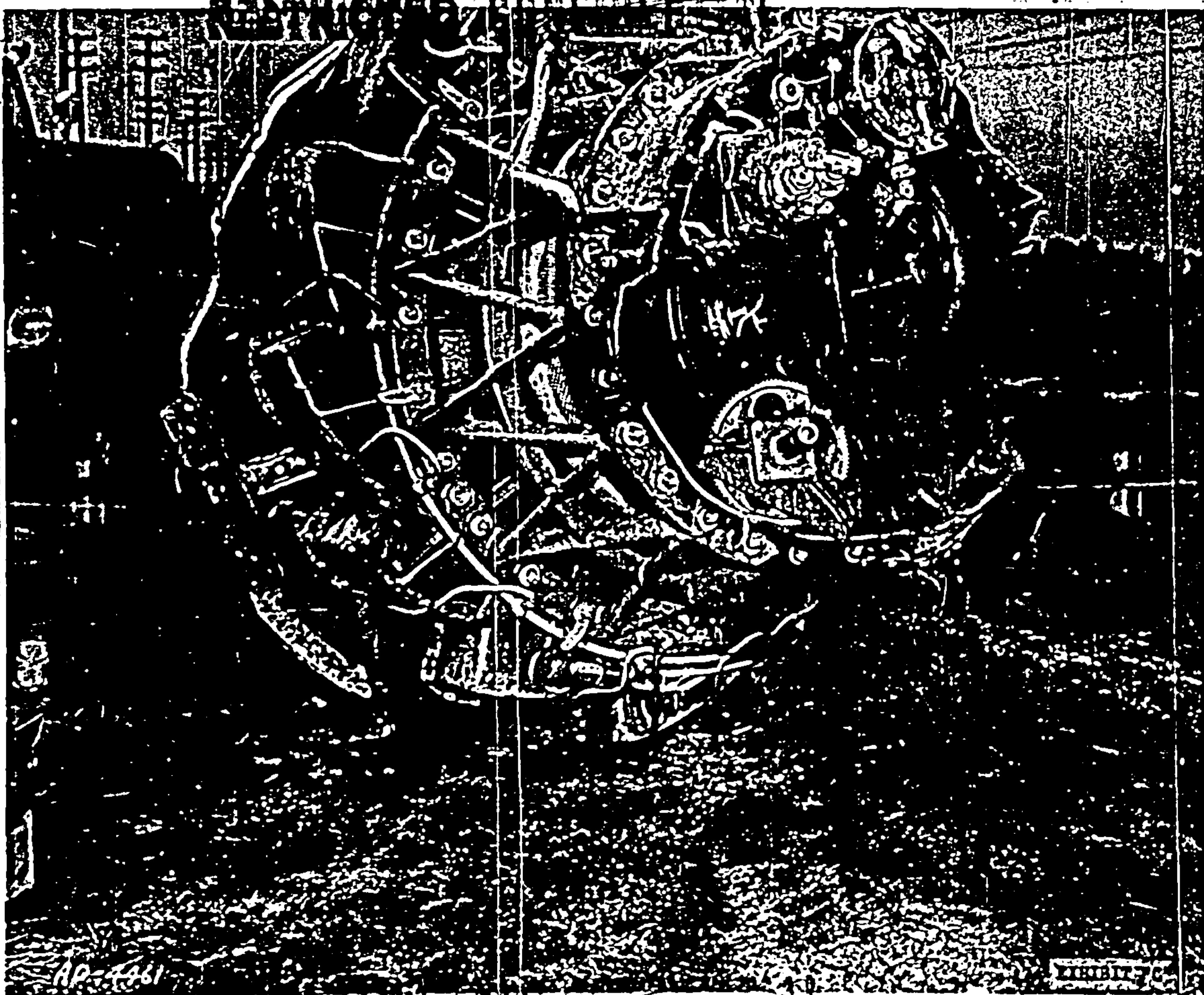

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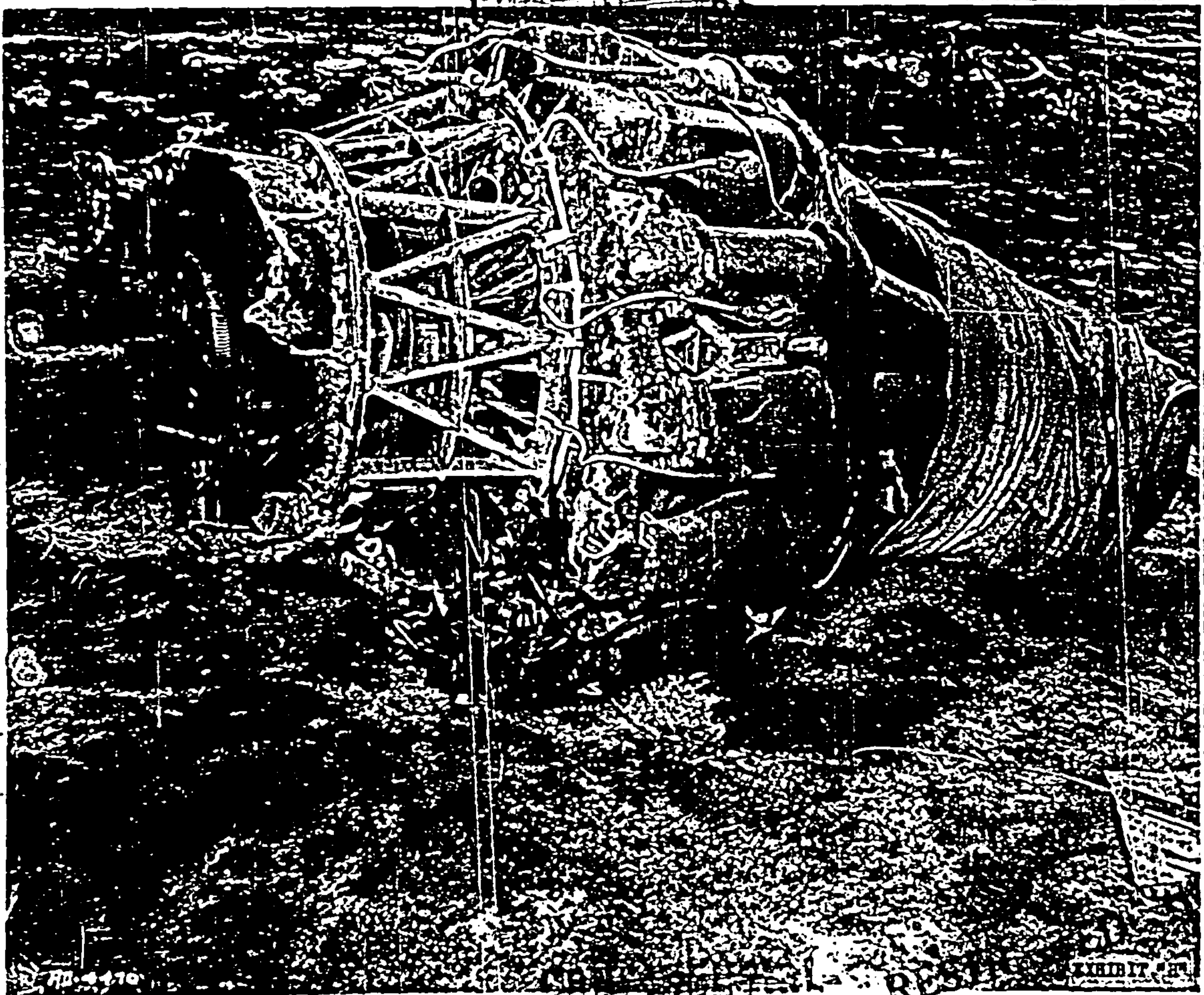
EXHIBIT

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EXHIBIT "J"

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09/12/1945

NORTHROP XP-79B

"HARRY CROSBY"

09/12/45

Northrop P-79 B

Last revised September 19, 1999

The Northrop XP-79 originated in 1942 as an idea by John K. Northrop for a high-speed flying wing fighter aircraft powered by a rocket engine. Near-sonic speeds were envisaged. The idea was somewhat similar to that which eventually produced the Messerschmitt Me 163 rocket-powered interceptor in Germany.

The Northrop fighter project was to be powered by a 2000 pound thrust Aerojet rocket engine, with takeoff assisted by a pair of 1000 pound thrust rocket boosters which would be dropped after takeoff. Northrop proposed that this airplane be flown by a pilot lying prone in the cockpit, since it was hoped that this would reduce strain on the pilot during violent maneuver and would present a minimum silhouette to enemy gunners.

In January of 1943, the USAAF issued a contract for three prototypes under the designation XP-79. The availability of jet engines led to a decision in March to use two Westinghouse 19-B turbojets in the third prototype, which was redesignated XP-79B.

Since the layout of the fighter was so radical, it was thought that test glider prototypes be built to verify the validity of the concept. One of these was designated MX-324, and was fitted with a fixed tricycle landing gear. The MX-324 was towed into the air by a P-38 on July 5, 1944, and became the first American-built rocket-powered aircraft to fly.

Delays in the development of the Aerojet rocket engine caused the USAAF to cancel the two XP-79s, leaving only the XP-79B. The serial number of the XP-79B was 43-52437. The XP-79B was finally ready for flight testing in the summer of 1945. The pilot lay prone in an unpressurized cockpit situated between the two turbojets. The flying wing was of semimonocoque construction and was built largely of magnesium in order to save weight. Instead of conventional ailerons, the wing had air intakes at the tips for lateral control, in much the same manner as the XP-56. The aircraft was equipped with a pair of vertical tails, presaging the MiG-25 and the F-15. The retractable landing gear consisted of four wheels, two each in tandem.

The XP-79B was to use a rather unusual technique for destroying enemy aircraft. The wing leading edge was reinforced so that it could slice off the wings or tails of enemy aircraft by ramming them! And if that didn't work, the XP-79B was equipped with a more conventional armament of four 0.50-inch machine guns in the wing leading edge.

The XP-79B was transferred to Muroc Dry Lake in June of 1945. Flight testing was delayed by problems with bursting tires during ground taxiing trials. On September 12, 1945, test pilot Harry Crosby finally took the XP-79B up in the air for the first time. It flew all right for about fifteen minutes, but the plane then suddenly went into a spin from which it proved impossible to recover. Crosby attempted to parachute to safety, but his chute failed to open and he was killed. The XP-79B impacted in the desert and was destroyed in the resulting fire. Magnesium burns very nicely. :-).

Although the mishap that cost Harry Crosby his life could have been corrected, the USAAF decided to abandon the project.

Specification of the XP-79B:

Powered by a pair of 1365 lb. st. Westinghouse 19B turbojets. Wingspan was 28 feet, length 14 feet, and height was 7 feet. Wing area was 278 square feet. Gross weight was 8669 pounds. Estimated performance included a maximum speed of 547 mph at 20,000 feet, an initial climb rate of 4000 feet, a service ceiling of 40,000 feet, and a range of 993 miles. The proposed armament of four 0.50-in machine guns was never fitted.

Sources:

1. American Combat Planes, Ray Wagner, Third Enlarged Edition, Doubleday, 1982.

    1. The American Fighter, Enzo Angelucci and Peter Bowers, Orion Books, 1987.

someone must have recognized the absurdity of that idea, because the XP-79B order also stipulated that the fighter should accommodate four .50-caliber Browning machine guns outboard of the jet engines. Neither the guns nor the cockpit pressurization system (allowing the pilot to function at 40,000 feet) were destined to be installed in the plane.

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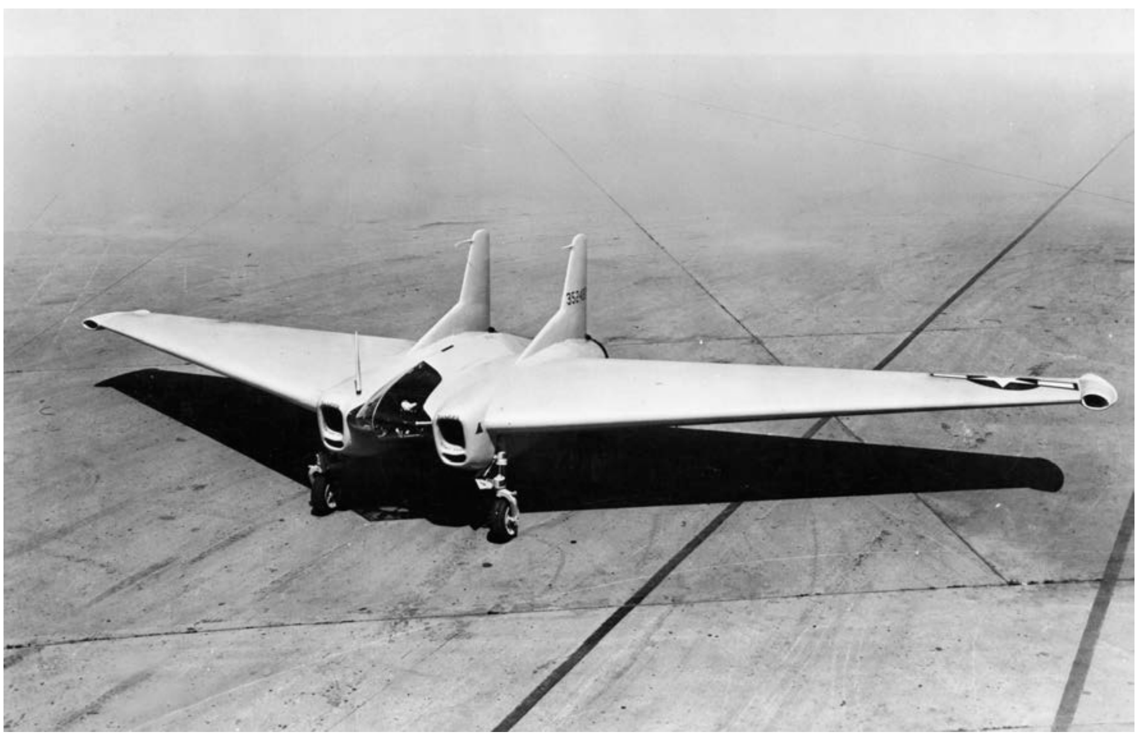
Jack Northrop's XP-79B jet fighter looked unusual, but its method of attack was even more bizarre.

By Jon Guttman

In the late stages of World War II, American bomber formations over Germany were occasionally attacked by a small, rocket-powered interceptor, the Messerschmitt Me-163 Komet. Fast as the Me-163s were, however, they were usually more spectacular than effective. Nevertheless, American aircrews must have marveled at the technology behind such an advanced-looking weapon--unaware that since 1942, something similar had been secretly under development in their own country.

The fighter that eventually became the Northrop XP-79B had an astonishing parallel development to the Me-163. It began in 1942 as a rocket-powered flying wing, but, in contrast to the Me-163, the American design was later adapted for jet power. Another difference between the XP-79B and its distant German cousin lay in their methods of attack. The Me-163 was meant to defend a faltering Third Reich with wing-mounted 30mm cannons or unguided rockets. The XP-79B's main means of downing its adversaries is best expressed in its nickname--Flying Ram.



John K. ("Jack") Northrop designed numerous advanced aircraft of conventional configuration, but he was fascinated by the flying-wing concept. He believed that such a pure airfoil surface would have the most efficient lifting capabilities. Also, the absence of a fuselage and tail unit would mean less drag to affect overall performance--as well as lower production costs. Shortly after designing Lockheed's famed Vega series of monoplanes, Northrop formed a small company of his own, the Avion Corporation in Burbank, Calif. His first Flying Wing made a successful maiden flight from Burbank Airport in 1929. It was originally powered by a single tractor-mounted engine, and tail surfaces mounted on twin booms aft of the wing increased controllability. Northrop's creation was modified to pusher-engine configuration before undergoing further flight testing at Muroc Dry Lake, Calif. Avion was renamed the Northrop Aircraft Corporation that same year and became part of United Aircraft and Transport Corporation, an early superconglomerate that also included Boeing.

During the Great Depression of the 1930s, Northrop temporarily shelved his flying-wing dream to create some solid moneymakers, like the record-breaking Alpha, Beta, Gamma and Delta series of high-speed mail planes, and military designs such as the BT-1 and A-17. Then in 1939, Northrop broke away from United to form a completely independent firm, Northrop Aircraft Inc., and relocated to Hawthorne, Calif. He obtained subcontracts to manufacture other companies' aircraft before gaining his first new contract for a design of his own--an order from Norway for 24 N-3PB seaplane patrol bombers.

Northrop felt confident enough to resume his flying-wing experiments in 1940. His next attempt, the N-1M, was the genuine article, dispensing with the boom-mounted tailplanes. It first took to the air on July 3 with Vance Breese at the controls. Breese reported that the N-1M handled well and seemed to require less horsepower than a conventional aircraft to achieve the performance he wrung out of it. The N-1M originally was powered by twin 65-hp Lycoming engines driving pusher propellers, but it underwent several changes in power plant and wingtip configuration in the course of more than 200 flights. Fortunately, the historic N-1M was preserved, and it is now on display at the National Air and Space Museum.

Northrop continued to experiment with flying wings like the N-9M and JB-1 during World War II. He also produced a fighter, the XP-56 Black Bullet (see "Aerial Oddities" in the May 1991 issue). This was a pusher-engine canard design that was *almost* all wing. (There was a tailless fuselage of sorts, from which dorsal and ventral vertical control surfaces protruded.) The XP-56 proved to be a failure, but that was compensated for by the brilliant success of Northrop's more conventional twin-engine, twin-boom night fighter, the P-61 Black Widow.

Northrop's flying-wing concept took a dramatic step forward in 1942, when he convinced the U.S. Army Air Forces (USAAF) that he could build a fighter that could reach the speed of sound. Beneath the USAAF-classified wraps, "Project 12," as the design was designated, was a rocket-powered flying wing with a wingspan of only 32 feet. The pilot was to fly it in a prone position, the rationale being that such a posture would make him less vulnerable to G-forces and raise his "blackout threshold" beyond normal human limits.

The first experimental vehicle under Project 12 was the MX-324, a glider that was to be followed by a powered version called the MX-334. A simple steel tube and wood affair with faired, fixed landing gear, the MX-324 had a wire-braced vertical fin that looked as if it had been added as an afterthought--which, in fact, it had been, since it could be and later was removed. In one of the most undignified methods ever devised for getting into an airplane, the pilot had to clamber up on the trailing edge of the wing and slither on his stomach through a triangular hatch. After some unsuccessful attempts to use an automobile to tow the MX-324 skyward, it was towed into the air behind a Lockheed P-38 Lightning.

During an early flight, the MX-324's test pilot, prewar racing pilot Harry Crosby, encountered trouble when turbulence behind the P-38 towplane flipped the glider upside down. The MX-324 went into a spin. Even when it suddenly came out of the spin, it was still inverted and descending in ever-tightening circles.

Crosby jettisoned the two-part hatch-canopy, climbed out on the wing and kicked free. After his parachute opened, however, he saw the runaway glider coming right at him. As luck would have it, the wayward wing narrowly missed Crosby and came down in the desert a short distance from where he came to earth. Little could Crosby have suspected that he would find himself in a similar situation in a similar airplane two years later...with a far less happy landing.

The MX-334 took to the air in October 1943 for some unpowered testing while the Aerojet Corporation completed its XCAL-200 rocket engine, which was to be powered by monoethyaniline fuel, oxidized by red fuming nitric acid. The MX-334 made its first flight with the new engine on June 23, 1944, and fulfilled Northrop's promise to the USAAF. Although capable of only 3.5 minutes of powered flight, it was the first American rocket-powered aircraft to fly.

Despite the effort put into the secret project, the USAAF ultimately concluded that the rocket-powered MX-334 was a dead end. Much research data had been culled from it, however, and Northrop had a spinoff of Project 12 in the offing that the USAAF regarded as being militarily far more feasible--the XP-79.

Essentially, the XP-79 was an interceptor that would bring down its opponents by ramming them in flight. During the early months of the German invasion of Russia in 1941 and 1942, Russian fighter pilots had frequently resorted to various *taran,* or midair ramming techniques. There was no real need for American fighter pilots to resort to such tactics, however, and the USAAF officer who came up with the idea for the ram fighter may be grateful that his identity is lost to history. In any case, in January 1943, Northrop was awarded a contract to build three XP-79 Flying Ram prototypes, each of which was to be powered by an Aerojet rocket engine with 2,000 pounds of thrust.

A plague of developmental problems with the proposed Aerojet engine, and the unlikelihood of its being able to keep the plane airborne for more than 30 minutes, led the USAAF to cancel its order for the rockets and for two of the XP-79s that were to be powered by them. The Army did, however, consent to completion of the third prototype, which used two Westinghouse 19B axial-flow jet engines with 1,345 pounds of thrust each. The jet-engine revision, designated the XP-79B, weighed 5,840 pounds empty and 8,669 pounds with a full operational load.

Like its rocket-powered precursor, the jet-powered XP-79B was essentially a wing, with the pilot lying on his stomach between the two jet engines. His head protruded into an acrylic-plastic windshield fitted with an armor glass section. An overhead hatch gave him entry to and, if necessary, a hasty exit from the cabin.

As radical as the XP-79's all-wing configuration looked, its structure was equally unusual. The airframe was made of heavy-gauge magnesium. The leading-edge skin was three-fourths of an inch thick; reinforcing steel armor plate of one-fourth-inch thickness was heliarc-welded at a 45-degree angle just inside the wing's leading edge. The wingspan was 38 feet, with a wing area of 278 square feet. Overall, the XP-79 was 14 feet long and 7 feet high.

Upon receiving reports of approaching enemy bombers, the XP-79B was intended to take off with the aid of JATO (jet-assisted takeoff) packs at an estimated rate of 25,000 feet in 4.7 minutes. Reaching an altitude of 40,000 feet, the Flying Ram would then dive into the formation of enemy aircraft at an estimated speed of up to 547 mph and clip their wing or tail surfaces with its own reinforced wings. Even among the USAAF brass, someone must have recognized the absurdity of that idea, because the XP-79B order also stipulated that the fighter should accommodate four .50-caliber Browning machine guns outboard of the jet engines. Neither the guns nor the cockpit pressurization system (allowing the pilot to function at 40,000 feet) were destined to be installed in the plane.

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04/23/1946

VICKERS 491 "VIKING"

04/23/46

AviationSafetyNetwork

The Aviation Safety Network

Accident Description

300 BEST

Accident description

Date:	23.04.1946
Type:	Vickers 491 Viking 1A
Operator:	Vickers-Armstrongs Ltd
Registration:	G-AGOK
C/n:	1/101
Year built:	1945
Crew:	0 fatalities / 4 on board
Passengers:	0 fatalities / 0 on board
Total:	0 fatalities / 4 on board
Location:	Effingham (UK)
Phase:	
Nature:	Test
Flight:	- (Flightnumber)

Remarks:
The Viking aircraft took off from Wisley Airfield at 17.05h for a testflight regarding single engine performance for the Certificate of Airworthiness. It climbed to 1000ft. After 5 minutes the no.2 engine was stopped and the propeller feathered. A steady 150-200ft/min was started. After 4 mins the no.1 engine cut out, came on again and cut out completely. The no.1 engine could not be restarted in time and a forced belly landing was made. PROBABLE CAUSE: "The sudden failure of the port power plant coupled with the inability to restart the starboard engine in the height available. The reason for the power plant failure cannot be definitely stated, but was almost certainly due to the cutting off of the fuel supply."

Source: (also check out sources used for every accident)

[disclaimer]

07/04/1946.

BRISTOL 170

07/04/46

AviationSafetyNetwork

Accident Description

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Accident reports
Accident specials
CVR / FDR
Database
Mailing list
News
Other sites
Pictures
Publications
Safety issues
Statistics

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About ASN

Accident description

Date:	04.07.1946
Type:	Bristol 170 Freighter 2A
Operator:	Bristol Aeroplane Comp
Registration:	G-AHJB
C/n:	12734
Year built:	
Crew:	0 fatalities / 5 on board
Passengers:	0 fatalities / 0 on board
Total:	0 fatalities / 5 on board
Location:	Aracaju; 198km E off (Brazil)
Phase:	Cruise
Nature:	Delivery
Flight	Bathurst - Natal (Flightnumber)

Remarks:
While on a delivery flight to Argentina fuel shortage forced the crew to ditch the plane. The crewmembers were rescued by an American Steamer. PROBABLE CAUSE: "A powerplant failure resulting from shortage of fuel due to faulty navigation."

Source: (also check out sources used for every accident)

EN.E CT.W

[disclaimer]

Accident description

Date:	**23.11.1947**
Type:	Bristol 170 Freighter 1A
Operator:	Bristol Aeroplane Comp
Registration:	G-AIMC
C/n:	12793
Year built:	
Crew:	0 fatalities / 5 on board
Passengers:	0 fatalities / 0 on board
Total:	0 fatalities / 5 on board
Location:	Wau (Papua New Guinea)
Phase:	Landing
Nature:	Demonstration
Flight:	- Wau (Flightnumber)

Remarks:
The Bristol landed uphill on the inclined Wau runway. At the end of the landing run the brake cable failed, causing the aircraft to run backwards, ending up in a ditch.

Source:
[WAAS] + [PEAPL] + [TCARoGB]

[disclaimer]

8/?/1946

DOUGLAS C-74

81X/46

including the test article.

This first flight of a C-74 occured on September 5th, 1945. The first C-74, 42-65402, was airborne just two months after after it rolled off the assembly line. The 1 hour and 35 minute flight was from Long Beach Municipal Airport and the crew reported the aircraft handled "with characteristic ease".

Aircraft Characteristics:

The Globemaster's engines were equipped with full-feathering, reversible Curtiss electric propellers. They shortened the aircraft's landing role and saved brake wear. They also enabled the airplane to back up for positioning on the ground.

In an aerodynamic sense, the airpland was remarkably efficient. Douglas engineers chose a full span flap arrangement consisting of split flaps under the fuselage center section, double-slotted inboard wing flaps, and complicated triple-slotted 'flaperons' on the outboard sections which served as both flaps and ailerons. Low drag airfoil sections were used to cover the 16 protruding flap hinges, giving the aircraft a distinctive 'toothed' look.

The aircraft had unusual 'bug-eye' canopies which were chosen more for safety than aerodynamics. They allowed the pilots a nearly unobstructed 360-degree view around the aircraft. The crew was provided with quarters, though compact. The engineer's station was behind the copilot, the radio operator was stationed behind the pilot and the navigator was stationed behind him. A toilet, buffet and sleeping quarters were also provided for a relief crew.

The landing gear was patterned after that used on the C-54 (DC-4) but expanded in size to withstand greater tolerances. Hydraulic pressure was only applied to gear after take off in order to retract the gear. Extending the gear was done by gravity alone with the gear lever simply releasing an 'up' latch and letting the gear free-fall. Hydraulic gear extension was available in case of emergencies and there was even a passageway provided so the crew could access each engine nacelle and manually lower the gear.

Air Force Service and Operations:

Of the 14 Globemasters built, 12 were delivered between October 1945 and April 1947.

Of these 14, the second built crashed during flight testing in August 1946. The fourth was diverted to a static test article at Wright Field, Ohio and virtually every component was tested to destruction between August 1946 and November 1948. This was done inorder to determine the individual component's ability to withstand design loads.

The 'C-74 squadron' was activated along with the 'C-74 Project' in September 1946. They were attached to the 554th AAF Base Unit located in Memphis, Tennessee. The 554th was a part of the Air Transport Command. Col. George S. Cassady was put in charge of the project and Maj. Lorris Moomaw temporarily commanded the new squadron.

The C-74 Squadron's mission was threefold: 1) To establish a flight program which would accumulate 300 hours of service time on the Globemaster's original R-4360-27 engines in the shortest possible time; 2) to gather and record all technical data from tests performed on the C-74; and 3) to train sufficient crew members and aircraft mechanics with which to conduct these tests. The R-4360 engine was earmarked for the B-35 and B-36 so Air Material Command was especially anxious to see the results of the squadron's use of the aircraft.

Original qualifications for a perspective C-74 pilot required 2,000 hours total military flying time; 250 hours first pilot time on the C-54, B-29, or C-69; 500 hours of night flying; and 75 hours of instrument time. These were minimal qualifications even though it was acknowledged that "the aircraft is actually easier to fly than the C-54 and the pilot and copilot have even less to do." Due to the complexity of the flight engineer's job, only the most qualified men were considered for this assignment.

1947

Operations in 1947 included two weekly trips from Morrison Field to Albrook Field, Panama using Rio Hato as an alternate field. The squadron was now based at Morrison Field, West Palm Beach, Florida after the 554th AAF Base Unit was deactivated in the Fall of 1946. This was presumably due to the fact that the runways at Memphis were not stressed to take the large gross weight of the C-74.

In March, a Globemaster was flown to Pope Field, North Carolina for inspection and flight testing by the Troop Carrier Command to determine the airplane's adaptability as a troop carrier. The aircraft was flown for 17 hours

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edge angles of fabric-covered control surfaces vary in flight with the pressure differential across the fabric (Mathews, 1944). A Douglas C-74 transport was lost in 1946 when elevator fabric bulging between ribs increased trailing-edge angle, causing pitch oscillations that broke off the wing tips. C-74 elevators were metal covered after that.

Understanding the role of trailing edge angle in aerodynamic hinge moments opened the way for its use as another method of control force management. Beveled control surfaces, in which the trailing edge angle is made arbitrarily large, is such an application (Figure 5.8). Beveled control surfaces, a British invention of World War II vintage, work like balancing tabs for small control surface angles. The beveled edge control works quite well for moderate bevel angles. As applied to the North American P-51 Mustang, beveled ailerons almost doubled the available rate of roll at high airspeeds, where high control forces limit the available amount of aileron deflection. But large bevel angles, around 30 degrees, acted too well at high Mach numbers, causing overbalance and unacceptable limit cycle oscillations (Figure 5.9). Beveled controls have survived into recent times; they are used, for example, on the ailerons of the Grumman/Gulfstream AA-5 Tiger and on some Mooney airplanes.

5.9 Corded Controls

Corded controls, apparently invented in Britain, are thin cylinders, such as actual cord, fastened to control surfaces just ahead of the trailing edge. They are used on one or both sides of a control surface. In a sense, corded controls are the inverse of beveled controls. Bevels on the control surface side that projects into the wind produce relative negative pressures near the bevel that balance the control aerodynamically, reducing operating force, whereas cords on the control surface side that projects into the wind create local positive pressures on the surface just ahead of the cord. This increases control operating force.

Cords on both sides of a control surface are used to eliminate aerodynamic overbalance. On one side they act as a fixed trim tab. Very light control forces have been achieved by cut and try by starting with aerodynamically overbalanced surfaces, caused by deliberately oversized overhang balances. Quite long cords correct the overbalance, providing stable control forces. In the cut and try process the cords are trimmed back in increments until the forces have been lightened to the pilot's or designer's satisfaction.

5.10 Spoiler Ailerons

Spoiler ailerons project upward from the upper surface of one wing, reducing lift on that wing and thus producing a rolling moment (Figure 5.10). Spoiler ailerons are often the same surfaces used symmetrically to reduce lift and increase drag on large jet airplanes for rapid descents and to assist braking on runways. Spoiler ailerons are generally used either to free wing trailing edges for full-span landing flaps or to minimize wing twist due to aileron action on very flexible wings. Ordinary hinged-flap and slot-lip spoiler ailerons in these applications have no particular interest as regards control force minimization. Hinge moments are high; brute hydraulic force is used to open them against the airstream.

However, retractable arc and plug spoiler ailerons are designed for very low hinge moments and operating forces. Although aerodynamic pressures on the curved surfaces of these ailerons are high, the lines of action of these pressures are directed through the hinge

Airplane Stability and Control
Abzug and Larrabee

> The first DC-2s had a very undesirable characteristic in that, even in smooth air, they would develop a directional oscillation. In rough air this characteristic was worse, and air sickness was a common complaint. ... It was noticed, by watching the rudder in flight, that during the hunting the rudder moved back and forth keeping time with the oscillations of the airplane.
>
> It is common knowledge that the control surfaces were laid out along airfoil lines. Because of this fact, the rearward portion of the vertical surface, or the rudder, had curved sides. It was thought that these curved sides were causing the trouble because of separation of the air from the surface of the rudder before reaching the trailing edge. In other words, there was a region in which the rudder could move and not hit "solid" air, thus causing the movement from side to side. The curvature was increased towards the trailing edge of the rudder in such a way as to reduce the supposedly "dead" area. ... The change that we made to the rudder was definitely in the wrong direction, for the airplane oscillated severely. ... After trying several combinations on both elevators and rudder, we finally tried a rudder with straight sides instead of those which would normally result from the use of airfoil sections for the vertical surfaces. We were relieved when the oscillations disappeared entirely upon the use of this type of rudder.

The Douglas group had stumbled onto the solution to the oscillation or snaking problem—reduction of the rudder floating tendency through reduction of trailing edge angle. Flat-sided control surfaces have reduced trailing edge angles compared with control surfaces that fill out the airfoil contour. We now understand the role of control surface trailing edge angle on hinge moments. The wing's boundary layer is thinned on the control surface's windward side (the wing surface from which the control protrudes). Conversely, the wing's boundary layer thickens on the control surface's leeward side, where the control surface has moved away from the flow. Otherwise stated, for small downward control surface angles or positive wing angles of attack the wing's boundary layer is thinned on the control surface bottom and thickened on the control's upper surface.

The effect of this differential boundary layer action for down control angles or positive wing angles of attack is to cause the flow to adhere more closely to the lower control surface side than to the upper side. In following the lower surface contour the flow curves toward the trailing edge. This curve creates local suction, just as an upward-deflected tab would do. In contrast, the relatively thickened upper surface boundary layer causes the flow to ignore the upper surface curvature. The absence of a flow curve around the upper surface completes the analogy to the effect of an upward-deflected tab. The technical jargon for this effect is that large control surface trailing edge angles create positive values of the derivatives C_{h_α} and C_{h_δ}, the floating and restoring derivatives, respectively.

The dynamic mechanism for unstable lateral-directional oscillations with a free rudder became known on both sides of the Atlantic a little after the Douglas DC-2 experience. Unstable yaw oscillations were calculated in Britain for a rudder that floated into the wind (Bryant and Gandy, 1939). This was confirmed in two NACA studies (Jones and Cohen, 1941; Greenberg and Sternfield, 1943). The aerodynamic connection between trailing edge angle and control surface hinge moment, including the floating tendency, completed the story (Jones and Ames, 1942).

Following the success of the flat-sided rudder in correcting yaw snaking oscillations on the Douglas DC-2, flat-sided control surfaces became standard design practice on Douglas airplanes. William H. Cook credits George S. Schairer with introducing flat-sided control surfaces at Boeing, where they were used first on the B-17E and B-29 airplanes. Trailing

09/14/1946

BELL XP-83

Bell XP-83

Last revised October 16, 1999

One of the primary weaknesses of early jet fighters was their voracious appetite for fuel, resulting in a short range and a limited endurance as compared to conventional piston-engined fighters. In March of 1944, the Bell Aircraft Corporation was asked by the USAAF to construct a jet fighter with extended radius to overcome some of these limitations. A Letter Contract for two prototypes was issued on March 29, 1944. The designation XP-83 was assigned.

Bell had actually been working on an interceptor design since March of 1943 under the company designation of Model 40. In April, in response to the USAAF's requirement, the Model 40 was reconfigured as a long-range escort fighter. The Bell Model 40 retained the basic overall configuration of the earlier P-59A Airacomet, the first US jet-propelled aircraft. Twin General Electric I-40 (J33) turbojets were installed in housings underneath the wing roots, adjacent to the fuselage. This arrangement had the advantage in that no appreciable asymmetric forces were exerted if one engine went out. In addition, no fuselage space was occupied by engines, leaving internal fuselage capacity free for fuel tankage and armament.

The rather large and bulky fuselage was of all-metal semimonocoque construction. A fully-retractable tricycle undercarriage was fitted. Internal fuel capacity was a capacious 1150 US gall. In addition, a pair of 250 US gall drop tanks could be carried. The ailerons were hydraulically-operated, and the flaps were electrically-controlled. A pressurized cabin was provided. The cockpit had a small, low canopy with a very sloping windscreen. The proposed armament was to be six 0.50-in machine guns with 300 rpg, all guns being mounted in the nose. However, alternative armament schemes of four 20-mm or 37-mm cannon and even a battery of 20 (!!!) 0.50-in machine guns were also considered.

A USAAF contract for two XP-83 prototypes was awarded on July 21, 1944, confirming the Letter Contract of March. Serials were 44-84990 and 44-94991. Only seven months after the awarding of the contract, the first prototype (44-84990) was flown on February 25, 1945 by chief Bell test pilot Jack Woolams. The aircraft proved to be underpowered and somewhat unstable. The close proximity of the turbojets was found to have the unintended side effect of allowing the hot jet exhaust gases to buckle the tailplane during run-ups on the ground unless fire trucks were standing by to spray cooling water on the rear fuselage.

The second prototype (44-84991) flew on October 19, 1945. It had a slightly different bubble canopy and a somewhat longer nose to accommodate a heavier armament of six 0.60-inch T17E3 machine guns. This aircraft was used in gunnery tests at Wright Field in Ohio.

The tailplane overheating problem was cured by modifying the tailpipes so that they angled outwards. Wind tunnel tests showed that an 18-inch extension of the vertical tail would cure the stability problems, but it is not certain whether or not this modification was actually carried out.

The performance of the XP-83 was rather disappointing, and no series production was ordered. Apart from its range, the XP-83 offered no significant advantages over the Lockheed P-80 Shooting Star which was already in production, and further work on the XP-83 project was abandoned.

Following the abandonment of work on the XP-83, the two prototypes were used for a short time as test beds for other development work. The first XP-83 was used in a ramjet engine test program, in which a pair of experimental ramjets were slung under the wings. It was intended that the aircraft would be able to fly on ramjet power only, once sufficient flying speed was obtained. A hatch was cut in the belly to provide entry into the aft fuselage, and an engineer's station was provided in the fuselage behind the pilot. However, on September 14, 1946, just as the test program was beginning, one of the ramjets caught fire during a test flight, forcing pilot Chalmers Goodlin and engineer Charles Fay to parachute to safety. The XP-83 was destroyed in the ensuing crash.

The second XP-83 survived until 1947, at which time it was scrapped.

Specification of the XP-83:

Two 4000-lb.st. General Electric J33-GE-5 centrifugally-fed turbojets. Performance: Maximum speed was 522 mph at 15,660 feet. Range on internal fuel was 1730 miles at 30,000 feet. With two 250-Imp.gall drop tanks, range was 2050 miles. Initial climb rate was 5650 feet per minute, and an altitude of 30,000 feet could be reached in 11.5 minutes. Service ceiling was 45,000 feet. Weights were 14,105 pounds empty, 24,090 pounds loaded, 27,500 pounds maximum. Dimensions were wingspan 53 feet 0 inches, length 44 feet 10 inches, height 15 feet 3 inches, wing area 431 square feet.

Sources:

1. Fighters of the United States Air Force, Robert F. Dorr and David Donald, Temple

Late 40's

7/13/?

quickly. If the landing was normal, the drogue chute could be left attached while the main braking chute was deployed.

Following the end of the landing roll, both the landing and braking chutes were jettisoned at the end of the runway before the B-47 taxied in. The chutes were recovered and repacked by the ground crews.

There were problems with the ejection seat equipment. The ejector seats were removed after an XB-47 accident in which the pilot was killed. As a substitute, an additional escape hatch and bail-out spoiler were provided underneath the nose.

Deliveries of the B-47A to the USAF began in December of 1950. The B-47A entered service in May of 1951 with the 306th Bombardment Wing (Medium) based at MacDill AFB in Florida. The 306th was intended to act as a training outfit to prepare future B-47 crews. None of the B-47As ever saw any operational duty. Most of the B-47As were unarmed and were initially almost without vital electronic components. Only four of the ten had the K-2 bombing navigation system. The tail armament of two 0.50-inch machine guns was tested with an A-2 fire control system on 49-1906 and with an A-5 fire control system on 49-1908. Some of the B-47As stayed with the Air Proving Command.

Serials of B-47A:

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49-1900/1909          Boeing B-47A Stratojet - Model 450-10-9 c/n
                                450001/450010
```

Specification of Boeing B-47A Stratojet:

Powerplant:
    Six General Electric J47-GE-11 turbojets, rated at 5200 lb.s.t. each.
Performance:
    Maximum speed 600 mph at 8800 feet. Service ceiling 38,000 feet. Combat ceiling 44,300 feet. Initial climb rate 3375 feet per minute. Combat radius 1550 miles. Range 2650 miles with 10,000 pound bombload. Ferry range 4000 miles. Takeoff ground run 6000 feet at sea level.
Dimensions:
    Wingspan 116 feet 0 inches, length 106 feet 9 inches, height 27 feet 8 inches, wing area 1428 square feet.
Weights:
    73,240 pounds empty, 106,060 pounds normal loaded, 157,000 pounds maximum takeoff.
Armament:
    Two 0.50-inch machine guns in tail turret (not actually fitted). Normal bombload 10,000 pounds. Up to 16 1000-pound bombs or one 22,000 pound bomb could be carried.

Boeing B-47 Stratojet
Boeing B-47 Stratojet - Chapter 1: XB-47
Boeing B-47 Stratojet - Chapter 3: B-47B

Joe Baugher jbaugher@worldnet.att.com
Maintained by Carl Pettypiece

 (1 only)

?/?/1947

4/X/47

Martin 210

XBTM-1, AM-1 Mauler Navy Attack Plane

After differentiating between torpedo and dive bombers during the 1930's, the Navy decided in 1943 to go back to the "three-purpose plane" category used for the T3M and T4M back in the twenties. The new "Bomber-Torpedo" (BT) planes, however, would be single seaters. Experience had shown that pilots could aim bombs or torpedoes and even navigate with radio aids, while powerful new piston engines (and later jets) provided enough speed to forgo a rear gunner. Development of the new type was assigned to several traditional Navy suppliers - Douglas, Grumman, Curtiss, and Martin - and to newcomer Kaiser Fleetwings, operating in the old Keystone plant in Bristol, Pennsylvania. After considering a liquid-cooled engine, Martin decided to power its entry with the larger of the two "monster" radials, Pratt and Whitney's four-row, 28-cylinder R-4360 "corncob." A contract was signed in January 1944 for two prototype XBTM-1's. Martin dubbed the plane "Mauler."

With work on the B-26 ending, Martin's engineering department was able to move fast. A mockup was ready within a month and the first Mauler flying in August. Looking ahead to desperate battles off the Japanese coast, the Navy ordered 750 of them on January 15, 1945. But then problems arose. The sheer size of the plane and engine made the Mauler difficult for the pilot to control; a complicated hydraulic-assist system had to be added. A number of other items had to be redesigned, including the propeller spinner, wing dihedral, and dorsal fin. The torque of the big engine was so strong that it was decided to compensate by offsetting it two degrees to the right of the plane's centerline.

Redesign lasted until early 1947, by which time the order had been cut to only 99 planes, now designated AM-1 in the Navy's new attack classification. By this time the rival Douglas AD-1 Skyraider, which used the somewhat smaller and simpler 18-cylinder Wright R-3350 engine, was entering squadron service. The Mauler, meanwhile, encountered still more problems in its carrier trials. The planes' tails vibrated violently after hooking arrestor wires; in one landing the whole rear section of the fuselage ripped off. Eventually a "roller hook" that dissipated sideways stress when engaging the wires was designed to solve the problem, but another year was lost.

In March 1948 "Able Mabels" entered service with four attack squadrons, mostly aboard the new USS Midway. In May, the Navy ordered another fifty planes. As these emerged in 1949 Martin test pilot O.E. "Pat" Tibbs began flying them with remarkable loads. In April 1949 he took up a Mauler carrying three 2,200-pound torpedoes, twelve 500-pound bombs, and 800 rounds of ammunition for the wing-mounted 20-mm cannons. The payload of 10,648 pounds set an unofficial record for single-engine planes. With the fleet, though, the Maulers proved difficult to land safely aboard even the Midway's 986-foot flight deck. One squadron commander nicknamed his AM's as "Awful Monsters." Although unable to match the Mauler's weight records, the Douglas "Able Dogs" were easier to fly and maintain; they were to serve on into the 1960's. In 1950 the Maulers were reassigned to naval reserve squadrons flying from inland concrete runways.

Eighteen Maulers were delivered as electronic-countermeasures planes, AM-1Q's. An electronics operator sat uncomfortably in a windowless compartment behind the pilot, equipped with black boxes and a chaff chute. AM-1Q's served mostly with Composite Squadron Four, based at Atlantic City, from which they were detached to other units. The last active-duty Mauler was in service with VC-4 in

05/?/1947 &
06/?/1949

XB-45

≈5/X/47 6/X/49

Any consideration of the XB-47 and XB-48 would be deferred until after they had flown. If either the XB-47 or XB-48 turned out to be markedly superior to the plane that was then being produced, then that aircraft would be purchased and the currently-produced version would be phased out. This is indeed what happened when the XB-47 appeared.

The USAAF concluded that the Convair XB-46 would likely be inferior in performance to the XB-45, and that its thin, graceful fuselage would not be able to hold all the required radar equipment. Since the configuration of the XB-45 did not depart significantly from that of proven aircraft already in service and hence presented fewer risks, on August 2, 1946, the USAAF announced that they were going to endorse the immediate production of the B-45. A contract for 96 B-45As (North American NA-147) was signed on January 20, 1947.

The XB-45 was a shoulder-winged monoplane powered by four Allison-built General Electric J35-A-4 turbojets paired side-by-side in large nacelles underneath each wing. The tailplane had a large dihedral angle in order to clear the jet exhaust. The crew consisted of two pilots sitting in tandem underneath a transparent canopy, a bombardier in a transparent nose, and a gunner sitting in the extreme tail. The three forward crew members entered the aircraft by means of a large door on the left-hand side of the nose, with the tail gunner having his own door in the right fuselage underneath the tailplane. The main landing gear was mounted just inboard of the engine nacelles, and retracted inward into wells in the wing roots.

The first XB-45 took off on its maiden flight on March 17, 1947 from Muroc Army Air Field, piloted by George Krebs. On that first flight, the aircraft had to be flown under severe speed restrictions, since the landing gear doors would not close properly. It was the first American four-jet bomber to fly.

Three XB-45s were built. Each of the three XB-45s was instrumented for a different specialized phase of the program. Near the beginning of the test flight program, one of the XB-45s crashed, killing two of North American's test pilots. A total of 131 flights were carried out by the surviving two aircraft before they were turned over to the USAF.

The USAF accepted one of the XB-45s on July 30, 1948, the other on August 31. Initially, they did not have cabin pressurization, but this was later added. In June of 1949, one of the XB-45s was damaged beyond repair in an accident. The remaining XB-45 had only a limited testing value due to an initial shortage in government-furnished equipment. A USAF flight test crew delivered the plane to the Wright-Patterson AFB in Ohio, where equipment was installed for bombing tests at Muroc AFB in California, but very few tests were actually carried out because of excessive maintenance requirements. On May 15, 1950 the aircraft was transferred to the Air Training Command to serve as a ground trainer.

Serials:

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45-59479/59481        North American XB-45 Tornado
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Specification of North American XB-45 Tornado:

Powerplant:
    Four Allison J35-A-7 turbojets, rated at 4000 lb.s.t. each.
Performance:
    Maximum speed 483 mph at 30,000 feet, 516 mph at 14,000 feet, 494 mph at sea level. Service ceiling 37,600 feet. Initial climb rate 2070 feet per minute. An altitude of 30,000 feet could be attained in 19 minutes. 2236 miles range with 8350 pounds of bombs, 1700 miles range with

 (1 only)

8/?/1947

8/x/47

Martin 219

P4M-1 Mercator Patrol Plane

Nineteen forty-four was a fertile year for Martin's engineers. With earlier projects like the B-26 and Baltimore winding down, and the unwanted B-35 shifted back to Northrop, they had time and energy to launch no fewer than six new designs: the XB-48, AM-1 Mauler, 2-O-2 airliner, XPBM-5A amphibian, JRM Mars, and Model 219 P4M-1 patrol plane for the Navy, dubbed the "Mercator." The Mercator shared several features with its Martin contemporaries. Like the Mars and Mauler it was powered by the Pratt and Whitney R-4360 "corncob" engine, which was becoming a Martin specialty. So was the high tail fin also seen in the 2-O-2 and XB-48. Like the XB-48, the Mercator had jets engines, two Allison J33's mounted beneath the big radials in the same nacelles.

The intended mission was long-range maritime patrol. Experience in World War II had shown the Navy that this need not be limited to flying boats: faster landplanes like the Lockheed PV-1 Ventura, PV-2 Harpoon, and Consolidated PB4Y Liberator and Privateer had been useful as well. In 1944, the old "Patrol" category was revived and applied to purpose-built landplanes that would combine the size and armament of four-engine planes with the economy and range of two-engine ones. Besides two XP4M-1 Mercators, the Navy ordered another prototype, the XP2V-1 Neptune from Lockheed.

As had been the case with the Mauler and Skyraider, Martin's competitor offered an older, less complicated plane. Like the Skyraider, the Neptune used Wright R-3350 engines. Lockheed had begun work on its design work as far back as 1941, and the Neptune was already a year into flight testing before the Mercator first took off in September 1946. The same month, a modified P2V called the "Truculent Turtle" covered a record 11,236 miles nonstop.

The Mercator offered several advantages, however. A third larger than the Neptune, it was also 100 mph faster when the jets were used. Combining two different types of powerplant in the same plane, however, proved difficult. Both piston and jet engines were adjusted to burn a highly volatile common fuel; when an XP4M-1's main fuel line burst on a test flight in August 1947, fumes killed a Martin flight test engineer and injured two others.

The Navy chose the cheaper, more reliable Neptune as its regular patrol plane; it was to continue in service even longer than the Skyraider. But the Mercator was not a completely lost opportunity for Martin - nineteen were ordered in 1947 and 1948. Most were delivered to Patrol Squadron 21, stationed at Patuxent River Naval Air Station in Maryland and later Port Lyautey in Morocco. Fast and heavily armed with nose and tail turrets with 20mm cannons and a 250CE Martin deck turret with twin .50's, Mercators were better suited to bombing and mine-laying missions in hostile airspace than to antisubmarine patrol. Beginning in 1951, they were specifically modified for electronic reconnaissance as P4M-1Q's. Serving with a variety of small, secret units, their tail numbers sometimes disguised, Mercators were sent out to monitor radar and radio signals along the coasts of the Soviet Union and its allies. Long patrol missions were conducted at night, the planes loaded with electronic black boxes and crewed by 14 pilots, operators, and gunners. Occasionally they met with opposition. There were rumors of a hostile attack after a Moroccan-based Mercator crashed in the eastern Mediterranean in February 1952. Another Mercator was definitely shot down by Chinese fighters near Shanghai in 1956. Still another fought off attacks by two North Korean MiG-17s in 1959, the tail gunner being wounded in

08/23/1947

08/23/47

AviationSafetyNetwork

Accident Description

Home
Accident reports
Accident specials
CVR / FDR
Database
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Other sites
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Publications
Safety issues
Statistics

Forum
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About ASN...

Accident description

Date:	23.08.1947
Type:	Avro 689 Tudor 2
Operator:	Ministry of Supply
Registration:	G-AGSU
C/n:	1235
Year built:	1946
Crew:	4 fatalities / 6 on board
Passengers:	0 fatalities / 0 on board
Total:	4 fatalities / 6 on board
Location:	Shirfold Farm (UK)
Phase:	Initial Climb
Nature:	Test
Flight:	- (Flightnumber)

Remarks:
Avro Tudor G-AGSU took off for a testflight and climbed to 50-80ft. The right hand wingtip then struck the ground until the aircraft crashed into trees, ending up in a pond. PROBABLE CAUSE: Incorrect assembly of the aileron control circuit.

Source:

[disclaimer]

?/?/1948

7/1/48

October of 1947. The maiden flight took place from Bethpage on November 21, 1947, test pilot Corwin H. "Corky" Meyer being at the controls. The landing took place at Idlewild Airport (now the John F. Kennedy International Airport), since the runway at Bethpage was thought to be too short to risk a first landing of a jet-powered aircraft. The second XF9F-2 prototype (BuNo 122477) flew five days later.

Neither XF9F-2 prototype was fitted with armament nor was it fitted with an ejector seat. The wings folded upward hydraulically. A single tailhook retracted into the rear fuselage underneath the jet exhaust. Internal fuel capacity was 597 US gallons.

During company and Navy trials, the two XF9F-2 prototypes were found to snake markedly at all speeds and were longitudinally unstable at all speeds. The snaking problem was addressed by increasing the area of the fin and rudder, and the longitudinal instability problem was attacked by adding baffles to the fuel tanks. One of the prototypes shed its tail section during an arrested landing at Patuxent River, Maryland, which required some strengthening of the rear fuselage.

In February of 1948, non-jettisonable fuel tanks were added to the wingtips of the first prototype. This feature became standard with the 13th production aircraft, and non-jettisonable wingtip fuel tanks were to be a feature of the Panther through its entire production run.

Since the Navy was fearful that the Taylor Turbine Corporation might not be able to deliver sufficient numbers of engines in a timely fashion, the Navy encouraged Taylor to negotiate an agreement whereby the Nene manufacturing license would be transferred to a more-established engine manufacturing company. This was done as requested, and the Nene license was purchased from Taylor by Pratt & Whitney.

Sources:

1. United States Navy Aircraft Since 1911, Gordon Swanborough and Peter M. Bowers, Naval Institute Press, 1990.

2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion, 1987.

3. Grumman Aircraft Since 1929, Rene J. Francillon, Naval Institute Press, 1989.

4. American Combat Planes, 3rd Enlarged Edition, Ray Wagner, Doubleday, 1982.

05/03/1948

Skystreak 05/03/48

[illegible]

Research

[illegible]

Inverted

Takeoff [illegible] 150 [illegible] 200-250 [illegible]

ANALYSIS: [illegible] takeoff [illegible]

A/c airborne – gear retracted [illegible]

A piece of the [illegible] followed immediately by [illegible]

A/c then rolled slowly [illegible] into [illegible] position [illegible] 150-170 [illegible] aircraft [illegible]

A/c [illegible] (inverted) [illegible] left wing striking [illegible] left wing off [illegible] pilot was killed instantly.

A/c [illegible] for approx. 1000' from point of [illegible]

Cause of the crash is believed to be result of an explosion of the [illegible] engine compressor section, which possibly severed the control cables. An official NACA investigation will [illegible] an official report [illegible] conclusions.

No [illegible] will be written on J35 engine because of inaccurate & inconclusive evidence. The explosion could have been caused by (A) a foreign object passing thru the air inlet ducts into the engine compressor section, or (B) by engine material failure.

ENGINE INFO: Model J-35-3, Ser. #C-500010. Operating time – 27.7 hrs. A 25 hr inspection was made at an operating time of 14.7 hrs. The accessory drive [illegible] pinion bearing was modified at 17.6 hrs. [illegible] regulator & fuel pump were installed at 14.5 hrs.

TALLY [illegible]

AIRCRAFT ACCIDENT CARD

[illegible]

CONTRIBUTING CAUSES & REMARKS

23 [illegible] after take off

[illegible]

Centrifugal [illegible] possibly caused by explosion

No [illegible]

[illegible]

DATE [illegible] 03

LOCATION: Muroc Air Force Base

PURPOSE: Research

DAMAGE: [illegible] INJURY: Fatal [illegible] 1

Service [illegible] NACA

Unl. Unl. [illegible] 0

Contact

[illegible] NACA [illegible]

[illegible] 77.8 [illegible] 1 min.

Takeoff approx 110' [illegible] inverted [illegible] 110 - ----- [illegible] mph.

ANALYSIS - [illegible] - [illegible] to E off [illegible] r/w over Dry lake bed.

A/c airborne - gear retracted - [illegible]

A piece of [illegible] a/c, followed [illegible] fuselage.

A/c then rolling slowly to left [illegible] 110' altitude [illegible] 135°-180° roll. Aircraft [illegible]

A/c struck ground at [illegible] 110° [illegible] (inverted); [illegible] striking [illegible] rolled left, [illegible] off [illegible] 110-200' before [illegible] was killed instantly.

A/c [illegible] on [illegible] for approx 100' from point of [illegible]

[illegible] is believed [illegible] result of an explosion [illegible] jet engine [illegible] which possibly severed [illegible] control [illegible]. An official NACA investigation [illegible] official report [illegible]

No [illegible] will be written on [illegible] inaccurate [illegible] inconclusive evidence. [illegible] (A) [illegible] from [illegible] the air inlet ducts into the [illegible] section, or (B) [illegible] material failure.

ENGINE INFO: Model J-35-3, Ser. [illegible]C-53001C. Operating time - 17.7 hrs. A 25 hr inspection was made at an operating time of 11.7 hrs. The accessory drive [illegible] pinion bearing was modified at 17.0 hrs. A new regulator & fuel pump were installed at 1[illegible] hrs.

TALLY

AIRCRAFT ACCIDENT CARD

FORM NAVAER [illegible]

23 Dove into ground immed. after take off.

PP1X Believed due to explosion of jet eng compressor

A59 Control cables possibly severed by explosion

H9 No crash helmet, shoulder straps not used.

[illegible] (Compressor)

BP

DAMAGE DESCRIPTION & REMARKS

GENERAL NATURE OF ACCIDENT

PRIMARY-SECONDARY TOP ROW

SPECIFIC TYPE OF ACCIDENT

LOCATION Muroc Air Force Base

Service NACA

77.5 [illegible] 1 min

DAMAGE DESCRIPTION & REMARKS

PURPOSE Research

Unl. Unl. [illegible] 50'

[illegible] Contact

Takeoff approx 150' [illegible] Inverted 150 - ----- [illegible] mph.

ANALYSIS - Takeoff - [illegible] to E off main [illegible] r/w over Dry lake bed.

A/c airborne - Gear retracted - [illegible]

A piece of the [illegible] was observed leaving the a/c, followed [illegible] by burst of [illegible] flame.

A/c then rolled slowly to left [illegible] 150' altitude [illegible] 120°-150° roll. [illegible] mph.

A/c struck ground at [illegible] left wing striking [illegible] left, [illegible] 150-200' before [illegible] was killed instantly.

A/c [illegible] ground for approx 100' from point of [illegible]

Cause of the [illegible] is believed to be result of an explosion of the [illegible] jet engine compressor [illegible] which possibly severed the control [illegible]. An official NACA investigation [illegible] will [illegible] official report [illegible] conclusions.

No [illegible] will be written on [illegible] because of inaccurate & inconclusive evidence. The explosion could have been caused by (A) a foreign object passing thru the air inlet ducts into the engine compressor section, or (B) by engine material failure.

ENGINE INFO: [illegible], J-35-3, Ser. [illegible]-500010. Operating time - 27.7 hrs. A 25 hr inspection was made at an operating time of 14.7 hrs. The accessory drive rear pinion bearing was modified at 17.0 hrs. A new regulator & fuel pump were installed at [illegible] hrs.

23 Dove into ground immed. after take off

SP12 Believed due to explosion of jet eng compressor

A69 Uncontrollable possibly caused by explosion

H9 No crash helmet - shoulder straps not used.

BP

[illegible]ure - Eng. Compressor)

TALLY

D N A B O

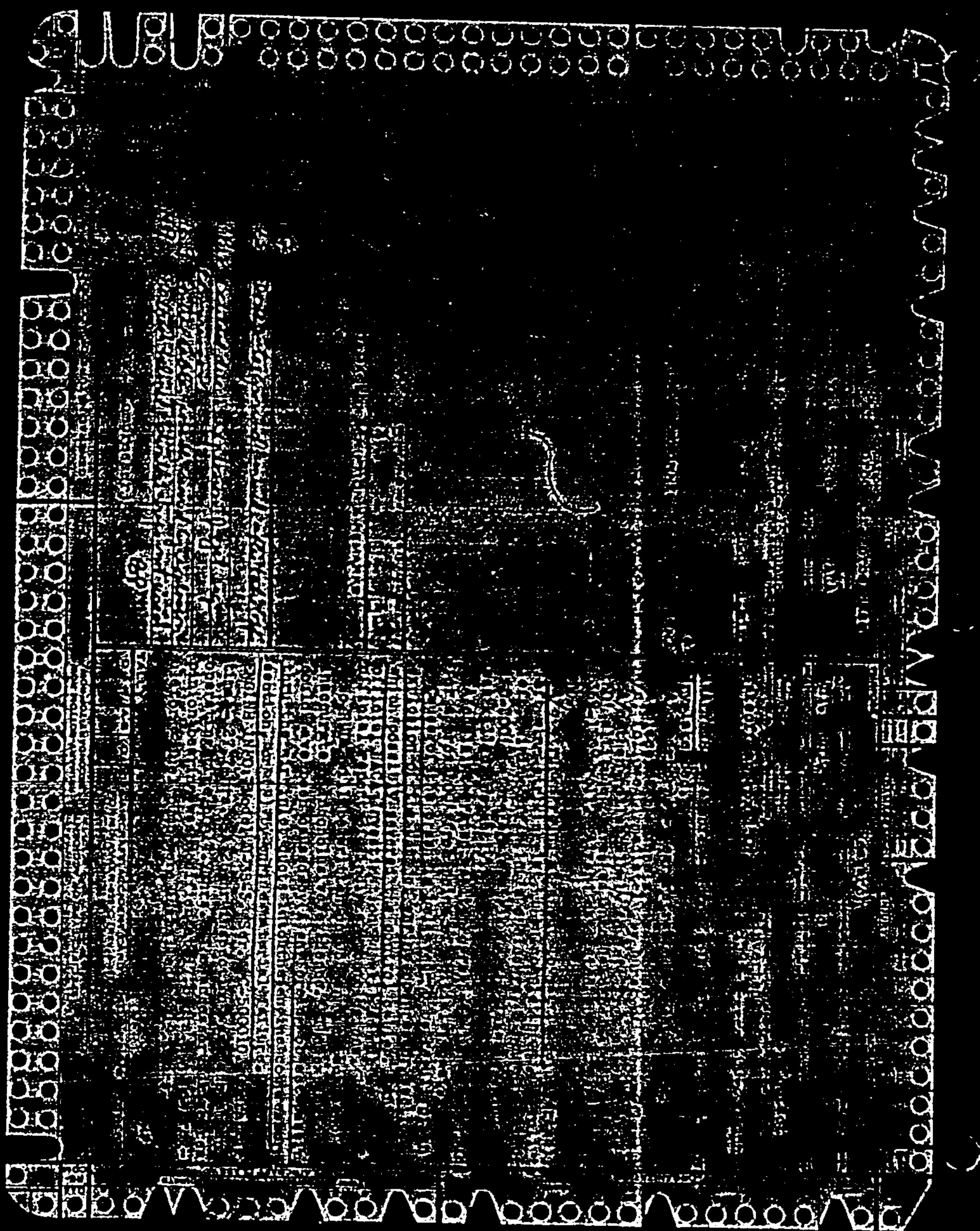
AIRCRAFT ACCIDENT CARD

FORM NAVAER 339 C (REV 9-45)

GENERAL NATURE OF ACCIDENT

PRIMARY-BOTTOM ROW SECONDARY-TOP ROW

SPECIFIC TYPE OF ACCIDENT



Aug 28 1948

X P(F) - 85
Goblin

Re Hookup to B-29

08/28/48

Since the XP-85 was to be launched and recovered from a retractable trapeze underneath its parent bomber, no conventional landing gear was fitted. A retractable hook was fitted to the fuselage in front of the cockpit. During recovery, the XP-85 would approach its parent bomber from underneath, and the hook would gently engage the trapeze. Once securely attached, the aircraft would be pulled up into the belly of the bomber. If an emergency landing were necessary, the aircraft was provided with a retractable steel skid underneath the fuselage, and the wingtips were protected by steel runners.

Since no B-36 could be spared as yet for the project, a Bell-Atlanta-built Boeing B-29B-65-BA (Ser No 44-84111) was specially modified for use as the mothership in the initial testing. Redesignated EB-29B, it was fitted with a special launch-and-recovery trapeze that would be used for the first test flights of the XP-85.

In June 1948, the XP-85 was redesignated XF-85 when the USAF replaced the prefix P for Pursuit by F for Fighter.

The first prototype XF-85 (46-523) was damaged at Moffett Field, California during wind tunnel testing, so it was the second aircraft (46-524) that was used for the initial flight trials. These began on August 23, 1948. Initially, the XF-85 made captive flights suspended beneath the EB-29B at 20,000 feet above Muroc Dry Lake (later Edwards AFB). The first free flight came on August 28. The test pilot detached his XF-85 from the EB-29B and flew free for 15 minutes while he evaluated the handling properties of the new fighter. However, when it came time to re-hook, he ran into trouble. The XF-85 was caught in violent air turbulence underneath the parent aircraft. After ten minutes of futile attempts to hook onto the trapeze, the XF-85 was slammed up against the trapeze and the canopy was shattered. Fortunately, the pilot was uninjured and he managed to make an emergency landing on the dry lake bed below.

Following repairs, 46-524 made three flights on October 14 and 15 of 1948. Three successful recoveries were made, although each one of them was a rather harrowing experience for all concerned. However, on the fifth flight, more trouble was encountered. The removal of the temporary fairing around the base of the hook resulted in severe turbulence and loss of directional stability, forcing the pilot to make another emergency landing. Vertical surfaces were added to the wingtips in an attempt to improve directional stability while flying in the turbulent air underneath the EB-29B. However, this did not help very much, and the sixth XF-85 flight ended in yet another emergency landing on the lakebed. The same fate awaited 46-523 on April 8, 1949, when it made its first and only flight.

In spite of the problems encountered with recovery, the XF-85 handled quite well in ordinary flight. Its test pilot commented favorably on the stability, control, and spin recovery characteristics. Estimated maximum speed was 648 mph at sea level and 581 mph at 35,000 feet. Initial climb was estimated to be 12,500 feet/min, and service ceiling was estimated at 48,000 feet. I don't think that the armament of four 0.50-cal machine guns was ever fitted.

However, the Air Force reluctantly concluded that since the recovery operation was so difficult a job for even experienced test pilots, it would probably be far beyond the capabilities of the average squadron pilot. In addition, it was projected that the performance of the XF-85 would likely be inferior to that of foreign interceptors that would soon enter service. Furthermore, a budget crunch in the autumn of 1949 led to a severe shortage of funds for developmental projects. Consequently, the Air Force terminated the XF-85 program on October 24, 1949.

I have never found any references which state that the XP-85 ever made any flights from a B-36 mothership.

Although the XF-85 Goblin was ultimately unsuccessful, it did provide some valuable data that was of use in the 1950s when the Republic RF-84F Thunderflash reconnaissance aircraft was adapted for launch and recovery beneath a B-36 bomber.

XF-85 Ser No 46-523 is currently on display at the Wright-Patterson Air Force Base Museum. I saw it there in May of last year. It is indeed one tiny airplane! 524 is on display at the Strategic Air Command Museum in Omaha, Nebraska.

References:

1. McDonnell Douglas Aircraft Since 1920, Volume II, Rene J. Francillon, Naval Institute Press, 1990.

2. The American Fighter, Enzo Angelucci and Peter Bowers, Orion Books, 1987.

/1949

French "Triton"

Sud-Ouest

1 149

Just as the mediocre MiG-9 and the outstanding MiG-15 turned the Soviet design team of Mikoyan and Gurevich into one of the great success stories of the jet age, so did the unsuccessful 21R and first-rate 29A *Tunnan* sire a proud line of fighting Saabs, with names like *Lansen*, *Draken* and *Viggen*.

France, recovering from a devastating German occupation, was understandably late in entering the jet age, although the Rateau firm had been experimenting with jet turbines as early as 1939. During the occupation, the *Societé Nationale de Constructions Aéronautiques de Sud-Ouest* (SNCASO) began clandestinely to design a jet test-bed called the SO 6000 Triton. Wind tunnel tests with models were conducted in 1944, and following the liberation, construction of five prototypes began early in 1945.

Seating two crewmen side by side within a corpulent fuselage, the S0-6000 was to have been powered by a Rateau SRA-1 axial-flow engine with 16-stage compressor and two-stage turbine embodying the bypass principle. At the time the airplane was completed, however, the SRA-1 was still not fully developed, so the modified prototype, SO-6000J No.1, used a German-built 1,984-lb.s.t. Junkers Jumo 004B-2 engine when it made its first flight on November 11, 1946. Subsequent Triton prototypes were built around the British Rolls-Royce Nene engines and were designated SO-6000N. The fourth airplane in the series crashed in 1949, but much was learned from the Tritons, and S0-6000N No. 3 survives at the *Musée de l'Air et l'Espace* at le Bourget.

The only operational French combat jet aircraft to fly before 1950 was the product of Marcel Bloch, a World War I pilot who had manufactured aircraft prior to World War II and had spent the war in a Nazi prison camp. Bloch survived his captivity, then suddenly changed his religion from Judaism to Catholicism and changed his name to Marcel Dassault. In 1946, he embarked on a private venture to rebuild his aircraft firm and, on June 29, 1948, succeeded in obtaining a French government grant to build three prototypes of a new jet fighter design.

On February 29, 1949, Dassault's straight-winged creation, the M.D.450 *Ouragan* ("Hurricane") took to the air, and promptly earned a contract for 150 more. As with McDonnell, MiG and Saab, Dassault's first jet was to be the forerunner of a dynasty of great aircraft, such as the *Mystère* and the *Mirage*.

A second noted French designer would create a jet fighter in the 1940s, but not for France. Emile Dewoitine lent his aeronautical experience to the Fabrica Militar de Aviones (FMA) to produce Argentina's first indigenously-built turbojet-powered aircraft, the I.Ae.27 *Pulqui* ("Arrow"). Powered by a Rolls Royce Derwent 5 engine generating 3,600 lb. of thrust, the all-metal, straight-winged *Pulqui* was armed with four 20mm cannons and was intended as a single-seat interceptor capable of operating from short, rustic runways. The prototype was first flight-tested on August 9, 1947, but its maximum speed of 447 mph and initial climb rate of 4,921 feet per minute were far below international standards of the time. As a result of that disappointing performance, FMA abandoned further development of the *Pulqui* jet fighter, turning its attention to the production of less sophisticated but more economically feasible aircraft types.

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jet technology faster than anyone had expected, but it also gave the Soviets a fighter that could outperform anything in the West except for the F-86 Sabre. During the fighting over Korea between 1950 and 1953, the MiG proved capable of outmaneuvering and outclimbing the Sabre, while the Sabre could outdive the MiG. In combat, however, the MiG-15 revealed one fatal weakness--an unstable gun platform, especially in a dive, where it had a tendency to snake. Soviet pilots who flew the MiG-15 over Korea found that to be a serious handicap, which was even more grievous for its less experienced North Korean and Chinese pilots. The problem was recognized by the MiG team, which remedied it by lengthening the fuselage and completely redesigning the wing to create the MiG-17, one of the outstanding jet fighters of the 1950s--and even of the 1960s. This was only the beginning for Mikoyan and Gurevich, whose wartime products had previously been known only for their mediocrity. The jet age was to make MiG a household word.

The Soviet Yak-15 and its progeny were almost unique in the history of jet aviation, but not quite. Sweden also tried, with less success, to enter the jet age by adapting a jet engine to a piston-engine airframe. Recognizing the unprecedented challenge that the Cold War would present to her policy of strict neutrality, Sweden embarked on a crash program to modernize her air defenses. On November 9, 1945, the Swedish government instructed the *Svenska Aeroplan Ante Bolaget* (Saab) to adapt its twin-boom, piston-engine 21A fighter to use the British de Havilland Goblin turbojet. The result, the Saab 2IR, retained some 50 percent of the 21A's original design when its prototype took off on March 10, 1947, with Ake Sunde at the controls.

Although its configuration resembled the de Havilland Vampire's, the Saab 21R's handling characteristics did not. Its maximum speed of 497 mph, which was about 100 mph faster than the 21A's, coincided with the stress factors for which the 21A had been aerodynamically intended, and pilots who exceeded that speed found the controls to be excessively heavy. An additional problem was the plane's fuel capacity, because it allowed a flying time of only 40 minutes. By the time the first Saab 21R entered service early in 1950, its production order had been halved from 120 to 60.

In October 1945, the Saab design team had tentatively laid out Project R-1001 for a pod-and-boom turbojet fighter whose corpulent appearance led the team's leader, Lars Brising, to dub it the *Tunnan* ("Barrel"). At the end of the year, the project was affected by two new developments. First, it was learned that de Havilland was working on a more powerful engine than the Goblin, called the Ghost. Second, a Saab engineer came back from a visit to Switzerland with a wealth of *Luftwaffe* reports on its experiments with wing sweepback.

By January 1946, a revised design incorporating the Ghost engine and a 25-degree wing sweepback had been finalized, and the first prototype, designated the Saab 29, was flown by British test pilot Wing Cmdr. A.R. Moore, RAF, on September 1, 1948. Such was the Swedish government's sense of urgency that large-scale production was requested before the new fighter was flight tested, and the first Saab 29A was delivered to fighter squadron F13 just 32 months later, on May 10, 1951. Fortunately, despite its hasty gestation, the 29 proved to be an excellent airplane.

05/06/1949

AviationSafetyNetwork

Accident Description

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Accident description

Date:	06.05.1949
Type:	Bristol 170 Freighter 31
Operator:	Bristol Aeroplane Comp
Registration:	G-AIFF
C/n:	12766
Year built:	
Crew:	7 fatalities / 7 on board
Passengers:	0 fatalities / 7 on board
Total:	7 fatalities / on board
Location:	Portland Lighthouse; 26km off (UK)
Phase:	Cruise
Nature:	Test
Flight:	Filton - (Flightnumber)

Remarks:
The Bristol 170 aircraft was operated by the Bristol company to perform some tests to obtain engine and propeller data under specific climbing conditions. The aircraft departed Filton at 10.03h. At 11.10h the commander of a surfaced submarine saw the aircraft crash into the sea. A large object, thought to be part of the wing was seen fluttering down separately. PROBABLE CAUSE: "The accident was the result of a structural failure in the air, the cause of which is unknown."

Source:

[disclaimer]

03/21/1950

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Accident description

Date:	**21.03.1950**
Type:	Bristol 170 Freighter 21
Operator:	Bristol Aeroplane Company
Registration:	G-AHJJ
C/n:	12742
Year built:	
Crew:	1 fatalities / 1 on board
Passengers:	3 fatalities / 3 on board
Total:	4 fatalities / 4 on board
Location:	Cowbridge; nr (UK)
Phase:	Cruise
Nature:	Test
Flight:	Filton - (Flightnumber)

Remarks:
Bristol 170 Freighter 21 had just been converted from Mk. 2A to Mk. 21 and was on its 2nd test flight for the Certificate of Airworthiness renewal. Some 34mins past departure the aircraft entered a spin, crashing out of control. PROBABLE CAUSE: "The accident is a result of a structural failure of the fuselage stern frame to which the fin is attached and must be attributed to the application on the fin and rudder of a load greater than the design ultimate load. Calculations suggest that the cause of this overloading was excessive rudder movement at a speed greater than 120kts EAS."

Source:

[disclaimer]

03/15/1950

YB-49

Flying Wing

08/10/50
— 06/05/48 —

Northrop YRB-49A

Last revised January 19, 2000

Following the cancellation of the B-49 project, the Air Force still decided to fund the conversion of the tenth YB-35 (42-102376) as a testbed for an unarmed, long-range photographic reconnaissance aircraft. The designation YRB-49A was assigned to the conversion, with the company designation being Model NS-41. It was powered by four 5000 lb.s.t. Allison J35-A-19 engines mounted in the wings, two on each side, plus two more J35s suspended in pods below the wing leading edge. Thr crew was six--pilot, copilot, flight engineer, photo navigator, radar navigator, and photo technician. Photographic equipment was installed in the tail cone bay just below the center section.

Northrop received a letter contract on June 12, 1948 for preliminary engineering work leading perhaps to an eventual production contract for 30 aircraft. This contract was signed on August 12, 1948. The Air Force believed that the nation would benefit from the pooling of Northrop's engineering skill and Convair's experience in quantity production of large aircraft, and the contract stipulated that only one of the aircraft was to be built by Northrop, with the remaining 29 to be built by Convair at its government-leased plant in Fort Worth, Texas.

However, it soon became apparent that the proposed six-jet RB-49A would be much slower than the B-47, and the Air Force Board recommended immediate termination of the RB-49A. This was done formally in late December of 1948. The funds that had been allocated to the RB-49A were then re-allocated to more B-36s. The cancellation became official in mid-January of 1949, and Northrop was directed to stop all work on the project except for completion and test of a single YRB-49A as part of a proof-of concept research and development program.

The YRB-49A took off on its first test flight on May 4, 1950. Its first flight was from Hawthorne to Edwards AFB. Tests were conducted at Edwards AFB for a period of time. On August 10, 1950, during its tenth test flight, the cockpit canopy blew off, tearing away the pilot's oxygen mask and injuring him slightly. Fortunately, the flight engineer was able to supply enough emergency oxygen to the pilot so that he was able to land the aircraft safely.

In early 1952, the YRB-49A was flown to Northrop's Ontario International Airport facility for the installation of a device that would improve the stability. However, at this time the Air Force had cut off further funding for the YRB-49A project, and the aircraft remained sitting out in the open in dead storage for a period of time. It was finally

Over twenty months of flight testing was carried out. Northrop test pilots flew the first YB-49 for almost 200 hours, accumulated in some 120 flights. Air Force pilots completed about 70 hours of flight time in the first YB-49, totaled in some 20 flights. The second YB-49 carried out some 24 flights with Northrop crews for a total of about 50 hours. The Air Force crews flew the second YB-49 five times for about 13 hours. A maximum speed of 520 mph was achieved, and a service ceiling of 42,000 feet was attained. A normal 10,000 pound bombload could be carried for an estimated 4000 miles on 6700 gallons of fuel, less than half the range of the piston-engined B-35. In spite of the added rudders and wing fences, the YB-49 design still encountered some stability problems which were never fully corrected.

On April 26, 1948, the first YB-49 achieved a milestone of sorts, the aircraft staying up in the air for 9 hours, 6 hours of which were above 40,000 feet. This is believed to have set an unofficial record for that period.

On May 28, 1948, the second YB-49 (42-102368) was turned over to the USAF. Only a few days later, tragedy struck. On the morning of June 5, 1948, 42-102368 crashed just north of Muroc Dry Lake. The pilot, Air Force Capt. Glenn Edwards, and all four other members of the crew were killed. What caused the crash is not known, but it was suspected that Capt Edwards managed to surpass the "red line" speed of the aircraft while descending from 40,000 feet, causing the outer wing panels to be shed and the aircraft to disintegrate in midair. Muroc AFB was renamed Edwards AFB on December 5, 1949 in honor of the late Capt. Glenn Edwards.

In spite of the crash, the Air Force still had sufficient confidence in the YB-49 that they continued with plans for the conversion of nine of the remaining eleven YB-35 airframes to a basically similar RB-35B strategic reconnaissance configuration with 8 jet engines, with another airframe to be used as a static test vehicle. In addition, orders were placed for 30 new RB-49s to be built from scratch.

Many deficiencies turned up in the second series of tests. The J35 turbojets of the YB-49 were extremely thirsty for fuel, and the jet-powered YB-49 had only half the range of the YB-35 that preceded it. The test pilots complained that the aircraft was extremely unstable and difficult to fly. They also maintained that the YB-49 was completely unsuitable as a bombing platform-- it could not hold a steady course or a constant airspeed and altitude, and that here was a persistent rocking motion in yaw, which tended to upset the bomb sights. In comparison with the B-29, the YB-49 had a much poorer circular average error and range error during bombing trials. In retrospect, many of the stability problems with the flying wing may have been insoluble with the technology available in the late 1940s, requiring the fly-by-wire technology that was developed much later for their solution.

By 1948, progress in range extension by other projects had reached the level that the YB-49 was now considered as being a medium bomber rather than a heavy bomber. This put it in competition with the XB-46, XB-47, and XB-48 projects, where the XB-35 had been considered as a B-36 competitor.

On January 4, 1949, the Air Force ordered Northrop to fly 42-102367 from Muroc AFB to Washington DC for a military air display at Andrews AFB. It departed Muroc on February 9, 1949, and when it landed at Andrews it had set a new transcontinental speed record of 4 hours and 20 minutes for the 2258-mile flight, averaging 511.2 mph. The pilot was Major Robert Cardenas, who had replaced the late Capt Glen Edwards as chief of flight test on the Northrop flying wing test program. Northrop test pilot Max Stanley was also on board. During the display at Andrews AFB, President Harry Truman inspected the YB-49 and was impressed.

On the way back to California, 42-102367 stopped off at Wright Field in Dayton so that the Air Force could take a look at the new plane. On February 23, the YB-49 took off to return to Muroc, but during the flight three of the J35 engines on the left and one on the right side caught fire, forcing an emergency landing at Winslow, Arizona. There were hints of sabotage, since it was later determined that the cause of the engine fires was that the turbine oil reserves had not been filled in any of the J35 engines during refuelling at Wright Field. The FBI was called in to investigate, but a blanket of security was thrown over the entire affair and the incident was all but forgotten.

By October of 1948, the YB-49 was clearly a doomed program. Nevertheless, testing continued, and there was always a remote possibility that its problems might be cured. However, the accidents and stability problems continued. On April 26, 1949, a fire occurred in one of the aircraft's engine bays, forcing $19,000 worth of repairs. The handwriting was now on the wall-- the contract for 30 new RB-49A aircraft was canceled in April of 1949. In November of 1949, the conversion of existing YB-35 airframes to YB-35B configuration was also cancelled.

On March 15, 1950, the cancellation of the entire YB-49 program became official. On that very same day, the first YB-49 (42-102367) got itself involved in a ground taxiing accident at Edwards AFB. There were no fatalities, but crewmen were injured and the aircraft was totally destroyed by fire. Excessive shimmy of the nosewheel followed by total gear collapse were blamed for the mishap.

The movie *War of the Worlds* filmed between 1952 and 1953 used stock footage of one of the YB-49s. In the movie, it was the plane which delivered a nuclear bomb onto the attacking Martian force. Many people confuse this plane with the B-2 stealth comber, which was designed much later.

WAR DEPARTMENT

ARMY AIR FORCES

REPORT OF MAJOR ACCIDENT

Use this form in accordance with AAF Reg. 62-14 and "Aircraft Accident Investigator's Handbook" issued by Office of Flying Safety, Headquarters, AAF.

Fill in all spaces except where otherwise indicated.

If additional space is needed, use additional sheet(s) and identify by proper section letter and subsection number.

VNR

ACTION	DATE
Preliminary Report Received	
Form 14 Received	11-30
Evaluated by	
Verified by	4-28
Checked by	KC 1-12
Coded by	4-27

50-3-15-4 XB-49

11029 — 9123-0

Section A—GENERAL INFORMATION

1. Place of Accident	Nearest Army Airfield, Distance and Direction from Same
Calif., Kern, Muroc 2 Miles South	Edwards AFB, Muroc, Calif.

2. Was Collision With Other Aircraft?	AF No. of Aircraft Involved	Date	Hour and Time Zone	Day / Night
[ ] Yes [X] No	42-102367	15 Mar 50	0823 PST	[X] Day [ ] Night

Section B—AIRCRAFT

1. Aircraft No.	2. Type, Model, Series	3. Home Station
42-102367	YB-49	Edwards AFB, Muroc, Calif.

4. Air Force or Command	Organization	Wing	Group No. and Type	Squadron
AMC AMC	—	—	—	—

5. Date of Manufacture	Total Hours	Date Last Overhaul	Overhauling Depot or Squadron	Hours Since Overhaul
21 Oct 47	265:53	None		None

6. Attach detailed statement of tech orders having direct bearing on this accident which have not been complied with. Describe orders and give reasons for noncompliance.

Section C—OPERATOR (Person at controls at time of accident)

1. Last Name	First Name	Middle Initial	Grade	Branch	ASN	Sex	Age
SCHLEEH,	RUSSELL 01	E.	Major	USAF	8435A	M	31

2. Assigned Station	Air Force or Command	Organization	Wing	Group No. and Type	Squadron
Wrt.-Pat. AFB, Ohio 63	AMC AMC	—	—		

3. Attached Station	Air Force or Command	Organization	Wing	Group No. and Type	Squadron
Wrt.-Pat. AFB, Ohio	AMC	Flt. Tst. Div. Engr. Sect.			

4. Aeronautical Rated	Present Rating	Date Assigned	5. Normal Duty Status
[X] Yes [ ] No	Senior Pilot	20 Apr 49	Experimental Test Pilot

Section D—OPERATOR'S FLYING EXPERIENCE (Including students)

Flying Time	1st Pilot or Dual Student	Other Pilot or Crew Member
1. Total Hours	2736:35	619:00
2. Hours This Type	165:35	2:20
3. Hours This Model	38:35	0
4. Hours Last 90 Days	76:00	22:20
5. Hours Last 30 Days	24:25	0
6. Hours Last 24 Hours	None	0
7. Actual Combat Hours	68:00	54:00

8. Training Class No. and School, OTU, CCTS, Etc.: Unknown

9. Phase and Hours of This Phase — Phase: Unknown

10. AAF Schools Previously Attended and Dates: No record of flying schools.

11. Instrument Rating — Type: Green; Date: 19 Feb 51; Last Check Where: Wrt-Pat AFB; Date: 3 Feb 50

12. Was operator on instruments at time of accident or immediately before? [ ] Yes [X] No

Hours	1st Pilot	Other
13. Total Instrument	110:00	272:00
14. Instrument Last 6 Mos.	10:05	15:40
15. Instrument Last 30 Days	0	0
16. Night Last 6 Mos.	22:55	11:00
17. Night Last 30 Days	1:30	0

Section E—PERSONNEL INVOLVED (including operator and all other persons, whether in plane or not)

Duty at Time of Accident	Name (Last, First, Initial)	Type of Aero. Rating	Serial No.	Grade and Branch of Service	Form Class	Org. Assignment (AMC)	Result	Parachutes Used	Parachutes Not Used
P	Schleeh, Russell E. 01	P	8435A	Maj., USAF		Flt. Tst. Div.	Maj		X
CP	Warfield, Allen, Jr. 03	P	9628A	Capt., USAF		"	Min		X
E	French, Philip M. 3	E	11402A	Capt., USAF		"	Maj		X
E	Cunningham, William H. 3	E	AF-15015476	M/Sgt. USAF		"	Min		X
E	Boone, Richard F. 3	E	AF-15012771	M/Sgt. USAF		"	Min		X
E	Hauser, George 3	E		Civilian		"	Min		X

Briefed

RESTRICTED

Section F—DAMAGE

Describe briefly the extent of the damage which occurred. (If no damage, write "None." If aircraft is missing, write "Missing." If aircraft was totally wrecked, so state.)

1. To Aircraft

Completely Destroyed 4

2. To Engines	1 4	4	2 4	4	3 4	4	4 4	4
3. To Propellers	1 —	—	2 —	—	3 —	—	4 —	—

4. To Private Property (Estimate and Attachments)

None

Section G—POWER PLANT FAILURE

(Use this section of the form if power plant failure was a contributing cause factor in the accident. This must be signed by engineering officer.)

1. Duration of Flight since Last Take-off: Hours Minutes

	(1)	(2)	(3)	(4)
2. Engine Model				
3. Engine No.				
4. Engine-Hours since Last Major Overhaul				
5. Date of Subsequent Propeller Overhaul				
6. Total Engine-Hours				
7. Propeller Model				
8. Propeller-Hours since Major Overhaul				

9. Statement of Operator, if Available, on Reaction of Power Plant and Manipulation of Controls Immediately Before Accident

See Attachment #1

10. Statement of Engineering Officer, Mechanics, and Others as to What Failed and Probable Reason Why

The primary cause of accident was failure of nose gear apparently caused by excessive nose wheel shimmy. (See Findings, Section M)

11. Outside Reading of Form: JP-1 A

Engineering Officer (Name, Grade, and Station)

Section H—AIRFRAME, LANDING GEAR, OR OTHER MATERIEL

(Use this section if materiel failure was a contributing cause factor in the accident. This must be signed by engineering officer.)

1. Describe the Materiel Failure, Including Statement of Kind of Failure at the Time of Failure and All Factors Which Might Have Contributed Toward the Failure

Determination of specific material failure has not been completed. When investigation has been completed, this information will be forwarded in a supplement form.

Engineering Officer (Name, Grade, and Station)

Section I—SPECIAL EQUIPMENT

(Use this section if special equipment—parachutes, radio, dinghies, oxygen equipment, fire extinguishers, etc.—was a contributing cause factor in the accident for any reason including failure, misuse, or by reason of not being in the plane)

1. Describe How the Special Equipment Contributed to the Accident or to Its Results

Not Applicable.

NORTHROP AIRCRAFT, INC.

FLIGHT TEST ENGINEERING SUMMARY

Model	YB-49
Serial No.	N-1487
	USAF 42-102367
Flight No.	Taxi Test
Date	15 March 1950
Duration	
Total Flt Time	265:53
Pilot	Maj. R. Schleeh
Flt Test Engr.	G. H. Hauser

Engine

Type: J35-A5, A15

Serial No.

1. 500856
2. 500163
3. 500079
4. 500107
5. 500120
6. 500165
7. 500537
8. 500855

Gross Weight	C.G. % MAC	Fuel	Take-Off Time	Time of Accident
117,472	21.1 W.D.	3022	--	08:23

CONFIGURATION CHANGES SINCE LAST FLIGHT

1. Fuel Loading

Tank	2	3	7	8
Gallons	1201	1321	250	250

2. Tire pressures:

Nose Wheel 47#

Main Wheels 65#

TEST EQUIPMENT CHANGES SINCE LAST FLIGHT

1. None.

SUMMARY OF RUNS AND DATA OBTAINED

A take-off was being made with a forward c.g. loading to demonstrate nose-wheel lift-off. Technique to be used was to set trim to provide zero stick force at a speed of 1.25 V_{SL} (approx. 130 mph ias) with flaps full up, and after attaining take-off power, release brakes and hold back on control column just off of the stops. The pilot was to note the indicated airspeed at which the nose wheel left the ground. A photographic record was to be started before the nose wheel left the ground and stopped after the nose wheel returned to the ground. Two taxi runs were planned. The accident occurred on the first taxi run. The pilot reported that the nose wheel left the ground at 104 mph ias and power was not cut until the airplane had accelerated to about 115 mph ias. The accident occurred after the nose wheel returned to the ground and airspeed had decreased to about 93 mph ias.

ATTACHMENT #9

Major Schleeh: In the first two reports on the YB 49, it was recorded that the steering system was objectionable. It is still objectionable and should be changed and modified.

Maj Askounis: In any of your turns on the lake of 180° did you at any time apply any brakes to either the outboard or inboard wheel?

Major Schleeh: I don't remember, but I believe that the hand brakes were used which are supposed to give equal braking.

Capt Walker: Was there in your opinion any operation in the last few flights, during the series of flights which you recently made, that resulted in stressing the nose gear to the point where it might result in misalignment or overstressing?

Major Schleeh: Yes, on the 143rd flight I encountered very severe nose wheel shimmy, which was reported to the contractor.

Maj Askounis: Do you remember the forward C.G.?

Major Schleeh: The forward C.G. was approximately 22.

Maj Askounis: There is in the record a statement that on one of the preceding flights in a post flight meeting you had advised Northrop Engineer personnel that you desired the nose wheel assembly to be changed because of tire scuffing or other evidence of operation which might affect safety of flights. Will you comment on the circumstances?

Major Schleeh: I requested Northrop personnel to check the nose wheel system thoroughly because the nose wheel got caught during a taxi run. However, I do not feel this condition was nearly as severe as the shimmy encountered on a later flight.

The meeting adjourned at 1630.

William R. Coleman
WILLIAM R. COLEMAN
1st Lieutenant, USAF
Recorder

LtCol Brancato: Can you explain the blow to your back?

Major Schleeh: It is possible that the Brown recorder directly behind the pilot's seat came loose on impact and hit the pilot's seat. The seat was broken.

LtCol Brancato: Was the back rest of the seat made of metal?

Major Schleeh: It was.

LtCol Brancato: How could the Brown recorder hit you in the back?

Major Schleeh: I don't know.

LtCol Brancato: Who was to your right?

Major Schleeh: Capt Warfield

LtCol Brancato: Who was between you?

Major Schleeh: No one. Capt French was on the right of Capt Warfield.

LtCol Brancato: Was he in a prone position?

Major Schleeh: Very close to prone. I imagine either prone or kneeling.

LtCol Brancato: Was that part of his mission?

Major Schleeh: Yes.

LtCol Brancato: Was he facing forward, or to the rear?

Major Schleeh: He was facing forward and to the rear.

LtCol Ascani: It has been determined that your gross weight for take-off was approximately 117,000 lbs, which is considerably less than the designed gross weight of 170,000 lbs. Considering that fact, is it still your opinion that the location of a forward C.G. could have created the severe shimmy condition of the nose wheel?

Major Schleeh: That was a possibility.

LtCol Ascani: In other words, the forward C.G. could have created the shimmy condition even though your gross weight was relatively low.

Major Schleeh: Yes.

LtCol Ascani: Would you care to make any remarks at this time for subsequent transmittal to the contractor in the way of rework, or redesign of the present steering system.

LtCol Ascani: Did you experience at any time while taxiing the aircraft skidding of the nose wheel?

Major Schleeh: Never while taxiing. However, during landings, it is a common occurrence.

LtCol Ascani: Are you willing to express an opinion on the possibility that the power available to the pilot through the nose wheel steering system is sufficient to create a condition which would cause the structural limitations of the nose gear to be exceeded?

Major Schleeh: That would depend on the configuration of the aircraft. Its C.G. position and gross weight very greatly affect the power available to the pilot for steering purposes.

LtCol Ascani: Did your taxi runs consist entirely of nose wheel lift-offs, or did they involve separation from the ground of the entire aircraft?

Major Schleeh: This particular test involved only raising the nose wheel.

LtCol Ascani: Were the crew members advised either way to fasten their safety belts and shoulder harness since the aircraft was equipped with such items?

Major Schleeh: They were not advised to fasten their safety belts. However, which was usual, they were asked if they were ready before the brakes were released.

LtCol Ascani: Since this taxi run constituted a mission peculiar to flight test programs and one which is not normally encountered in normal flying, would you recommend as a future procedure that all crew members properly secure themselves while taxi runs are being made.

Major Schleeh: I certainly would recommend that all crew members secure themselves during taxi tests and in addition wear crash helmets.

LtCol Brancato: At the point of impact, will you please tell us what happened to you; what blow you experienced, and where?

Major Schleeh: At the point of impact, my right arm was rigidly holding the wheel and my legs were pressing the lower part of my body. That is all I remember.

LtCol Brancato: What object hit you on the head?

Major Schleeh: I feel that something came from the rear of the aircraft.

Capt Walker: State your full name, rank, organization, and relationship to the aircraft which crashed.

Major Schleeh: Russell E. Schleeh, Major, AF, 8435A, pilot, Wright-Patterson Air Force Base, Headquarters Air Materiel Command, Flight Test Division.

LtCol Ascani: We have your official statement, Major Schleeh, is there, at this time anything in addition to your statement that you would like to contribute so that we can arrive at the most logical conclusion of what caused the accident and also that we may determine what recommendations to make in future or similar cases?

Major Schleeh: My original statement with the recommendation still holds. However, I would like to suggest that Northrop perform taxi tests in the center of gravity both with and without the nose wheel steering engaged. As far as this accident is concerned, I have nothing more to add.

LtCol Ascani: This is not the first experience you have had insofar as flying this airplane is concerned?

Major Schleeh: That is correct.

LtCol Ascani: Can you state on how many previous occasions you were present at this station to fly the YB 49?

Major Schleeh: I was here on one other occasion to fly the YB 49.

LtCol Ascani: During the other period that you flew this particular aircraft, did you encounter severe shimmy of the nose wheel during any particular flight?

Major Schleeh: We did not encounter any shimmy at all. I have had a total of approximately fifteen flights in the YB 49, and in only two did we have any nose wheel shimmy. Both of those occurred on the forward C.G. which was the only time we were in that configuration.

LtColAscani: Mr. Hetsell of Northrop raised the possibility that immediately prior to the taxi run a violent turn may have been accomplished. There was no mention of it in your statement and it is not intended to determine who shall be criticised at this time, but it will have a direct bearing possibly on the cause of the nose wheel failure. Can you state at this time whether a violent turn was accomplished?

Major Schleeh: Very definitely not. Upon leaving the apron and getting on the dry lake, a turn to the left of 90°was made which was a normal turn. We were advised by the tower that that portion of the runway was not used. The turn was slowed down and I made a 180° degree turn and taxied back. Again a normal turn was accomplished.

ATTACHMENT #1.

Mr. Young: Yes. Project Engineer requested complete inspection of nose wheel strut and attaching structure. This condition was investigated by company inspectors, myself and Mr. McBride and production mechanics. (names unknown).

Lt. Col. Ascani: Any other questions? Mr. Young is there anything you would like to contribute in the way of suggestions or recommendations or simple matter of fact statements?

Mr. Young: No.

The meeting adjourned at 1530.

The Board proceeded to Base Hospital to interview Maj. Schleeh.

Mr. Young: (Cont.)	of project engineer and company inspection.
Lt. Col. Ascani:	Any other question?
Capt. Walker:	Mr. Young, following the flight preceeding the taxi test which resulted in the accident, was maintenance action necessary on the nose gear?
Mr. Young:	The assembly, after flight 144 which was flight prior to the accident, was ok'd for taxi. The flight would have taken place the day before the crash except that weather conditions were not permitting. The airplane was then pre-flighted for the following morning with the normal servicing as for normal flight. There was no mechanical maintenance other than pre-flight.
Capt. Walker:	When had the nose wheel last been replaced?
Mr. Young:	I believe last one or two flights.
Lt. Col. Ascani:	That is sufficient.
Capt. Walker:	What was the reason for the last replacement of the nose wheel assembly?
Mr. Young:	Major Schleeh requested replacement of nose wheel assembly after flight 142 due to excessive loads and laying over of tire in his taxi. Actually there was no visible damage to the wheel assembly.
Capt. Walker:	How was this action requested from maintenance personnel?
Mr. Young:	At the post-flight meeting after flight 142 Major Schleeh stated he did not want to list the nose wheel condition as a pilot squawk but he recommended replacement to the Project Engineer, Mr. J. Fisher.
Lt. Col. Ascani:	Was that on the basis of his visual post-flight inspection of the nose wheel?
Mr. Young:	No. He arrived at that from the load he put on it during his taxi.
Capt. Walker:	This occurred prior to flight 143?
Mr. Young:	No.
Capt. Walker:	Did you inspect the nose wheel assembly after replacement?

Capt. Walker: In your opinion would a side load on the nose wheel of sufficient magnitude to damage the nose wheel tire to the extent that it would require replacement, spring or deform the nose wheel strut to the extent that a thorough inspection would be required before operation of the airplane?

Mr. Hetzel: I cannot answer that question but can obtain the answer ~~from engineering personnel at Northrop. I cannot answer~~ it since I do not know the relative strength of the various parts involved in such a side load.

Lt. Col. Ascani: Any more questions?

The next witness, Mr. Young, was called.

Capt. Walker: Mr. Young will you state your full name and position.

Mr. Young: Robert W. Young, Project Inspector in charge of YB-49. I conducted the pre-flight inspection of airplane prior to taxi.

Lt. Col. Ascani: Official status, please.

Mr. Young: Project Inspector for YB-49 for Northrop Aircraft Inc.

Lt. Col. Ascani: It has been stated previously that excessive shimmy had occurred on YB-49 on a good number of occasions. Do your official forms bear that out?

Mr. Young: This is right. On numerous occasions the pilot in his test report of flight would squawk about a shimmy on landing.

Lt. Col. Ascani: I am referring to all flight test reports.

Mr. Young: I am referring to all flight test reports which I have on file.

Lt. Col. Ascani: Could you state the severity of shimmy on any specific occasions or would it appear to be at the same relative level in each case.

Mr. Young: In that I am not a flying member of aircraft I am not one to say.

Lt. Col. Ascani: Is there any official record of back lash existing in nose wheel system prior to this last flight when the aircraft was damaged?

Mr. Young: At the 100 hour inspection all points which showed evidence of lost motion were checked and corrected to the satisfaction

Lt. Col. Ascani: There are no indications in the pilot's statement that a violent turn was made just prior to taxi run. However, it is possible that the pilot may have unintentionally omitted any information on that matter. For the purpose of further aiding the contractor in arriving at the most logical conclusion for the cause of nose wheel failure, this Board will attempt to obtain that information and make it available to the contractor.

Maj. Askounis: Do you feel that the flexibility of as long a nose wheel strut as is in installed in XB-49 may have any bearing on the failure of the nose wheel during this taxi run?

Mr. Hetzel: It is my personal opinion that this is a possibility inasmuch as the shimmy dampener design is based on a rigid strut, and with a flexible strut, there is always a possibility of feeding larger loads into the shimmy dampener than were contemplated in the design.

Capt. Walker: In an informal discussion with maintenance and inspection personnel of Northrop there was the statement made that some back lash had existed in the nose gear assembly. It cannot be stated whether this condition existed at the time of accident, but assuming that there might be back lash in the nose wheel sway brace or associated structure, would that in your opinion, tend to increase the tendency for the nose wheel to shimmy?

Mr. Hetzel: If there is back lash in any of the nose wheel linkage it would tend to induce shimmy. To date, we do not know how much back lash may have existed at the time of this taxi run. We do know, however, that at the 200 hour inspection of this airplane the entire nose wheel mechanism which had been subjected to several reported cases of shimmy was disassembled and inspected.

Lt. Col. Ascani: Would that include magnaflux?

Mr. Hetzel: I do not know. Very little play was found, but the parts which contributed to that play were replaced. The airplane had flown approximately 67 hours since that inspection and it is assumed that the play was approximately 67/200ths of what it was at the time of inspection.

1st Lt. Coleman: Do you think that the terrain over which the aircraft taxied to the lake or the runway could have damaged the nose gear?

Mr. Hetzel: I doubt that it could with a large wheel diameter such as the one on the YB-49.

Mr. Hetzel: (Cont)	and towing loads to such an extent that squawks were then received on these items. In other words, it did not seem to be possible to obtain dampener adjustment which were satisfactory from all three standpoints, that is shimmy dampener, towing loads and steering loads. The details of these adjustments, I am not too familiar with, but they were made in each case by the designing manufacturer from the Northrop Engineering Department with frequent consultations with the dampener manufacturer.
Lt. Col. Ascani:	The examination of aircraft forms reveals that shimmy dampening of nose wheel was a problem which caused an appreciable amount of difficulty in the past. May I ask you at this time whether you are in a position to recommend that, prior to actual flight of any similar articles of aircraft, tests be conducted to determine whether the present shimmy dampener is adequate for all conditions, or whether a major redesign should be recommended?
Mr. Hetzel:	I would have to answer that question in two parts. First, as an official representative of Northrop, the parts which failed during this accident either initially or as a result of shimmy, are being redesigned and greatly strengthened for the YRB-49B airplane. At present it is planned to fly the YRB-49B with a restricted gross weight and a restricted C.G. travel to diminish the possibility of nose gear failure in case of such an accident. Secondly, it is my personal recommendation that a tow rig test be conducted with a similar gear and dampener to give information not only relative to this problem but information applicable to other aircraft of similar size. This test is known to be an expensive one and the final decision will undoubtedly rest with the Air Force as to the dollar value of such a test. There may be other recommendations as a result of investigation now being conducted at Northrop.
Lt. Col. Ascani:	Do you have any further recommendations or additional statements that you would like to contribute at this time?
Mr. Hetzel:	I have no recommendations. I might ask a question that I have in mind. As I said before, I am not trying to avert any responsibility on the part of Northrop, since the aircraft was being operated well within the right limitations. On the other hand, we would like to know if a rather violent turn was made during the taxi run just prior to lining up with the runway?

Mr. Hetzel:	My personal opinion after inspection of the track made by the nose wheel on the desert is that the accident was caused by a shimmy, and that the broken components were a result rather than a cause of accident.
Lt. Col. Ascani:	Do you think the forward C.G. location at the time of this accident in any way created an excessive amount of shimmy on nose wheel?
Mr. Hetzel:	I would like to answer that question in three steps. First, shimmy is always caused or accentuated by high loading of a nose wheel due to forward C.G. location at light weight or intermediate location at heavy weight. Second, the load on the nose wheel in this case was considerably less than the load for which the shimmy dampener was designed. Third, the center of gravity of the airplane was forward of the limit established by Northrop. This statement should in no way be considered to reduce the responsibility of Northrop Aircraft Inc., since the load was still well within the design limit.
Lt. Col. Ascani:	What was the gross net weight?
Mr. Hetzel:	I do not have the exact figures with me.
Capt. Horvat:	Do you have the number of nose wheel shimmy in the past on that aircraft, say at least 5-10?
Mr. Hetzel:	I do not know the exact number but there had been recurrent nose wheel shimmies.
Capt. Horvat:	Assuming that you have quite a bit of dampener trouble, was the situation investigated by the proper agencies or was the only action replacements or new dampener?
Mr. Hetzel:	In answer to the last part of your question there was no action taken other than simple replacement of dampener. In answer to the question as a whole, I would have to give a somewhat lengthy answer in the original concept of this design. The contractor proposed a tow rig test of this nose gear, I believe, to have been conducted by the dampener engineer, which would also have been appropriate to other large aircraft. This program was cancelled as a result of data available, but due to weight and design the dampener for this size aircraft is based upon extrapolation of data from other units and not upon test data. During the recurrent test cases of shimmy the orifice adjustment on the shimmy dampener has in general been reduced after each reported case of shimmy, eliminating the shimmy but at the same time increasing the steering loads

?

Mr. Hensley: (Cont.)	On the way to the crash the Assistant Chief was notified by the tower that there were six occupants and only five accounted for. Therefore all equipment was used in an effort to control the fire in the area where personnel would normally be found.
Capt. Walker:	That proved fortunate for preserving the nose wheel for further investigation.
Mr. Hensley:	I was later instructed to save all of that particular section possible. I sent to North End for extra equipment.
Lt. Col. Ascani:	Anything further?
Mr. Hensley:	No.

The next witness, Mr. Hetzel of Northrop was called.

Capt. Walker:	Please state your full name and position.
Mr. Hetzel:	Hetzel, R. E. P., Chief of Flight Test for Northrop Aircraft Inc., and Chairman of Aircraft Accident Investigating Board. Officially located at Hawthorne Field, Hawthorne, California.
Lt. Col. Ascani:	Mr. Hetzel, can you provide this Board with any additional facts beyond that already obtained from statements of the crew and other witnesses so that we can better arrive at a reasonable conclusion as to the cause of accident?
Mr. Hetzel:	Since I am not aware what the other witnesses may have stated, my statement may go over ground which has already been covered. At present, there is a detailed inspection of the nose gear parts being conducted at Northrop by Northrop engineering personnel with the assistance of manufacturers' representatives, particularly Goodyear and Houdaille. The Goodyear Company is conducting inspection because they are the supplier of nose gear tire and tube which were involved in this accident. The Houdaille representative is present since there is some question as to whether the shimmy dampener was operating properly. This inspection is being conducted to determine to the best of our knowledge, whether the primary failure was a material failure of some component of nose gear or whether the primary failure was malfunction or inadequacy of nose wheel shimmy dampener.
Lt. Col. Ascani:	Are you personally in a position at this time to express an opinion?

Mr. Hemsley: It is definitely my opinion. The airplane, at the point of contact with the ground, was 2.7 miles from the station. With a stand-by, the equipment would not have been more than 1/2 mile away. I am certain that the fire could have been put out if a stand-by was made.

Lt. Col. Ascani: The pilot states, Mr. Hemsley, that when he left the plane he turned around and looked back and the left side was completely enveloped by flames. Was that your observation?

Mr. Hemsley: At the time he left the plane we were quite aways from it. I wouldn't make an attempt to concur with it. When crash trucks arrived there were two sections of the plane approximately 25-30 feet apart and both sections were about 50% enveloped in fire.

Lt. Col. Ascani: May I ask you, what is your opinion on the adequacy of fire fighting equipment for this installation, considering its many peculiar requirements including the lake bed?

Mr. Hemsley: Not sufficient.

Maj. Askounis: I would like to know if it is your personal opinion that we have inadequate amount of equipment or whether it is the rolling speed of equipment?

Mr. Hemsley: I would have to say it is neither. At the time of this crash the inadequacy was due to personnel. Two of the trucks should have had seven men each. They actually had five on one and three on the other. The third truck should have had five men but had only three. The fourth truck did not leave the station due to the fact that only one man is assigned and he was detailed to the motor pool to check vehicle trip tickets; therefore, this truck did not reach the scene of crash for approximately 20 minutes after the crash occurred.

Maj. Askounis: Is there an inadequacy of rolling speed if personnel were there to man the equipment?

Mr. Hemsley: No Sir. Equipment is adequate but personnel is inadequate.

Lt. Col. Ascani: Are there any further questions from Board?

Maj. Askounis: If you had been at scene of crash at time of accident how many 155 or 150 trucks would have been needed?

Mr. Hemsley: Two 150's; one 155; and one 110.

Capt. Walker: Did anyone direct or suggest that you concentrate your equipment on the nose wheel?

Mr. Hemsley: No directions were given with regards to the nose wheel.

The Aircraft Accident Investigating Board, appointed by Special Order #56, Headquarters, Edwards Air Force Base, Muroc, California, dated 22 March 1950, convened at 1330 on 21 March 1950 in the Conference Room, Edwards Air Force Base, Muroc, California.

Members present were:

Lt. Col. John Brancato
Lt. Col. Fred J. Ascani
Maj. Frank A. Conaway
Maj. Gust Askounis
Capt. William J. Horvat
Capt. William A. Walker
Capt. James W. Andrew
1st Lt. William R. Coleman

Members absent were:

Capt. Franklin B. Bevard

The meeting was called to order by the President and the Investigating Officer briefed the board on the purpose of meeting and brought each member up to date on accomplished investigation. All witnesses appearing before the board were read the provisions of AF Reg. 62-14A.

The first witness called was Mr. Hemsley.

Capt. Walker: State your full name and position.

Mr. Hemsley: Ellis E. Hemsley, Fire Chief, Edwards Air Force Base, Muroc, California.

Lt. Col. Ascani: Is there anything that you would like to enlarge upon except that which is included in your statement on Form 5-4?

Mr. Hemsley: No.

Lt. Col. Ascani: May I ask you, Mr. Hemsley, why there was no fire equipment standing by even though taxi tests were being conducted?

Mr. Hemsley: The only answer I have is that the men in charge of the crash station were not called upon to make a stand-by. When the aircraft taxied away from starting point they had no idea where it was going. I would say this, that in my opinion or to my knowledge rather, no test that I recall, has been made on that aircraft without a stand-by.

Lt. Col. Ascani: Is it your opinion that all, or the major portion, of the aircraft could have been saved had fire fighting equipment been standing by on the lake?

ATTACHMENT #14

FIRST WING, MATS

Station EDWARDS AFB

Date 15 MARCH 1950

SUBJECT: Aircraft Accident Report

TO: Base Operations Officer, EDWARDS AFB MUROC, CALIF.
(Field)

Date of Accident 15 MARCH 50 Place of Accident NORTH-SOUTH RUNWAY ON THE LAKE

Time of Accident 0823 P No. of Aircraft involved ONE

Serial No. of Aircraft 42-102367 Type of Aircraft YB-49

Name(s) of Pilot(s) involved and rating(s), if available MAJ. SCHLEEH

Weather report current at time of accident 25,000 FT SCATTERED VISABILTY 35 MI.

Additional weather information observed by Operator SLIGHT HAZE

Location and path of aircraft(s) at time of accident THE A/C WAS HEADING SOUTH ON THE NORTH-SOUTH RUNWAY ON THE LAKE.

Radio instructions or visual signals given to aircraft prior to accident CLEARED TO TAXI. THE A/C WAS MAKING TAXI TESTS ON THE LAKE.

Brief account of accident and emergency action taken THE A/C WAS TAXIING FAIRLY FAST WHEN THE NOSE GEAR APPEARED TO COLLAPSE. FIRE BROKE OUT IMMEDEATLY. FIRE STATION NO.# 1 WAS NOTIFIED AT THE TIME THE NOSE GEAR SEEMED TO COLLAPSE. OPERATION OFFICER AND CRASH NOTIFIED IMMEDEATLY.

I certify the above statements are true and correct to the best of my knowledge.

Sgd. Robert J. Fuller Jr.
Senior Control Tower Operator on duty

Form 1" 15-6 (21 Jan 47)

ATTACHMENT #12

WAR DEPARTMENT
AAF FORM NO. 1A
(REV. 1 JAN 46)

AIRPLANE FLIGHT REPORT—ENGINEERING

INSPECTION STATUS

	DATE OR HOURS DUE	INSPECTED TODAY BY	STATION
PREFLIGHT			
DAILY			
25 HOURS			
50 HOURS			
100 HOURS			

SERVICING AT STATION OF TAKE-OFF
(CHECK IMMEDIATELY BEFORE TAKE-OFF)

SERVICE	FUEL (GALLONS) SERVICED	FUEL IN TANKS	OIL No. 5 SERVICED	No. 5 IN TANKS	No. 6 SERVICED	No. 6 IN TANKS	No. 7 SERVICED	No. 7 IN TANKS	No. 8 SERVICED	No. 8 IN TANKS	RADIATOR CHECKED
1ST			19	32	18	32	18	32	13	32	
2D											
3D											
4TH											
5TH											

INSPECTION OF AUXILIARY EQUIPMENT

EQUIPMENT	SYMBOL	INSPECTED BY	STATION
BOMB.			
GUNNERY			
CHEM.			
PHOTO.			
NAV. INST.			

STATUS TODAY: 1. 2. 3. 4.

EXPLANATION:

EXCEPTIONAL RELEASE
WHEN THE "STATUS TODAY" IS INDICATED BY A RED SYMBOL, AND AN "EXCEPTIONAL RELEASE" HAS NOT BEEN GRANTED BY AN AUTHORIZED MAINTENANCE OFFICER, THE PILOT OF THE AIRCRAFT WILL SIGN THIS RELEASE BEFORE FLIGHT.

RELEASED FOR FLIGHT 1. 2. 3. 4.

COMMUNICATIONS

EQUIPMENT	SYMBOL	INSPECTED BY	STATION	REMARKS
VHF				
HF				
LIAISON				
COMPASS				

AIRCRAFT AND ENGINE TIME RECORD
(ENTER IN HOURS AND MINUTES)

ENGINE	No. 5	No. 6	No. 7	No. 8
HOURS TO DATE	47:15	76:23	131:04	12:00
HOURS TODAY	3:27	3:27	3:27	3:27
TOTAL	50:42	79:50	134:31	15:27
OIL CHANGE DUE				
CUNO CLEANING DUE				

AIRCRAFT	
HOURS TO DATE	
HOURS TODAY	
TOTAL	

REMARKS: PILOTS AND MECHANICS—SEE INSTRUCTIONS INSIDE FRONT COVER.

AIRPLANE SERVICED FOR FLT. # 144 BY R. FRIESEN

CERTIFIED TRUE COPY:

William R. Coleman
WILLIAM R. COLEMAN
1st Lt., USAF
Asst. Chief, Base Operations Office

1st SERVICE ... STATION
2nd SERVICE ... STATION
3rd SERVICE ... STATION
... STATION

USE REVERSE SIDE FOR ADDITIONAL REMARKS

DATE	AIRCRAFT ORG. DATA	AIRCRAFT DATA	ENGINE DATA
	AIR FORCE	COMPONENT: A. F.	ENGINE MODEL: J-35-5E-15
STATION: E. A. F. B.	COMMAND, WING, GROUP		5 SERIAL NO. A-500120; 6 SERIAL NO. A-500165
CREW CHIEF OR ENGINEER: R. YOUNG	SQUADRON NO. AND TYPE	AIRCRAFT MODEL: YB-49; AIRCRAFT SERIAL NO. 42-102367	7 SERIAL NO. A-500537; 8 SERIAL NO. A-500855
			TOTAL FLIGHT TIME → -

ATTACHMENT #13

WAR DEPARTMENT
AAF FORM No. 1A

AIRPLANE FLIGHT REPORT—ENGINEERING

INSPECTION STATUS

	DATE OR HOURS DUE	INSPECTED TODAY BY	STATION
PREFLIGHT	3-14-50	RY	K. A. F. B.
DAILY	3-14-50	RY	K. A. F. B.
25 HOURS	275		
50 HOURS			
100 HOURS	300		

SERVICING AT STATION OF TAKE-OFF (CHECK IMMEDIATELY BEFORE TAKE-OFF)

SERVICE	FUEL (GALLONS) SERVICED	FUEL IN TANKS	OIL No. 1 SERVICED	No. 1 IN TANKS	No. 2 SERVICED	No. 2 IN TANKS	No. 3 SERVICED	No. 3 IN TANKS	No. 4 SERVICED	No. 4 IN TANKS	RADIATOR CHECKED
1st	7543	10,332	13	32	13	32	14	32	14	32	
2D											
3D											
4TH											
5TH											

INSPECTION OF AUXILIARY EQUIPMENT

EQUIPMENT	SYMBOL	INSPECTED BY	STATION
BOMB.			
GUNNERY			
CHEM.			
PHOTO.			
NAV. INST.	O.K.	RY	K. A. F. B.
COMM.	O.K.	RY	K. A. F. B.

STATUS TODAY: 1. 2. 3. 4.

EXPLANATION: SEE 41 B FORM

EXCEPTIONAL RELEASE

WHEN THE "STATUS TODAY" IS INDICATED BY A RED SYMBOL, AND AN "EXCEPTIONAL RELEASE" HAS NOT BEEN GRANTED BY AN AUTHORIZED MAINTENANCE OFFICER, THE PILOT OF THE AIRCRAFT WILL SIGN THIS RELEASE BEFORE FLIGHT.

RELEASED FOR FLIGHT 1. ____ 2. ____ 3. ____ 4. ____

COMMUNICATIONS

EQUIPMENT	SYMBOL	INSPECTED BY	STATION	REMARKS
VHF				
HF				
LIAISON				
COMPASS				

AIRCRAFT AND ENGINE TIME RECORD (ENTER IN HOURS AND MINUTES)

ENGINE	No. 1	No. 2	No. 3	No. 4
HOURS TO DATE	98:18	76:27	76:53	28:57
HOURS TODAY	3:27	3:27	3:27	3:27
TOTAL	102:45	79:54	80:20	32:24
OIL CHANGE DUE				
CUNO. CLEANING DUE				

AIRCRAFT	
HOURS TO DATE	262:26
HOURS TODAY	3:27
TOTAL	265:53

REMARKS, PILOTS AND MECHANICS—SEE INSTRUCTIONS INSIDE FRONT COVER.

AIRPLANE SERVICED FOR FLT. #144 BY R. FRIESEN
3-14-50

CERTIFIED TRUE COPY:

William R Coleman
WILLIAM R. COLEMAN
1st Lt., USAF
Asst. Chief, Base Operations Office

USE REVERSE SIDE FOR ADDITIONAL REMARKS

DATE	AIRCRAFT ORG. DATA	AIRCRAFT DATA	ENGINE DATA	
3-14-50	AIR FORCE	COMPONENT: A. F.	ENGINE MODEL: J-35-5 E15	
STATION: K. A. F. B.			1 SERIAL No.: A-500856	2 SERIAL No.: A-500163
CREW CHIEF OR ENGINEER: R. YOUNG		AIRCRAFT MODEL: YB-49	3 SERIAL No.: A-500079	4 SERIAL No.: A-500107
		AIRCRAFT SERIAL No.: 42-102367	TOTAL FLIGHT TIME → 265:53	

ATTACHMENT #13

S T A T E M E N T

On 15 March 1950, the YB-49 aircraft #367 was scheduled for a high speed taxi test to determine the nose lift off speeds. In order to determine the exact moment at which the nose wheel left the ground, I stationed myself at the bombardier's station from which it was possible to observe the nose wheel at all times during the run. 100% power was applied to the airplane and we began our roll during which time the nose wheel acted normally, and everything appeared to be satisfactory.

I was unable to determine the airspeeds because I couldn't watch the meter and the nose wheel at the same time, but after attaining sufficient airspeed, the nose wheel was lifted off the ground. At that time I reported to Captain Warfield and Mr. Hauser that this had been done. The nose wheel was held off the ground for approximately five seconds and was then lowered extremely gently, to the surface of the lake. Following contact of the nose wheel with the lake, everything appeared to be satisfactory and Major Schlech appeared to have complete control of the airplane. However, about ten seconds later, the nose wheel began to shimmy extremely violently. Since the bombardier's position does not have a safety belt, I immediately tried to move to the rear of the airplane, but at this time the failure of the nose gear occured and I was thrown forward into the extreme forward part of the airplane so that I am unable to state whether the nose wheel tire blew out, or not. I was the last man to leave the airplane, assisted through the pilot's canopy which had been released, by Captain Warfield, who returned to the airplane and helped me through the canopy.

Captain Philip N. French, 11402A

NOTE: The above statement was given by Captain French in the presence of 1st Lt. Rex K. Stoner, Jr. and Miss Betty J. Pierson, who have signed as witnesses. Captain French was unable to sign his statement because of a broken right wrist.

R.K. Stoner Jr.
REX K. STONER, JR., 1st Lt, USAF

Betty J. Pierson
Betty J. Pierson, Stenographer

ATTACHMENT #6

S T A T E M E N T

I, M/Sgt William H Cunningham, S/N 15015476, was instructor Flight Engineer on YB-49 S/N 42-12367 on 15 March on a taxi test run. We started up and taxied out onto the lake and lined up for the run. The Major asked for 100% power and Sgt Boone opened the throttles. All engines came up normally and everything checked ok. The OK report was given to the pilot and he called "rolling". The airplane started rolling, and the nose came up, power was reduced and the nose settled back. We rolled some distance and I felt the nose wheel start to shimmy. It had happened before and I wasn't alarmed. It started increasing and became so severe that I couldn't read the engine instruments. After the shimmy became severe there was a loud pop and I had the impression that the airplane veered to the right. Then there was loud noise and confusion, the cabin was filled with dust and I was thrown forward. After the shimmy started I had moved from my standing position at the flight engineers back and half sat on the navigators seat. I was thrown toward the bombardiers seat. My head hit something and I was stunned. I looked at the pilot's canopy and the astrodome and thought they were both in place. I then saw a hole in the floor just aft of the forward escape hatch and moved toward it. I got out thru it and moved toward the front of the airplane. The left part of the wing was broken off and on fire. Both parts of the airplane seemed to be resting on the main wheels and the leading edge. I moved away from the airplane looked back and saw Capt Warfield pulling Capt French out through the pilots hatch. Major Schleeh was walking around, had difficulty standing and Sgt Boone was helping him. I remember that somebody was calling for Hauser and Capt Warfield started back in the airplane, but came back when Mr Hauser was seen running away. To the best of my memory this is a true account of what happened.

/s/ William H. Cunningham

A TRUE COPY:

William A. Walker
WILLIAM A. WALKER
Captain, USAF

ATTACHMENT #5

S T A T E M E N T

I, the undersigned, M/Sgt Richard P Boone Jr SN 15012712, 3050th AMC Support Sqdn, was acting flight engineer during a taxi test in YB-49 SN 367 on 15 Mar 50. We taxied out, everything was normal at my station. We taxied out onto the lake bed and prepared for the run. Mr. Hauser, flight test engineer asked the pilot to set up the test conditions. The pilot told the crew to get ready for the run, and called for 100% power. I checked my belt to see that it was fastened. I did not use shoulder harness. I then applied power to 100% rpm. Everything was OK and we started to roll. The nose ~~came off,~~ wheel was lifted off, the co-pilot closed the throttles to idle and all ~~engines came back to appx 60%.~~ We were rolling along and the nose wheel started to shimmy. I had experienced shimmy before, and at the beginning this did not seem any worse than it had before. It built up until the entire airplane started to shake. There was a loud noise like a tire or air bottle exploding, then the nose dropped and ~~my~~ I was thrown backward, my knees came up and hit the panel. I leaned forward and ~~grabbed~~ pulled the throttles, but could not move them. The seat gave way and left me. I don't remember unfastening my belt. The first thing I did was try to find a hole. I saw two holes, but one looked to small to get out. There was a hole ahead of me, thru the plexiglass, but there was somebody in the hole. I then saw that the canopy was half off and the pilot was getting out. I don't know whether I went out after Major Schleeh or Capt Warfield, but I did go out the canopy opening. I felt a desire to run but it seemed I couldn't make much speed. I looked around to see who was out and saw three other people. The right side of the airplane was on its nose and the main wheel, the wing leading edge was on the ground and the trailing edge was sticking up. Capt Warfield pulled Capt French out. We couldnt find the civilian immediately, Capt Warfield started back into the airplane, but when Major Schleeh fell, he saw Mr Hauser running in the other direction and we all called Capt Warfield to come back. The right side of the airplane was not burning at this time. It started burning about a minute later. We all cleared the airplane as soon as we could. This, to the best of my memory is a true account of what happened.

/s/ Richard P Boone Jr
M/Sgt 15012712

A TRUE COPY:

William A Walker
WILLIAM A WALKER
Captain, USAF

ATTACHMENT #4

S T A T E M E N T

At 0820 on 15 March 1950, a take-off run was made on the YB-49 airplane USAF No. 42-102367 to determine the nose wheel lift-off speed with the airplane loaded in a forward CG. The purpose was to obtain elevator control power information. The airplane had been loaded to 117,000 pounds gross weight at a CG position of 21.1% MAC with landing gear down and taxied out on the dry lake. With landing and trim flaps in the zero positions, 100% take-off power was applied and the take-off run south was made. I was seated at the test engineer's station, behind the photopanel in the tail section with safety belt fastened, but safety harness not used.

A photographic record of the take-off run was started upon a call from Major Schleeh over the interphone, at an airspeed of approximately 70 mph IAS. As the nose wheel lifted off at approximately 85 mph IAS, Captain French called out that information over the interphones from a prone position ahead of the bombardier's station. The airplane reached a speed of 105 mph IAS with nose wheel off the ground, before the power was cut back and the nose wheel settled back onto the ground. The nose wheel touched down at approximately 95 mph IAS and immediately started to shimmy at a fast rate of oscillation. The amplitude increased rapidly and Capt. French called out over the interphones that the nose wheel was shimmying badly. The airplane vibrated and shook, and, after the nose gear gave way, nosed into the ground. The shock of impact was moderately severe, and the airplane skidded roughly to a stop, supported by the main landing gear and nose. The airplane was still headed in a south direction between the two runways. Both my safety belt and seat held, although I suffered several minor leg and hand cuts and bruises after striking some of the equipment located at that station, during the impact, skid, and my escape. I was shielded from the instrumentation control panel before me by my right hand.

After the airplane came to a stop, I released my safety belt and stood ove the bottom hatch in the fuselage tail section located below and to the left of the test engineer's station. I released the emergency hatch jettison lever, turned the latch, and kicked the hatch out and down below the airplane. I then jumped down from the open hatch, falling about eight feet to the ground. I could hear the engines still running, though could see nothing through the clouds of dust. I started running back, away from the tail of the airplane and after 100 feet through the clouds of dust about the airplane, I could see and hear the engines above the dust and the airplane in a nose down attitude, still supported by the main gear. After I had run about 300 feet, I could see flames coming from the section of the airplane where the left wing had parted from the cabin section. I then joined the other five crew members who had escaped from the front end. By that time, the flames had spread throughout the center section of the airplane.

George H. Hauser, Jr.

GEORGE H. HAUSER, Jr.
Flight Test Division
Headquarters, AMC
Wright-Patterson AFB

ATTACHMT #3

S T A T E M E N T

I was the co-pilot of the YB-49 aircraft #367 on 15 March 1950. The purpose of the taxi run was to determine elevator stick forces at nose wheel lift-off speed. We taxied out down the ramp onto the North-South runway, taxied down, turned around and came back, lined up and attained 100% take-off power. When this was attained Major Schleeh puts the stick forces on it. I handled the throttles. As soon as the nose wheel pulls off, I immediately retard the power. Then, I lower 25° flaps.

My safety belt was fastened, but my safety harness was not, and neither the seat nor the belt failed. The airspeed when the nose wheel left the ground was 100 mph and the nose wheel touched down about 90. For approximately five seconds, the airplane rolled along normally and then we began to get a shimmy. The wheel began to shimmy at about 105 to 110. Major Schleeh had directional control of the aircraft at all times. The power was reduced to full off position as soon as the nose wheel left the ground. As soon as the nose wheel started to shimmy, Major Schleeh tried to pull the nose back off, but couldn't do it. Very light braking action was applied and directional control maintained. I feel that the shimmy became so great that it caused the tire to blow out. When that happened, the strut broke, or at least that is what it felt like. The nose wheel gear then collapsed, and I feel that we had so much momentum that the aircraft broke up. The lake bed felt smooth all during the roll.

We left the airplane through the canopy. Major Schleeh had to go out first because he fills the hole up until he gets out. There were no difficulties in getting out of the airplane. Major Schleeh released the canopy. He was #1 man out, I was #2 followed by Boone; French had trouble, so I went back and got him. Sgt. Cunningham left through the hole in the side. Mr. Hauser went out the back hatch.

The nose of the aircraft was resting on the ground and the main gear was still extended. The left wing broke off at the inside bomb bay section. It came to rest about twenty feet from the main section and right wing. The crew compartment remained intact. That is what saved us. Fire originated in the left outboard wing section. It then spread to the remaining part of the aircraft.

Allen Warfield Jr.
ALLEN WARFIELD, JR.
Captain, USAF, 9828A

ATTACHMENT #2

The directional control of the aircraft was normal. I made very slight corrections in order to stay on the runway. Only the amount of correction normally used in any aircraft.

As a final statement, I recommend that Northrop be required to taxi test the YB-49 in the forward CG configuration in order to prove that the system is safe, before the airplane is turned over to the Air Force.

/s/ Russell E. Schleeh
RUSSELL E. SCHLEEH
[illegible]

A TRUE COPY:

William A. Walker
WILLIAM A. WALKER
Captain, USAF

STATEMENT

On 15 March 1950, the YB-49 aircraft #367 was prepared for taxi tests. The CG configuration was approximately 21%. I was the pilot of the aircraft. At this time I would like to note that the last landing, prior to this date, that we made with this airplane in the forward CG configuration, we encountered severe nose wheel shimmy. This was reported to Northrop and a complete examination of the nose wheel system was accomplished by them. Northrop personnel reported that the shimmy dampening system was incorrectly adjusted. They reported that the adjustment was made and the airplane was turned over to us with the assumption that proper adjustment had been made. We hadn't flown it again with the forward CG configuration until the taxi run today.

We requested to use the lake for the taxi tests because the runway length is short and by using the lake, it would eliminate wear and tear on the airplane. The purpose of the test was to measure the elevator power—the point at which the nose wheel leaves the ground with full elevator deflection. The take-off direction was [illegible] and wind velocity at the time was five to ten mph, South-Southwest. The engines were run up to 100%; brakes were released; and the nose wheel left the ground at 104 pilot's IAS. The throttles were moved back to idle position, however the aircraft continued to accelerate to approximately 115 – nose wheel still being held off the ground. At 110, the nose wheel was lowered and everything appeared quite normal. At approximately 105 the nose wheel started to shimmy severely. At that time I attempted to eliminate the shimmy by applying more pressure on the nose wheel by moving the stick in the forward position. This failed to bring the desired results, so the stick was then pulled back in an attempt to eliminate the shimmy. Upon reaching approximately 80 mph, the nose wheel collapsed and from then on anybody's guess is as good as mine. Vision was completely obscured in the cockpit because of dust. Egress was accomplished by pulling the canopy release and physically tearing the canopy off the airplane. It came off without any difficulty. I was the first one out, followed by Captain Warfield, Sgt. Keene and Captain French. Sgt. Cunningham left through the side and Mr. Mauser went out the back hatch.

My shoulder harness and safety belt were fastened, however, I have reason to believe that the seat failed. At least it seemed to me that it failed as I had to fight to keep away from the panel. When I got out of the airplane and away from it, I turned around and looked. The left side appeared to be completely enveloped by flames and the main gear appeared to be still in the down position. The right main gear was also in the down position, and at that time I saw no fire on the right side. I don't know where the fire developed.

When the nose wheel was lowered, I used nose wheel steering, which is, in itself, a shimmy dampener. It locks the wheel in the desired position. I was using nose wheel steering at the time of the accident. I released it to see if the shimmy would stop, but when it didn't stop, I started using nose wheel steering again immediately.

ATTACHMENT #1.

RECOMMENDATIONS

1. That an investigation be conducted by the appropriate Headquarters, AMC activity to determine the advisability of redesigning the shimmy dampener for the nose wheel of this particular type of aircraft. H

2. Until such time as the specific cause of the excessive nose wheel shimmy is definitely established it is recommended the aircraft be restricted to flights with a mid C.G. location. 2

3. Based on Findings 4 and 5 above, it is recommended that the entire nose gear assembly be inspected at specified intervals to determine integrity of material. 9

4. It is recommended that insofar as it is practicable all protective equipment available to crew members be utilized when tests of this nature are being conducted. 7

5. It is recommended that when any test aircraft is being operated on Rodgers Dry Lake bed that fire fighting equipment be provided as near as possible on stand-by basis. A

ATTACHMENT #11.

Section M—DESCRIPTION OF THE ACCIDENT

1. Tell in narrative form, in as much detail as necessary, everything that is known about the accident. Be sure to cover everything that may have contributed toward the accident. Include recommendations for action to prevent similar accidents, and action taken.

On 15 March 1950 YB-49 42-102367 taxied out to Rodgers Dry Lake for a test mission consisting of high speed taxi runs. Aircraft taxied to runway on lake and advanced power to 100%. As speed increased nose wheel was pulled off ground as mission was to determine at what speed the nose wheel could be pulled off. At this point power was reduced and nose wheel was lowered back to runway. Violent shimmy of nose wheel was encountered and all efforts to stop shimmy had no effect. Nose gear collapsed and aircraft broke in two when leading edge contacted the ground. Fire immediately broke out in left wing and aircraft was completely destroyed by fire.

FINDINGS:

1. Failure of the nose gear was the primary cause of the accident.
2. Excessive shimmy of nose wheel was the main contributing factor to the failure.
3. It is possible that the forward C.G. contributed to final collapse of nose gear.
4. It was established that the use of nose wheel steering at high rolling speeds and during medium to sharp turns caused skidding of the nose wheel.
5. This aircraft possessed a history of several prior nose wheel shimmy incidents. It is possible that the combined effect of these incidents may have developed a flaw in the nose gear not detectable by visual inspection.
6. Injuries to crew members were caused by lack of utilization of shoulder harness, safety belts, crash helmets and occupation of crew positions not normal but necessary for the purpose of the specific test being conducted.
7. Three of the four crew member seats occupied tore loose from their mounts at the time of impact.
8. Aircraft was entirely destroyed by fire as a result of the distance existing between the fire fighting equipment and scene of accident.

2. Recommendations

See Attachment #11.

H,2,9,7,A

3. Action Taken

1. Nose gear assembly has been turned over to the contractor for detailed investigation as to primary cause of excessive shimmy and collapse of nose gear.
2. A U.R. will be submitted if investigation by contractor reveals failure of components of nose gear assembly.

ACCIDENT INVESTIGATING BOARD FROM REPORTING STATION. EACH MEMBER MUST SIGN. Station: Edwards AFB, Muroc, California.

Name	Grade	Organization
FRED J. ASCANI	Lt. Col.	3077th Exp. Gp.
WILLIAM A. WALKER	Capt.	3077th Exp. Gp.
FRANK A. COWART	Maj.	2759th Exp. Wg.
GUST ASKOUNIS	Maj.	3077th Exp. Gp.
JOHN [illegible]	Lt. Col.	2790th Med. Gp.
WILLIAM R. COLEMAN	1st Lt.	3077th Exp. Gp.
JAMES W. [illegible]	Capt.	3077th Exp. Gp.
WILLIAM J. HORVAT	Capt.	3077th Exp. Gp.

[redacted]

Section J—AIRPORT AND FACILITIES AND AIRWAYS

(Use this section if the airport or its facilities or airways facilities were a contributing factor in the accident, either because of inadequacy, condition, or poor maintenance)

1. Remarks

Section J—AIRPORT AND FACILITIES AND AIRWAYS

(Use this section if the airport or its facilities or airways facilities were a contributing factor in the accident, either because of inadequacy, condition, or poor maintenance)

1. Remarks

Not Applicable.

Section K—WEATHER (This must be signed by weather officer of the reporting station)

1. What Was the Weather at the Time and Place of the Accident?

25,000 Scattered, 35 Mi. Visibility, Wind SW, 3 Mi. Per Hr.

2. If Weather Was a Factor in the Accident, State How and Attach Copy of Weather Report

Not A Factor J

WEATHER OFFICER (Name, Grade, and Station) ➡ FRED J. CURTIS, MAJOR, DETACHMENT COMMANDER

Section L—GENERAL INFORMATION

1. If Error on the Part of Someone Other Than the Operator Was a Factor, State How

Not Applicable.

2. What Was the Mission?	3. Did Pilot Carry Upon Clearance?
S-24 7	[x] Yes [ ] No

4. Were There Any Violations of Orders or Regulations? (Explain)

None.

5. Disciplinary Action Taken or Contemplated

None.

6. Kind of Clearance (Attach Form 23)	From	To	Or Local	Station of Last Inspection
None		None		

7. If UR Form 54 Has Been Submitted on Any Factors Involved in the Accident, Give UR No. and Date	No.	Date

Remarks (Use and Attach Copy)

U.R. will be submitted later as soon as detailed investigation by Northrop Aircraft Inc., is completed.

8. Are Copies of AAF Forms 1, 1A, Attached Hereto as Required by AAF Regulation 62-14? [x] Yes [ ] No | 9. Are Photos Attached? [x] Yes [ ] No

06/05/1948

YB-49

RESTRICTED UNTIL ENTRIES ARE MADE ILLEGIBLE

WAR DEPARTMENT
AAF Form No. 14

CONFIDENTIAL

ARMY AIR FORCES

REPORT OF MAJOR ACCIDENT

Use this form in accordance with AAF Reg. 62-14 and "Aircraft Accident Investigator's Handbook" issued by Office of Flying Safety, Headquarters, AAF.

Fill in all spaces except where otherwise indicated.

If additional space is needed, use additional sheet(s) and identify by proper section letter and subsection number.

ACTION	DATE
Preliminary Report Received	6-7
Form 14 Received	
	6-28
Verified by	7-17
Checked by	1-1
	7-5

TYPE, MODEL AND SERIES: B-49

No. Aircraft Involved: 1

Section A—GENERAL INFORMATION

1. Place of Accident	Nearest Army Airfield, Distance and Direction from Same
California, Kern Co., 12 Miles North West	Muroc Air Force Base, California

2. Was Collision With Other Aircraft?	AF Nos. of Aircraft Involved	Date	Hour and Time Zone	Day / Night
☐ Yes ☒ No	42-102368	5 Jun 48	0755 PDST	☒ Day ☐ Night

Section B—AIRCRAFT

1. Aircraft No.	2. Type Model Series	3. Home Station
42-102368	YB - 49	Muroc Air Force Base

4. Air Force or Command	Subcommand	Wing	Group No. and Type	Squadron
AMC				

5. Date of Manufacture	Total Hours	Date Last Overhaul	Overhauling Depot or Sub-Depot	Hours Since Overhaul
14 Jan 48	58:02			

6. Attach detailed statement of tech orders having direct bearing on this accident which have not been complied with. Describe the orders and give reasons for noncompliance.

Section C—OPERATOR (Person at controls at time of accident)

1. Last Name	First Name	Middle Initial	Grade	Branch	ASN	Sex	Age
FORBES, JR.	DANIEL	H.	Major	USAF	AO-35522	M	30

2. Attached Station	AF or Command	Subcommand	Wing	Group No. and Type	Squadron

3. Assigned Station	AF or Command	Subcommand	Wing	Group No. and Type	Squadron
Wright-Patterson AFB	AMC			Flt. Test Div.	

4. Aeronautical Rating?	Present Rating	Date Received	5. Normal Duty Status
☒ Yes ☐ No	Pilot	Jan 1942	Test Pilot

Section D—OPERATOR'S FLYING EXPERIENCE (Including civilian)

Flying Time	1st Pilot or Solo Student	Other Pilot or Other Student
1. Total Hours	1786:50	615:15
2. Hours This Type	28:55	11:20
3. Hours This Model	25:30	7:55
4. Hours Last 90 Days	70:25	36:20
5. Hours Last 30 Days	13:50	5:45
6. Hours Last 24 Hours	1:10	
7. Actual Combat Hours	277:00	

Fill in Items 8 and 9 only if operator was student in training or rated pilot in LSB, OTU, etc.

8. Training Class No. and School, OTU, OCTS, Etc.

9. Phase and Hours in This Phase — Phase | Dual on Current | Solo on 1st Phase

10. AAF Schools Previously Attended and Dates:
Primary, Ontario, Calif. - 41
Basic, Ontario, Calif. - 41
Advanced, Stockton, Cal. - 42

11. Instrument Rating — Type	Date
White	19 Dec 48
Last Check Station: Wright Fld.	Date: 19 Dec 47

12. Was operator on instruments at time of accident or immediately before? ☐ Yes ☒ No

If answer to number 12 is Yes, or if accident occurred at night or under instrument or hazardous conditions, fill in items 13 through 17.

	Hours	1st Pilot	Other
13. Total—Instrument			
14. Instrument Last 6 Mos.			
15. Instrument Last 30 Days			
16. Night Last 6 Mos.			
17. Night Last 30 Days			

Section E—PERSONNEL INVOLVED (Including operator and all other persons, whether in plane or not)

Duty of Time of Accident (a)	Name (Last Name First) (b)	Type of Aero. Rating (Symbols) (c)	Serial No. (d)	Grade and Branch of Service (e)	Personnel Classification (AAF Reg. 65-5) (f)	Org. Assignment—Air Force or Command, Group Number and Type, Station (g)	Fatal, Major, Minor, None, Unknown (h)	Parachutes Used Yes (i)	Used No (j)	Deployed Yes (k)	Deployed No (l)
	FORBES, DANIEL H., JR.	P	AO-35522	Major, USAF		AMC	Fatal				
	EDWARDS, GLEN W.	P	AO-40795	Capt., USAF		AMC	Fatal				
	SWINDELL, EDWARD L.	E	AO-876402	1st Lt., USAF		AMC	Fatal				
	Lesser, Clare C.	E	None	Civilian		AMC	Fatal				
	LaFountain, C. H.	E	None	Civilian		AMC	Fatal				

5-4

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Section F—DAMAGE

1. To Aircraft

Total Wreck

	1	2	3	4
2. To Engines	Damaged and burned beyond repair (8 engines) 44	44	44	44
3. To Propellers	None			

4. To Private Property (Explain on Attachment)

None

Section G—POWER PLANT FAILURE

1. Duration of Flight Since Last Take-off: Hours / Minutes

	(1)	(2)	(3)	(4)
2. Engine Model				
3. Engine No.				
4. Engine-Hours Since Last Major Overhaul	See Attachment #1			
5. Depot or Sub-depot Performing Overhaul				
6. Total Engine-Hours				
7. Propeller Model				
8. Propeller-Hours Since Major Overhaul				

9. Statement of Operator, if Available, on Behavior of Power Plant and Manipulation of Controls Immediately Before Failure

Not Available

10. Statement of Engineering Officer, Mechanics, and Others as to What Failed and Probable Reasons Why

See Attachment #1

11. Octane Rating of Fuel: JP-1

Engineering Officer (Name, Grade, and Station):

Section H—AIRFRAME, LANDING GEAR, OR OTHER MATERIEL

1. Describe the Materiel Failure, Including Statement of Kind of Flight at the Time of Failure and All Factors Which Might Have Contributed Toward the Failure

See Attachment #1 - 2 - 3 - 4

Engineering Officer (Name, Grade, and Station):

Section I—SPECIAL EQUIPMENT

1. Describe How the Special Equipment Contributed to the Accident or to Its Results

None

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Section J—AIRPORT AND FACILITIES AND AIRWAYS

(Use this section if the airport or its facilities or airways facilities were a contributing factor in the accident, either because of inadequacy, condition, or poor maintenance)

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1. Explain

Not a Factor

Section K—WEATHER (This must be signed by weather officer of the reporting station)

1. What Was the Weather at the Time and Place of the Accident?

Clear, Visibility 5 Miles Haze, Wind 24 MPH, WSW

2. If Weather Was a Factor in the Accident, State How and Attach Copy of Weather Reports

Not a Factor

WEATHER OFFICER (Name, Grade, and Station) ➔ Fred T. Austin Major USAF

Section L—GENERAL INFORMATION

1. If Error on the Part of Someone Other Than the Operator Was a Factor, State How

None

2. What Was the Mission? Test Flight

3. Did Pilot Check Upon Clearance? [X] Yes [ ] No

4. Were There Any Violations of Orders or Regulations? (Explain)

None

5. Disciplinary Action Taken or Contemplated

None

6. Kind of Clearance (Attach Form 23) From: See Attachment #5 To: Or Local: Local Station of Last Departure: Muroc AFB

7. If UR Form 54 Has Been Submitted on Any Feature Involved in the Accident, Give UR No. and Date No. Date

Explain Fully and Attach Copy

None

Mg. Fogg 12/20/47

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8. Are Copies of AAF Forms 1, 1A, Attached Hereto as Required by AAF Regulation 15-14? [ ] Yes [X] No

9. Are Photos Attached? [X] Yes [ ] No

Section M—DESCRIPTION OF THE ACCIDENT

1. Tell in Narrative Form, in as Much Detail as Necessary, Everything That is Known About the Accident. Be Sure to Cover Everything That May Have Contributed Toward the Accident. Include Recommendations for Action to Prevent Similar Accidents, and Action Taken

YB-49 42-102368 took off Muroc AFB at 0644 PDST for an estimated 3 hour local test flight. The crash occurred approximately 12 miles NW of Muroc AFB at about 0755 PDST. The airplane was in an inverted position at the time of contact with the ground. The nose of the plane headed about 300°. Explosion occurred almost immediately and almost the entire wreckage was consumed be fire. The line of flight could not be definitely established. However, there appeared to be very little momentum in any direction at the point of impact. Pieces of the airplanes flaps, elevons, fins and both wing tips were scattered from the main wreckage on a line of 050° an area approximately ½ mile wide and 2.8 miles long.

2. Recommendations

An accompanying airplane be flown with any new type aircraft until all phases of flight testing have been completed. More frequent contact with ground station during course of test flights.

3. Action Taken

Necessary steps are being taken to procure additional aircraft and pilots to provide escort for all test flights at this station.

ACCIDENT INVESTIGATING BOARD FROM REPORTING STATION. EACH MEMBER MUST SIGN.	Station: Muroc Air Force Base	
Name—Member: SIDNEY T. SMITH	Name—Member: RUSSELL M. ROTH	Name—Investigating Officer: [illegible]
Grade: Lt.Col. Organization: USAF, 4144th AF BU	Grade: Capt. Organization: USAF, 4144th AF BU	Grade: 1st Lt. Organization: USAF, 4144th AF BU
Name—Member: FOUNTAIN M. HUTCHISON, JR.	Name—Medical Officer: [illegible]	Name—Member: JOHN L. CRAIG, JR.
Grade: 1st Lt. Organization: USAF, 4144th AF BU	Grade: 1st Lt. Organization: MC, 4144th AF BU	Grade: 1st Lt. Organization: USAF, 4144th AF BU

AFCAI-4G/Maj Rhoads/elm/78078

AFCAI-4G

19 Aug 48

SUBJECT: Fatal Aircraft Accident Involving YB-49 No. 42-102368

TO: Commanding General
Air Materiel Command
Wright-Patterson Air Force Base
Dayton, Ohio

1. A recent investigation by this headquarters of an accident which occurred 12 miles northwest of Muroc Air Force Base, California, on 5 June 1948, and involved YB-49 No. 42-102368, revealed that structural failure had occurred in flight and that the aircraft tumbled about its lateral axis.

2. The subject aircraft was so completely demolished that a definite conclusion as to the cause of the accident could not be reached; however, it was the opinion of the investigating officers that the tumbling and structural failure resulted from one of the following:

a. A stall was attempted wherein the nose of the aircraft approached the vertical position, reverse flight was commenced creating the initial structural failure and tumbling resulted.

b. Asymmetrical power tests were being conducted during which the pilot possibly overcontrolled, thereby placing undue stress on the airframe of the subject aircraft, resulting in structural failure and tumbling.

3. It was determined that:

a. No pacer aircraft accompanied the flight.

b. No voice communication was maintained between ground personnel and the subject aircraft regarding the phase of flight being accomplished.

c. No duplicate copy of that portion of flight to be accomplished was provided for ground personnel.

d. It is the opinion of pilots who have flown the YB-49 type aircraft that the control forces are too light and it is their desire that corrective action be taken to change the control system so as to make the forces more closely resemble those of conventional type multi-engine aircraft.

By Authority of [illegible]

e. Skin buckling at Station 115 on the subject airplane was in evidence as the result of overloading; however, all personnel concerned were aware of this fact and the flight was cleared notwithstanding.

~~CONFIDENTIAL~~

AFCAI-4G, "Fatal Aircraft Accident Involving YB-49 No. 42-102368,"
(Contd)

f. The fuel tanks of the YB-49 type aircraft have no baffles installed.

4. In view of the above, it is recommended that:

a. when practicable A pacer aircraft be required to accompany all aircraft which are undergoing AF phase test work.

b. Voice communication between ground personnel and an aircraft undergoing tests be maintained.

c. A duplicate copy of that portion of the flight to be accomplished be provided for ground personnel.

d. A study be made to determine the advisability of modifying the control forces on the subject type aircraft in order that they will more closely simulate the control forces of conventional multi-engine aircraft.

e. The cause of the skin buckling at Station 215 be determined and corrective action be taken.

f. A study be made to determine whether fuel tank baffles should be installed to prevent rapid changing of the center of gravity when the aircraft is placed in other than straight and level flight.

BY COMMAND OF THE CHIEF OF STAFF:

/S/ A.H. Gilkeson
A.H. GILKESON
Brigadier General, USAF
The Air Inspector
JAF

Classification Cancelled ~~or Changed~~
~~To~~ ____________
By Authority of Maj. Gen. ...
By Jly Date 17 Sep 51

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

980a

Basic Ltr dtd 19 Aug 48 fr USAF, Subj: Fatal Acft Accident Involving YB-49 No. 42-102368

1st Ind. MCAB/JTL/mad

Hq AMC, Wright-Patterson Air Force Base, Dayton, Ohio, 7 October 1948

TO: The Inspector General, First Region, USAF, Field Office of The Air Inspector, Langley Air Force Base, Hampton, Virginia

1. The following information regarding the recommendations made in paragraph 4, basic communication, are submitted:

a. A pacer aircraft was used during all YB-49 Phase I flight testing accomplished by the contractor. The policy of requiring the contractor to utilize a pacer aircraft will be continued during future flight tests made by contractor personnel. Pacer aircraft will be used during Phase II flight testing whenever a test is considered to be extremely hazardous.

b. The recommendation concerning the use of radio communication between ground personnel and the aircraft undergoing test is concurred in, and will be followed in future Phase I flight testing by the contractor. A radio monitoring station with recorder has been established for the purpose of monitoring all hazardous tests during Phase II flight testing.

c. A duplicate copy of the flight testing plan for each flight will be retained by the Operations Office of the contractor in future Phase I flight testing. A duplicate copy of the test card is provided the ground radio monitoring personnel for Phase II flight testing.

d. The contractor has just recently completed an extensive series of flights to obtain data for the purpose of improving the control forces of the YB-49 type aircraft. These data are now in the process of being reduced, and upon completion, will be used in connection with making the necessary changes in the aircraft so as to obtain control forces in the YB-49 comparable to those of large conventional type aircraft.

e. The Aircraft and Missiles Section, Procurement Division, this Headquarters, advises in reference to the skin buckling supposedly caused by overloading, that the contractor has investigated the condition noted and advised that the aircraft had not been loaded beyond 192,000 pounds, a load which is not considered as an overload in view of the fact that the aircraft was designed for a maximum gross weight of 213,552 pounds. However, it ~~Classification Changed~~

~~To~~

By Authority of Aug. Fess

By JM Date 17 Sep 54

3

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

Subject: Fatal Acft Acc Involving
YB-49 No. 42-102368 1st Ind. 7 Oct 48

contractor that compression wrinkles appeared on the lower wing surface skin and structure aft of both main landing gears when the airplane was loaded to gross weights approaching the max allowable. The structure involved was secondary structure only and wrinkles under high compression load are considered normal. The contractor further states that a close inspection was made at the time the wrinkles were noted and that no damage to primary structure was observed. It is not believed that the skin buckling condition discussed herein was a factor in the crash of the subject aircraft since it has been established that the accident involved positive load factor conditions rather than the negative load which caused these wrinkles. Further, there was no evidence in the crash of any structural difficulty in the vicinity of Station 215 which is the inboard side of the landing gear bay. This entire portion of the aircraft is believed to have struck the ground as a unit.

f. The contractor has been requested to initiate a study on the fuel sloshing problem in the YB-49 aircraft. The laboratory set-up approximating a typical fuel tank installation of the aircraft has been constructed and necessary corrective action will be determined after completion of thorough tests.

FOR THE COMMANDING GENERAL:

JAMES T. LEWIS
Major, USAF
Chief, Flying Safety Section
Base Services Division

Classification Cancelled or Changed
To
By Authority of Maj. Ling
By JW Date 11 Sep 54

[redacted]

REPORT OF SPECIAL INVESTIGATION OF AIRCRAFT ACCIDENT INVOLVING YB-49, NO. 42-102368

1. DATE AND TIME OF ACCIDENT: 5 June 1948, 0755 PST

2. LOCATION OF ACCIDENT: 12 miles NW of Muroc, Kern County, California

3. AIRCRAFT TYPE, MODEL, SERIES AND SERIAL NUMBER: YB-49 No. 42-102368

4. AIRCRAFT HOME STATION AND ORGANIZATION: Muroc Air Force Base, AMC
Muroc, California

5. RESULTS TO AIRCRAFT: Completely wrecked

6. HISTORY OF AIRCRAFT AND ENGINES:

AIRCRAFT: Date of initial flight - 14 January 1948 - Not yet accepted by USAF
Total hours - 58:02
Date last overhaul - None
Overhauling depot or sub-depot - None
Hours since overhaul - None

ENGINES:	1	2	3	4
Model	J-35-15	J-35-15	J-35-15	J-35-15
Number	A-500-827	A-500-819	A-500-821	A-500-804
Total hours (including ground run-up)	20:50	21:22	21:15	20:33
Hours since last major overhaul	00:00	00:00	00:00	00:00

ENGINES:	5	6	7	8
Model	J-35-15	J-35-15	J-35-15	J-35-15
Number	A-500-834	A-500-830	A-500-812	A-500-798
Total hours (including ground run-up)	19:58	19:33	19:32	19:21
Hours since last major overhaul	00:00	00:00	00:00	00:00

7. PILOT, HOME STATION AND ORGANIZATION: Daniel H. Forbes, Jr., Major, AO[illegible]
Wright-Patterson AFB
Flight Test Division, AMC
Dayton, Ohio

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To
By Authority of [illegible]
By [illegible] Date 17 [illegible]

[redacted]

8. PILOT HISTORY:

Flying Time	1st Pilot or Solo Student	Other Pilot or Other Student
Total hours	1785:50	615:15
Hours this type	25:55 Jet Bomber	11:20 Jet Bomber
Hours this model	25:30 (YB-49)	7:35 (YB-49)
Hours last 90 days	70:25	30:20
Hours last 30 days	13:50	5:45
Hours last 24 hours	1:10	0:00
Actual combat hours	277:00	

Primary - June, July, August 1941 - Ontario, California
Basic - August, September, October 1941 - Ontario, California
Advanced - November, December 1941, January 1942 - Stockton, California

9. COPILOT, HOME STATION AND ORGANIZATION: Glen W. Edwards, Captain, AO40795
Wright-Patterson AFB
Flight Test Division, AMC
Dayton, Ohio

10. COPILOT HISTORY:

Flying Time	1st Pilot or Solo Student	Other Pilot or Other Student
Total hours	1521:00	[illegible]6:00
Hours this type	31:15 Jet Bomber	30:20
Hours this model	5:15	6:00
Hours last 90 days	75:15	[illegible]:10
Hours last 30 days	8:10	40:10
Hours last 24 hours	0:00	1:10
Actual combat hours	[illegible]:00	1:10

11. OTHER CREW MEMBERS, HOME STATION, ORGANIZATION AND HISTORY:

ENGINEER: Edward L. Swindell, 1st Lt., AO876402
Wright-Patterson AFB
Flight Test Division, AMC
Dayton, Ohio

CIVILIAN ENG.: C. C. Lesser
Wright-Patterson AFB
Flight Test Division, AMC
Dayton, Ohio

CIVILIAN ENG.: C. H. La Fountain
Wright-Patterson AFB
Flight Test Division, AMC
Dayton, Ohio

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By Authority of *[illegible]*
By *[illegible]* Date *[illegible]*

History of flight engineers not applicable as all members of the investigating party concluded that they had no bearing on the accident.

[redacted]

12. RESULTS TO CREW AND PASSENGERS: All occupants fatally injured.

13. NARRATION OF EVENTS: On 5 June 1948 at 0544 PDT, YB-49 No. 42-102368 took off from Muroc AFB, California, for the purpose of conducting a test flight. Two radio contacts were received, one at 0710 PDT in which the pilot stated "over Bakersfield and still ascending" and one at 0733 in which the pilot stated "North end of Antelope Valley at 15,000 feet and descending." This was the last heard of the aircraft until a call was received at 0805 PDT stating that an aircraft had crashed and was burning at a point 12 miles NW of Muroc AFB.

14. FACTS:

a. The flight was properly cleared and authorized. (Exhibits 1 and 2)

b. The mission was to include the following: (Exhibit 3)

(1) That part of phase 2 test flight which would include a check climb to service ceiling or to 40,000 feet.

(2) Two types of low power clean configuration stalls at 5000 RPM and 5400 RPM respectively, to be conducted at 15,000 feet or at an altitude close thereto where the smoothest air could be found.

(3) Thrust and fuel consumption tests were to be conducted wherein engines No. 5 and 6 would be shut down and the other six engines advanced to full power for a period, later to be reduced to 7400 RPM.

(4) An air start of the two dead engines was to be accomplished.

c. Weather was no factor.

d. From conversation with flight test personnel at Muroc AFB, it has been determined that both the copilot and the pilot were well qualified for the mission and were extremely conservative as individuals. (Exhibit 4)

e. The three flight engineers were considered to be among the best qualified in the Air Materiel Command. (Exhibit 4)

f. The statement of a fully qualified witness depicted the aircraft to have tumbled about its lateral axis; however, the type of tumble, inside or outside, could not be determined due to the distance between the witness and the aircraft. (Exhibit 5)

g. The aircraft landed in a flat, inverted position with evidence of very little, if any horizontal motion. (Exhibit 7, page 5, Mr. Bates)

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By [illegible] Date 11 Aug 54

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h. The aircraft commenced to disintegrate in flight as evidenced by the wreckage pattern. (Exhibit 7, page 16, Mr. Schwartz)

i. Wreckage was strewn for a distance of 2.8 miles on a heading of 50° N from the main point of impact. (Exhibit 7, page 4, Mr. Lien)

j. All of the crew members were in their proper positions with respect to the design plan of the aircraft and safety belt buckles of the pilot and copilot were found to be locked. (Exhibit 4)

k. There was no conclusive evidence of engine failure. (Exhibit 7, page 4, Mr. Bates)

l. The wreckage pattern which extended NE to SW produced parts in the following general order: control surface skin, inboard flap skin, part of one stabilizer, left outboard flap, stringers of various types, elevons, wing tips, engine covers, point of impact. (Exhibit 4)

m. The aircraft was apparently traveling generally in an easterly to westerly direction. (Discussion, paragraph 15d)

n. The following winds were in existence at the time of the crash:

Surface	- 20 m/h from	180°
4000	15	140°
6000	15	120°
8000	20	220°
10000	20	250°
12000	25	260°
16000	50	270°
20000	50	260°
25000	50	280° (Exhibit 7, page 11, Mr. Lien)

o. There was no evidence of any air fire. (Exhibit 7, page 5, Mr. Bates)

p. One of the left hand flaps tore off with a downward motion toward the nose of the aircraft. (Exhibit 4)

q. The lower half of the left hand rudder was forced open beyond its design limits and was still attached to the wing panel. (Exhibit 4)

r. The upper half of the left hand rudder was not attached to the wing tip panel whereas the complete right hand rudder was still attached to its wing tip panel. (Exhibit 7, page 5, Mr. Bates)

s. Both wing tips failed upward at nearly the same station. It was concluded that both elevons tore off at the same time as the tips. (Exhibit 7, page 12, Mr. Meyers)

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t. The gear and flaps were up at the time of the crash. (Exhibit 7, page 6, Mr. Bates)

u. The trim flaps were in the neutral position. (Exhibit 7, page 6, Mr. Bates)

v. The greatest initial structural failure occurred at, or in the vicinity of the trailing edge of the wing. (Exhibit 7, page 6, Mr. Harrington)

w. There were approximately 9000 gallons of fuel remaining at the time of the accident. (Exhibit 4)

x. The fuel tanks on the YB-49 type aircraft have no baffles installed. (Exhibit 4)

y. A pilot who had landed just prior to the flight of the YB-49 reported the air to be smooth. (Exhibit 4)

z. The wing slots were found to be in the open position. (Exhibit 7, page 6, Capt. Wethe)

aa. NACA wind tunnel tests have shown that a flying wing model will tumble either when suspended in an absolute tail down position or when pitched into the tunnel in a tumbling motion. (Exhibit 7, pages 5 and 6, Capt. Wethe)

bb. The weight of the aircraft at the time of the accident exceeded the recommended stall weight. (Exhibit 4)

cc. The copilot, prior to the accident, had stated the following concerning stalls of a YB-49: when approaching a power off stall, the nose of the aircraft had a tendency to climb, the stick had to be pushed forward to counteract this tendency and zero control forces were present when stalling the aircraft. No stalls had been attempted in the subject aircraft prior to this flight. (Exhibit 7)

dd. No pacer aircraft had been requested or was provided to accompany the YB-49. (Exhibit 4)

ee. There was no duplicate copy of the test phases to be accomplished. (Exhibit 4)

ff. The subject aircraft had never been stalled. (Exhibit 7, page 5, Capt. Wethe)

gg. Northrop Aircraft Inspection pick-up sheet, reported that the structures aft of both main gears buckle severely when the aircraft is heavily loaded. (Exhibit 8)

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By Authority of [illegible]
Date [illegible] 54

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13. DISCUSSION:

a. Representatives of the Flying Safety Division, FOTAI, arrived at Muroc AFB on 7 June 1948.

b. Three days were spent at the scene of the accident investigating the wreckage.

c. On 10 June 1948 a meeting concerning the findings of the various investigating personnel was held. Present were Air Force personnel including both military and civilian from AMC, Northrop Aircraft Corporation personnel, Allison Engine personnel, and the representatives of the Flying Safety Division, FOTAI. (Exhibit 7)

d. Concerning the direction of flight of the subject aircraft, it is believed that the course was generally from the east to the west for the following reasons:

(1) The wreckage, commencing with very light portions of skin and increasing in both density and part weight, was scattered from the NE to the SW on a magnetic heading of 230°.

(2) It is known that the initial structural failure of the aircraft commenced at some altitude below 15,000 feet MSL, reference the second radio report from the pilot. The wind from 6,000 to 16,000 feet varied from 180° to 280° and from 15 to 50 mph. (Exhibit 7, page 11, Mr. Lien) Consequently, if the aircraft had been traveling from the north, south or west when structural failure began an entirely different wreckage pattern would have been established. Parts would have had to blow in an easterly direction for approximately three miles. Of these parts, the left outboard flap was farther than a mile from the main point of impact. This flap is relatively heavy and is of a configuration not conducive to flight. Therefore, it is believed that the subject flap fell to earth in practically a straight line with very little, if any, glide. Also, other parts, such as stringers, which would have very little glide tendancy, were found farther east than the flap. Assuming the above to be so, it may be concluded that in order for the respective parts to have landed in their relative positions, structural failure must have commenced as the aircraft was flying in a westerly direction.

e. Four possibilities present themselves as to the initial cause of the structural failure:

(1) That the pilot was conducting asymmetrical power tests when certain surfaces and/or component sections parted from the

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aircraft thereby causing it to tumble forward about its lateral axis. This forward tumble, during the period while the aircraft still maintained a great deal of horizontal momentum, might conceivably have caused the flaps and rudders to tear off and force open respectively in the manner prescribed in paragraphs 14p, q and r. The surfaces and/or sections which would be required to tear from the aircraft in order to cause forward tumbling would be the elevons and/or the wing tips. If either of the above had initially torn off the aircraft and, remembering the fact that the flight was from east to west, they would have been found at the NE end of the wreckage path instead of at the SW end close to the main point of impact. Therefore it is felt that the above may be discounted.

(2) That the engine compressors may have thrown buckets thereby damaging or severing completely the control cables. Inasmuch as the aircraft has two separate control systems, the above possibility becomes remote plus the fact that examination of the engines revealed no indication of failure in flight. This theory may therefore be discounted.

(3) One of the likely possibilities is that the pilot was performing the power stalls mentioned in paragraph 14b, and as the aircraft was in excess of the maximum safe stall weight, the following occurred:

(a) The tendency of the nose to continue to climb while approaching a stall asserted itself.

(b) The unbaffled fuel rushed aft in the wing.

(c) The center of gravity moved aft beyond safe limits.

(d) Reverse flight was commenced.

(e) Outboard flap skin commenced to tear off.

(f) One of the stabilizers and the left inboard flap tore off.

(g) The rudders were forced open.

(h) The aircraft commenced to tumble backward about its lateral axis.

(i) Throughout the tumble parts continued to separate themselves from the main structure until finally the elevons and wingtips tore off. It is believed that, as the wingtips came off, the aircraft commenced to roll about its longitudinal axis as well as tumble about its lateral axis until it eventually lost all forward momentum and fell directly to the ground in an inverted position. It might be mentioned that the wing slots should be

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By [illegible] Date [illegible]

opened before performing low speed stalls as the tips stall out otherwise. The wing slots were found in the open position, but it could not be determined whether or not the pilot opened the slots with a view toward performing stalls for the following reason: two systems operate the slots, an electrical system and a hydraulic system. When both of these systems become, for any reason, inoperative the slots are so constructed as to automatically open. When the wingtips tore off, both systems were immediately rendered inoperative and the slots opened of their own accord.

(4) A fourth and also likely possibility is that, inasmuch as the limit maneuver load factors of positive 2 G's and negative 1.33 G's are relatively small for an aircraft of this design, it is believed that during a power point check the pilot may have exceeded the allowable speed permitted for a specified altitude, and in order to decrease speed, inadvertently applied excessive control movement. Due to the characteristics of this aircraft, light to practically negligible control forces were present and excessive control movement could have caused materiel failure of the control surface and airframe, resulting in tumbling. It is to be noted (Exhibit 8) that severe skin buckling at Station 215 was observed when the aircraft was loaded heavily. In this case the aircraft was loaded to 80% of its designed gross weight and it is believed that the subject buckling of skin was prevalent during the test phase of this flight. It is felt that the application of any excessive G force would cause failure of the aft wing section at Station 215. This would tend to induce the loss of flaps and elevons thereby establishing tumbling characteristics of the aircraft, which resulted in failure of the wingtips and the subsequent crash.

f. The Northrop Aircraft Corporation has agreed to subject the wingtips of the subject type aircraft to strain tests from Station 766 (Exhibit 9) outward, in order to determine the possibility of any excess weakness being present throughout this area. In addition, the Northrop Company has agreed, providing suitable parts are available, to subject the wingtips to destructive tests for the purpose of determining the G forces necessary to cause such failure as that experienced in the subject accident.

16. CONCLUSIONS:

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By ______ Date ______

a. It is concluded that the subject accident was caused by one of the following:

(1) The aircraft was stalled while in excess of its maximum safe stall weight.

(2) Surface skin commenced to tear from the main structures as the result of a power point check wherein excessive inadvertent control forces were applied.

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17. RECOMMENDATIONS:

a. That a pacer aircraft be required to accompany all aircraft which are undergoing AF phase test work.

b. That voice communication between ground personnel and an aircraft undergoing tests be maintained.

c. That a duplicate copy of that portion of the flight to be accomplished be provided for ground personnel.

d. That a study be made to determine the advisability of modifying the control forces on the subject type aircraft in order that they will more closely simulate the control forces of conventional multi-engine aircraft.

e. That the cause of the skin buckling at Station 216 be determined and corrective action be taken.

f. That a study be made to determine whether fuel tank baffles should be installed to prevent rapid changing of the center of gravity when the aircraft is placed in other than straight and level flight.

18. STATEMENT OF REBUTTAL OR REFUTATION:

a. Inasmuch as the pilot was killed in the crash, it was impossible to obtain a statement of rebuttal regarding pilot error.

JOHN S. PERSONS
Colonel, USAF
Chief, Flying Safety Division

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[illegible] Date 17 Feb 54

HqAMC Form No. 19-614 (Rev 10 Sep 46)

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WF-L-2 SEP 47 2000

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HEADQUARTERS
AIR MATERIEL COMMAND

IN REPLY ADDRESS BOTH COMMUNICATION AND ENVELOPE TO COMMANDING GENERAL, AIR MATERIEL COMMAND, ATTENTION FOLLOWING OFFICE SYMBOL:

MCAEXF

MCAEXF/JTL/mjr
WRIGHT FIELD, DAYTON, OHIO
14 July 1948

SUBJECT: Information on Preventative Action Taken By Lower Echelon in Case of Aircraft Accident.

TO: Commanding Officer
Department of the Air Force
Field Office of the Air Inspector
Langley Air Force Base, Hampton, Virginia
Attn: Flying Safety Division

1. The attached correspondence on the following AMC accident is forwarded in compliance with AF Letter 62-21, 12 December 1945:

Type: YB-49
Number: 42-102368
Date: 5 June 1948
Place of Accident: Muroc AF Base, California
Operator: Daniel H. Forbes, Jr., Major

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~~To~~
By authority of
By

2. This office has been advised by the Project Officer, YB-49 type, that the Contractor has reviewed the stress analysis of the wing section which failed and determined that ultimate failure would occur at 4.5 g's ± 20%, and is now preparing an engineering proposal and cost estimate for fabrication and static testing of a wing panel from station 400 outboard.

3. The No. 1 YB-49 has been returned to the Contractor for extensive tests of control forces and for the installation of strain gages in the region where the failure occurred on the No. 2 airplane. It is also contemplated that a more comprehensive stall program will be completed by the Contractor's pilots prior to resuming Phase II testing by the Flight Test Division.

4. Flight Test Division this headquarters plans to use chase aircraft where a particular flight is considered to be of a hazardous nature, and, in addition, a ground station radio is being installed for the purpose of monitoring each of all hazardous flight tests with a recording.

5. This headquarters concurs with the Aircraft Accident Board, and the action taken by the Base Commander to prevent the recurrence of similar type accidents.

FOR THE COMMANDING GENERAL:

James T. Lewis
JAMES T. LEWIS
Major, USAF
Chief, Flying Safety
Base Services Division

Incl:
Ltr fr Hq Muroc dtd
15 June w/1st Ind.

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B/L: Fr Pres. AC Accident Board, subj: Aircraft Accident, 15 June 48. 545a

MBCO 1st Ind.
HEADQUARTERS MUROC AIR FORCE BASE, Muroc, California, 17 June 1948.

TO: Commanding General, Air Materiel Command, Wright-Patterson Air Force Base
Dayton, Ohio.

1. The inclosed Accident Report AAF Form No. 14 is approved.

2. Due to the death of all occupants the cause of the materiel failure cannot be determined at this time. Investigation as to possibility of structural weakness is being carried on by the Northrop Aviation Company in close cooperation with the Muroc Air Force Base Technical Engineering Division and the Air Materiel Command Flight Test Division. No disciplinary action on any supervisory personnel is necessary as no violations of existing instructions were evident.

3. Careful study of the report fails to show that any consideration has been given to the possibility of hydraulic-control failure as a possible cause. This has been mentioned to the parties concerned and assurance has been given that this possibility will be made a matter of study along with future efforts to arrive at the possible cause of this accident.

4. A committee is being appointed, to meet with representatives of various aircraft companies and Flight Test Division personnel, to study methods that may be used without violating security to more closely follow the progress of flight tests to the end that acquired information resulting from any test program may not be lost as a result of a crash.

5. The recommendations of the Accident Board recommending an accompanying aircraft flying along with new type aircraft until all phases of development is completed, is concurred in and it is further recommended that action be taken, at Air Materiel Command level, to provide the necessary aircraft and personnel to accomplish this end.

S. A. GILKEY
Colonel, USAF
Commanding.

7 Incls.
n/c

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~~To~~
By Authority of Maj. Fogg
By Jm 4/54

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OFFICE OF THE C[illegible]
MUROC [illegible]
MUROC, [illegible]

SUBJECT: Aircraft Accident Meeting on YB-49 No. 42-102368

TO: Whom It May Concern

The meeting was called to order by Captain [illegible] Investigating Officer, and the following personnel were [illegible]

Muroc Personnel:

Lt. Col. F. J. Collins
Captain R. W. Roth
Captain [illegible] Walker
1st Lt. F. [illegible] Hutchison
1st Lt. J. I. Crum
W/O K. W. Patterson

AMC Flight Test Division:

Major [illegible] McIntosh
Major G. Askounis
Major R. L. Cardenas
Captain R. [illegible] Harrington

Office of Flying Safety:

Major F. W. Rhoads
Major W. Ondo

AMC Project Headquarters:

Captain J. [illegible]

AMC Aircraft Laboratory:

Mr. J. W. Farrington
Mr. [illegible] Anderson

Allison:

Mr. Frainock
Mr. [illegible] Powell

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By [illegible]

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Ltr To Whom It May Concern, dtd 10 June [illegible]
Meeting on YB-49 No. 42-102[illegible]

AMC Procurement Inspectors:

Mr. J. H. Bridges

General Electric Company:

Mr. V. L. Weaver
Mr. H. F. Frischherts

Northrop Aircraft, Inc.:

Captain S. R. Barker AF OIC
Mr. J. W. Meyers
Mr. W. A. Liem
Mr. R. C. Catlin
Mr. F. C. Bretcher
Mr. A. M. Schmorts
Mr. C. L. Bates
Mr. C. Hoffman
Mr. S. F. Erbeck
Mr. O. M. Douglas
Mr. S. A. Krieger
Mr. [illegible] Ashkenas
Mr. Max Stanley

Aircraft Projects Section, AMC:

Mr. R. L. King

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By Authority of [illegible]
By [illegible] Date [illegible]

Captain Walker was asked to give a brief summary [illegible] Power Plant's investigation of the engines from the YB-49.

Captain Walker: Our first phase of the examination was conducted at the scene of the crash and we didn't find anything of great significance there. The engines were brought into the base late yesterday (9 June 48) afternoon and were lined up in the same relationship as at the scene of the crash. We are now in the process of cutting the tail cones off and the combustion chambers open, but may not be finished this week. In general, these are some of the things we have found: We could [illegible] say that the engines were all inverted. The airplane appears to have hit the ground flat and were oriented much the same as the plan form of the airplane with one or two exceptions. It seemed to have hit the ground with considerable force, enough to break off the majority of the accessories off the accessory gear cases. These accessories were very near the front of the engine, as if there was very little component velocity to scatter them out. The right hand engine group – numbers 5, 6, 7, and 8, had very

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little scatter. They seemed to have dropped to the ground in [illegible] of the engine and remained there. The left hand engine group [illegible] 1, 2, 3, and 4 - appear to have hit the ground harder than the right hand group because first, the compressor cases were broken up more [illegible] on the other, and second, tail cones and tail pipes were all flattened considerably; whereas on the right-hand engine group, they were flattened only in the disconnect flange area where some wing structure [illegible] force. This was not from impact of the ground. All tail pipe nozzles were deformed slightly. We found all of the throttle valves. In the case of seven, the magnesium body had burned up, in the case of the [illegible] it had partially burned. The throttle valve itself is steel or copper alloy. We are able to determine the position of the throttle valves when they were picked up. We can't say that was the position at the moment of impact, but there is a significant trend in that six throttle valves were in or near the idle position. One was in full off position. Engine #1 was idle, #2 was closed, #3 was idle, #4 was closed, #5 open, #6 and 7 were in idle, #8 was between idle and closed. There was some interest shown in connection with the condition of #4 engine, which was more beat up than any others. The case was almost completely consumed by fire and approximately 50% of the blades were missing from the compressor rotor. After the engine was brought back and we removed the tail cone, we were able to see that turbine rotor was turning at time of impact at sufficient speed to break off large numbers of turbine buckets and to bend all those that didn't break. That tells us that the engine was still turning at time of impact. There is a hole in the girdle of #2 engine through which you can see the turbine blades and determine that it also was turning at time of impact. All other engines we have only been able to observe compressor blades, some of which showed bending all the way around and others showed bending only on the bottom [illegible] they struck the ground. #2 engine, some of the blades (compressor) [illegible] on top as it lay on the ground and [illegible] in the turbine section, we could see they [illegible] impact. This means that the blow was on the [illegible] deformed that first, and kept it from going one complete revolution [illegible] impact. We examined some of the combustion chamber assemblies on #4 engine and found one compressor blade laying loosely in one can in the forward end of the combustion chamber, but it might have been thrown there after impact. There appeared to be an explosion of considerable force in the area of the left engine group. The engine compartment doors from that group were found scattered at least 100 feet from the engines. They showed soot and other signs of fire to show that they were in the fire before they were blown away from the burned area. Some were completely outside the burned area. Nothing on any doors found that would indicate disintegration of compressor cases before impact. Regarding the possibility of fire in an engine before impact, we found nothing to prove or disprove that, except in the case of the engine doors on the left hand engine group, some of them didn't appear to have been subjected to very great heat. The finish was still bright, but several were covered with soot. We have recorded the condition briefly as we found it, on the scene, so that

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By [illegible]

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Ltr To Whom It May Concern, dated 10 June 1948, Subj: Aircraft Accident Meeting on YB-49 No. 42-102368.

we wouldn't overlook any information that might be useful later. We are going to add to that when the engines are opened up and [illegible] our investigation.

Major Cardenas: to Northrop: Was there any indication of actual compressor failure prior to impact? If there had been there is the possibility of the buckets shearing through the control system. Is the position of the control system in such a position that had there been a compressor failure, the buckets would or would not go through the elevon control?

Mr. Bates: That is a remote possibility that it could have gone through both systems. There is no conclusive evidence to date of the engine failure.

Captain Roth advised that fuel samples were taken and sent in for analysis. It was definitely determined that the plane was inverted at time of impact.

Mr. Meyers, of Northrop, was asked to discuss Northrop's investigation to date.

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By Authority of [illegible]

Mr. Meyers: We have a standing crash investigation [illegible] consisting of C. L. Bates, chairman of the board, Mr. Lien, Mr. [illegible], Mr. Catlin and myself. Mr. Bates will talk for us.

Mr. Bates: I would like to have Mr. Lien discuss the procedure followed in our investigation of the scene of the crash.

Mr. Lien: So far our investigation has been for the purpose of identifying the location of the parts of the airplane. For the most part, they were in two main groups. - Those of the crash area proper and the second part being in an area approximately 1/4 mile wide and three miles long, extending to the northeast of the crash area. From this, there have been no conclusions made as yet. A complete survey of the area has not been finished. Outside of mentioning the tremendous amount of work involved, there is nothing further to mention. This area 1/4 mile wide and three miles long, has been divided into zones 100 yards square. Each zone is divided and each zone and each part numbered. The extent of the work so far is to collect a set of zone maps for the area mentioned. We have started to put them on a chart. It is not far enough along to submit it at this meeting, but can be submitted for your investigation, upon completion. By Saturday, the on the spot investigation will be completed. There are apparent trends to the disposition of the parts. It is not a conclusion in any way. There are such a large number of parts, that until

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they are classified and identified as a flat part, or something [illegible] that it won't mean anything until it is studied.

Mr. Bates: First of all, both wing tips came off the airplane [illegible] failure is such that we can positively say that they failed [illegible] to positive loading. Both of them failed in almost the same spot [illegible] would indicate very nearly symmetrical loading at the time of failure. The main portion of the airplane in the burned area evidently landed flat and evidently without too great an impact velocity, as nothing was [illegible] more than a few inches. The fact that everything is practically in a flat position would indicate it landed almost directly on its back without motion after impact. We would not be surprised at the inverted position. What happened is indefinite, but we would expect it to tumble in that position. It should be mentioned that the upper half of the left hand rudder is not attached to the wing panel where it assembles, while on the right hand panel, the entire rudder and trim flap assembly are intact. We find no evidence of any fire in the air. Had there been such a fire, we would have expected to find parts scattered away from the structure at least burned, or some evidence of fire. Except for the wide scattering of parts, with possibly an indication of lighter parts being farther away from the main portion of the airplane than the heavier parts, there is nothing more we can say now.

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Mr. Heyser: The proximity of the wing tips to each other would tend to indicate a simultaneous failing as well as [illegible]

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By [illegible] Date [illegible]

Captain Wethe: We have dug out of Northrop [illegible] and summaries of what tests were conducted on the airplane during [illegible] phase II flights for stability and performance on the two airplanes. We have a rather detailed report taken from the pictures of the photopanel of the six previous stalls that were conducted by Flight Test Division on airplane #1497. This was not the airplane that crashed. The crashed airplane was Air Force #368. It has been definitely established that this airplane, #368, had never been stalled. I would like to enter these reports of the previous flights (reports of clean stalls conducted by the contractor) as a part of the investigation. We should discuss [illegible] stall since we have determined the airplane had gear and flaps [illegible] crashed. We have some reason to believe that stalls were to be conducted on this flight. In a previous clean stall on the other 49, it was stalled at 83 mph. The point of stall was at an altitude of 14,755 feet [illegible] The camera was turned off at 14,105 feet unfortunately, as the airplane was still descending at 6500 feet per minute when the camera was turned off. There is a report on a clean stall conducted by the contractor from which we can tell some things. The pitch indicated at the stall point with 60% rpm and nose was about 22 degrees. At the recovery, the nose only came down to zero degrees. In other words, with a 60% rpm stall, there was no tremendous pitching motion and the airplane did not end up in a nose down position. The other thing we investigated was a review of the motion pictures taken by the NACA when they conducted the tumbling tests on the N9M model. The airplane was put in a vertical wind tunnel and could be

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made to tumble either by introducing the model into the tunnel with a pitching rotation or by suspending the model in the tunnel in a [illegible] tail down position. Any other position in the tunnel would not make the model tumble. From the evidence of the tumbling of the model in [illegible] cal wind tunnel, and the evidence on a photo recorder of previous [illegible] stalls, it appears reasonable to assume that the airplane would not tumble out of any stall other than a complete vertical stall which was definitely not contemplated in the flight plan.

Question by Major Cardenas: At the point of stall where positive 23 degree angle of pitch was encountered, I am interested in the force on the elevons and stick force measured by the pilot.

Mr. Meyers: At the point of stall in clean position, the elevon force was eleven pounds pull.

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Major Cardenas: Pilot's measured pulling.

By Authority of [illegible]

Mr. Lien: That's the way it is recorded.

By [illegible] Date [illegible]

Mr. Harrington: We haven't much to add to what Northrop has said. We were impressed by the amount of the failure to the trailing edge of the wing, particularly flaps. It would be hard to account for the failure with the flaps closed, unless it was something which amounts to [illegible] flight, a condition in which the thing was slipping backwards, the trailing edge becoming the leading edge and having high force on it. We can agree on the statements made by Northrop.

Mr. Bates: It is definitely known that the flaps were closed at least the actuators seemed to be in a closed position. Trim flaps were approximately neutral, gear up, and flaps up.

Captain Wethe: I would like to add one thing. The slots were open when the airplane was found at investigation, but this is not conclusive due to the fact that they would open even if they had been closed, at the time of wing tip failure. With failure of hydraulic pressure and D.C. power by breaking wing tips off, the slots will automatically open. There is also a spring that would open the flaps. The report of the stall conducted by the contractor reveals the following: that trim speed was 275 mph indicated at an altitude of approximately 20,000 feet, when the airplane was again stalled at a nose up pitch attitude of approximately 25 degree and the pitch attitude came down to approximately zero degrees on recovery. This stall was at 20,000 feet, and approximately two thousand feet were lost in the stall.

Mr. Lien: Is the angle of bank indicated there?

Captain Wethe: It is not indicated on this chart, however, it is probably available.

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Mr. Bretcher: Possibly sixty degrees, as I remember.

Major Cardenas: Actually I can't throw any light on stalls, because I have never stalled the airplane. From the standpoint of investigation of the crash, I can't add much more than was stated. It would be fine if we could determine whether the slots were open or not, whether the airplane failed or they were in stalls, since the slots will open. One of the rudders, the left--the top part was torn from the airplane. Was it on the wing tip?

Captain Harrington: We examined the portion that was on the ground, which indicated that the rudder failed in an open position and there was some force from behind, forcing it open. That would indicate sliding force back or the possibility of spin -- one wing going backwards would have a tendency to show sliding or spinning motion. The report of notations that Ed Swindell had made on stalls that were in the records that Mr. Coleman took back, have been brought back to us. One notation shows that in clean configuration at 15,000, there was not much of a stall warning and the stall is complete at 87 1/2 ias, 60% power. Trim speed is 160 mph. He has a note which says, "Not quite the nose up tendency as before." "No stall warning, didn't fall through had to push it". They apparently ran one at 30,000 feet, but there is no record other than 140 trim speed at 30,000. The one at 15,000 feet made mention "Not quite the nose-up tendency". Another note says "Gear down, full flaps, very slight stall warning." The only other one says, "Flaps half down, trimmed at 160 mph; at 100 mph slight stall warning; stick forced high, nose comes up." That's all Ed had to say. The rudder couldn't fail in that position in normal flight. It would have to be reverse flight as indicated by flaps.

Mr. Schwartz: Landing flaps were bent with a negative bending movement. The flaps bent opposite from what they were meant. It would have happened from a forward tumble, or reverse flight. We found several fragments of rudders and in those fragments it is evident that they broke outward. The one on the airplane had the [illegible] off.

By Authority of

Mr. Yates: On the left hand lower rudder surface, which [illegible] the wing tip, once the upper surface has left the [illegible] ly free. They are interconnecting. Any conclusions reached from the appearance of that place alone could not be conclusive. On the right hand wing, the lower rudder surface gave evidence of having contacted the wing skin, but the upper surface did not.

Major Cardenas: Would it be possible for that type of failure to occur on the rudder assuming that the wing tip departed from the airplane?

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Mr. Bates: It might. It would depend upon the way they were torn off. The trailing edges are very flimsy structure, only covered on one side with skin, so it is possible. There is no evidence to indicate one way or the other.

Lt. Col. Collins: Would it have been possible for anybody to get out of the aircraft if it were in a flat spin?

Major Cardenas: Greater possibility to get out of the plane in a flat spin than in tumble.

Mr. Myers: I have spun the N9M. Assuming the characteristics are the same, I would say you could get out in a spin, either inverted or proper, because the axis of the spin is very nearly in the cockpit itself.

Mr. Lien: The tumbling report by NACA indicated the G's at the pilot's head approximately 4.3 which, if the airplane were tumbling forward would probably be enough to kill the crew.

Major Cardenas: What about the safety belts? The pilot's was still buckled. In other words, he never reached down to unbuckle the safety belt. In flat spin, assuming the same characteristics, I believe they would at least reach down. In tumbling, it is sometimes hard to even write on a knee pad.

Mr. Lien: We are collecting parts of chutes and safety belts in one area. I believe there are enough personal effects to identify whose they were, but that is not completed yet.

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By [illegible] Date [illegible]

Mr. Bretcher: Regarding clean stalls. The only stalls we did were at about 20,000 feet. In clean stall, the nose did come fairly high. At the point of stall, all feeling on the stick left. There was no effect of control on the airplane from the stick. The airplane then started to roll very slowly toward the left, with the nose dropping down also very slowly, or at least it seemed slow. I used normal stall recovery procedure. Forward stick and opposite ailerons. We rolled to about sixty degrees. It seems the nose was pointed down quite a ways when the feel came back on the stick and you felt you could start to pull out.

Major Cardenas: When the nose came below the horizon, was there a very steep angle down?

Mr. Bretcher: I can't say exactly about that. I was looking down at the ground, but I don't recall the attitude.

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Major Cardenas: The reason is that from the standpoint of both wing tips failing symmetrically and simultaneously -- what were your forces when you recovered? Did you recover rapidly?

Mr. Bretcher: No, slowly.

Major Cardenas: What was your airspeed?

Mr. Bretcher: As I remember, 180 mph.

Major Cardenas: I am thinking of the possibilities of the stall being normal, following the same pattern as Fred's. If the attitude to the point seemed extreme with respect to nose down. There is a possibility of the pilot having exceeded the forces the wings would stand. I am interested in speed at time of nose down.

Mr. Stanley: Forward speed was not in excess of 180, at that time. I was co-pilot. I didn't think it was in deep attitude. I was conscious of roll. It didn't seem unnatural, or cause for alarm.

Major Cardenas: None of the boys, as I knew them, were of the type that would lose their heads in emergencies. I have seen Danny handle emergencies, and Ed. They were not excitable. There is a normal tendency, of course, to correct quickly. Whether, at 160 or 180 speed, with the light force at the time, it would be possible to pull enough of a load to exceed limit load factors?

Mr. Stanley: It would take considerable over-controlling of the airplane to do it.

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Mr. Krieger: At 180, it would only require approximately 1/4 of the stick deflection to stall the airplane; to exceed the load factor that you would have at stall speed.

Col. Collins: Would it be possible to go from one stall into another?

Mr. Bretcher: Stick forces are very light all the way through.

Major Cardenas: From talking to Coleman, Ed Swindall made mention of the fact that throughout the whole maneuver -- the stall approach and recovery -- the stick forces were extremely light. With 1/4 of the deflection, you could exceed limit load factor?

Mr. Krieger: At 180 mph, forces about twice the stall speed, you could.

Mr. Schwartz: At 15,000 feet at 200 mph, you get factor three.

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Major Cardenas: The wing tips sheared the same place, and landed close together. Could rudder failure occur by the tips themselves coming down? We aren't sure whether they were running stalls or not. They were descending at 15,000 feet.

Mr. Bretcher: The afternoon before the accident, Major Forbes asked one of the fellows if he wanted to ride the next day — more or less kidding him, Forbes said he had a stall to do at 10,000 feet.

Major Askounis: I intended to fly on Saturday, but Lesser was leaving and gave me a telegram to deliver. I gave Ed the telegram. He said "I will fly tomorrow, and you fly Monday." They intended to run power requirements to 40 thousand, run the stall at 15,000, and then run another power required at 10,000. The day before, Lesser asked Forbes about running stalls at 15,000, while we were in the air. It was rough and they decided to call it off. I believe 15,000 was the altitude they had picked. Lesser asked if we wanted to stall at 15,000.

Major Cardenas: They would not have run the stalls below 1_,000. When we planned to run the program, we had 15,000 feet as a minimum altitude for stalls. They wouldn't

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Mr. Allen: The gross weight prior to starting the engines was __,000. CG held down to 26.0%. The only radio contacts with them that day have been typed out and signed by the person receiving them. I will read them. "Message received from 42-102368 on 6-5-48 between 07:05 and 07:10 Daylight Saving time. Message received by R. W. Rolfe, Northrop Flight Test Section: 'Over Bakersfield and still ascending.'" and the second message is: "Message received from 42-102368 on 6-5-48 at 07:33 Daylight Saving Time. Message received by R. French, Northrop Inspection Department: 'North end of Antelope valley, 15,000 feet and descending.'

Captain Roth: For the purpose of information to those here, it has been determined by medical examination that they were definitely killed on impact with the ground, or prior. They were messed up but were not burned to death. They sustained death before, or on impact.

Major Rhoads: Possibly one mile to 1 1/2 miles beyond where the Northrop line of investigation stops, we found what we believed to be a stabilizer part, inasmuch as it had marking of a small star.

Mr. Meyers: Northrop found that, too. We have been concentrating on stalls. As far as Northrop is concerned, we have not yet been able to eliminate the possibility of failure at high speed. We know that there are even some factors which might tend to indicate that such an apparent indication that everything happened at once. We know it was in the flight program for this flight, to run high speeds at low altitudes.

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Mr. Aubkenag: If the airplane was going at 350 IAS, it could slow down to terminal velocity in 2,000 feet.

Mr. Meyers: I would guess that the wing tips would carry as far as the airplane, if it tumbled.

Mr. Krieger: With any possibility of the wing tips going further than the center portion, you could tell whether it might have been pointing backwards. The lighter objects would go further along the original flight pattern than the center section.

Captain Roth: Along the line of flight?

Mr. Meyers: There are some marks where the wing tips hit that would tend to indicate that they were traveling in the opposite direction from the plane.

Mr. Lion: The wind velocity for that day was as follows:

4000	15 mph	140	degrees
6000	15 mph	180	"
8000	20 mph	220	"
10000	20 mph	250	"
12000	25 "	280	"
16000	50 "	270	"
20000	50 "	260	"
25000	30 "	280	"

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From the southwest, surface up to 4,000 ft. where it stabilized. We flew over it at 9:30 and turbulence was mild.

Major Cardgnue: Have they determined what parts floated ahead?

Mr. Bates: All I can say is that the parts are scattered to the leeward of the main part of the wreckage and it would appear it could occur either from high speed at low altitude or the opposite.

Mr. Meyers: The preliminary indication is that lighter parts are farthest away from the aircraft. It could indicate wind driftage.

Captain Roth: I have Capt. FitzGerald's statement here. From that, it appears it couldn't have been going in hardly any direction. Assuming he was coming straight in, could they drift that much?

Mr. Bates: They left at the same time, and light parts would drift away.

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No parts were found to the southwest, whatsoever.

__Mr. Lien:__ We searched with an L-5 down to the road, within a [illegible] radius. I am not confident, however, that you would see anything from an airplane flying over it. There may be parts not observed.

__Mr. Bates:__ All parts were to the northeast and not to the southwest.

__Major Cardenas:__ At high speeds, if they were at low altitude, had the wing slots, either accidentally, or through failure, come open, would it be possible to insert such a load as to shear the wing tips?

__Mr. Krieger:__ The wind tunnel tests, with slots open and almost [illegible] speed, show practically no change in trim for the airplane [illegible] that the airplane would not tend to load up. Pressure is over [illegible] sections, but not wing tips. It wouldn't tend to pitch one way or the other to make higher load factors.

__Mr. Bates:__ Both wing tips leading edges forward of the slot are intact.

__Mr. Meyers:__ Indications are that elevons were on the airplane at the time the wing tips left it. They appeared to have broken off at the same time. The right elevon is near the left tip and the left near the right tip.

__Captain Roth:__ Assuming that you go into high speeds, what would be the first part to fail?

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__Mr. Schwartz:__ At high speed, or just sufficient to [illegible] factor, it would break the wings off, just [illegible]

By Authority of [illegible]

By [illegible] Date [illegible]

__Captain Roth:__ Is there a possibility of recovering from a stall and getting into another stall?

__Mr. Bretcher:__ Yes, there is a possibility. If they stayed at nose down recovery attitude too long. It does pick up speed very quickly.

__Major Cardenas:__ At 200 mph in nose down attitude it is possible, by pulling back too rapidly, getting an accelerated stall, exceeding load factor on the wings.

__Mr. Bates:__ There is conclusive evidence that the tips pulled off upward. There is a definite break and not a tearing action. It was a positive failure.

__Major Cardenas:__ Had they gone up and slipped back, and tumbled either

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direction, would it give negative failure?

Mr. Bates: In a vertical stall — stopped in the air and started to slide back, I wouldn't think it would happen.

Major Ondo: In the tumbling tests, was the tumble in one direction?

Captain Wethe: Entered vertically, tail down, it tumbled forward. From a vertical position, it would tumble forward.

Mr. Meyers: The indications on the flaps and trailing edge, are that the failing was downward, indicating failure in a "cock-pit outside", or nose-down tumble.

Mr. Krieger: You can't tell in a tumble. You can't say at what time, what the air loads were. Sometimes air loads are possible by up or down at the trailing edge. In a tumble from a vertical position, it is a matter of chance whether it slips from one side to the other. You could have "cock-pit in" or "out" tumble.

Mr. Schwartz: At maximum forward speed, you might get in a tumble, if it dropped from a vertical.

Captain Wethe: It is difficult to conceive they would be using power which would have gotten them into such an attitude. They were being very conservative in their stall program.

Mr. Krieger: Unless you started with 200 or 300 mph, you wouldn't have gotten a flight path steeper than 15 to 18 degrees. Full power climb at the lowest speed — the flight path wouldn't be more than a total of 30 degrees.

Captain Wethe: You think we could say, with their flight plan of starting stalls with a trim of 160 ias, there is no possibility that you could get the airplane in a vertical attitude?

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Mr. Krieger: No possibility of over forty degrees.

Mr. Ashkenas: They may have decided to run [illegible] vertical gust. They were only out an hour and ten minutes. If it was too heavy to run stalls, they would have come down to run power required.

Major Cardenas: If possible, we would like to hold weight not over 140,000 on stalls. Did they run stalls on Friday? I talked with [illegible] and he said they had one more flight to do, if they completed stalls on Friday.

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Captain Wethe: They ran no stalls on Friday.

Mr. Coleman: With the engines cut on the right, wouldn't it be more difficult to recover?

Mr. Bretcher: I would say no possibility of stalls with the engines out on one side.

Major Cardenas: They were definitely not going to do that. Also, no accelerated stalls.

Mr. Anderson: Regarding reversed control forces, my impression is that the airplane was designed for no feedback of the control forces to the pilots.

Mr. Meyers: That's correct. Mechanically impossible for control reversal in the airplane.

Mr. Lien: If the tips came off and the airplane tumbled, is it likely that the remainder of the airplane would stay together through tumbling maneuver?

Mr. Schwartz: If that great a portion came off, it probably would withstand it.

Mr. Lien: Would the G's be 4 or 5?

Captain Wethe: 4.3 G's at the pilot's head.

Mr. Krieger: That was made for the N9M. The position of the pilot's head in this airplane would be different. Load factors there were practically up through the pilot's head because he was closer to the center of gravity. Here, the pilot's were on a line. If it were rotating around the axis ten feet back of the pilot, load factors would be more forward on the pilot and co-pilot, rather than up. The G's might be about as high.

Mr. Lien: Do load factors come from rotation in tumbling?

Mr. Krieger: Yes, not from lift or drag. When the full tumble develops, no load factors are present at the cg. Descending at its terminal velocity, somebody sitting at the center of rotation would feel no load factor.

Major Ordo: We have no conclusions that we want to state.

Captain Roth: Then we have nothing that we can definitely conclude as yet. Agreed?

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Lt. Col. Collins: How about unusual maneuver at high speeds?

Major Cardenas: It could have been stalls or structural failure in high speed flight. Could have been structural failure that caused positive load factors. Elevon failure might have given loads, or structural failure, high speeds, or stalls. It might have tumbled, or recovered. There are three ways it could have happened.

Mr. Meyers: If the airplane were tumbling backward, it would not be possible for the flaps to fail in a forward direction, would it?

Mr. Krieger: Actually, the airplane is traveling forward at 200 mph. At one point in its travel, it is knife-edging, and then slightly above and slightly below. It is possible for it to fail either way. When it is going backwards, it is practically indifferent whether it would fail up or down. Some of the highest loads we get on control surface are on what we call local tail wind condition on the ground. It could go up or down.

Captain Wethe: We have no positive evidence of the actual cause of the failure. We have no specific reason to continue grounding the 35 or the other 49.

At this point, a discussion was held regarding the grounding of the airplanes. It was decided that the airplanes would not be flown until after the meeting of 12 June 1948, at which Major Gen. Carroll, AMC will be present.

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Lt. Col. Collins: It is recommended that [illegible] from now on.

By [illegible] Date [illegible]

Captain Wethe: There is a possibility that this accident occurred during or after a stall. There is also a possibility that it could have occurred through overcontrolling. I recommend three things: 1st, in future flight test programs of this airplane, an accompanying airplane be with it; 2nd, that we revert to the practice of maintaining inter-phone conversations on special flight test frequency, coding confidential information, if necessary; and 3rd, that any other flight tests be conducted with previous data left on the ground, complete flight card to be accomplished on that test, but left on the ground.

Mr. Krieger: Where were the fins found, or were they found?

Mr. Catlin: We found two fins off of one side. They were pretty well intact. One — the upper section came off, that is about 18 inches of it. We haven't been able to determine whether it was inboard or outboard.

[illegible]

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On the other side, there is one that the upper section had come off.

Mr. Krieger: There are thoughts that parts of the fins remained with the airplane?

Mr. Catlin: No, all fins came off. They were found pretty well together.

Mr. Krieger: It is hard for me to see how the fins can be torn off the airplane in a symmetrical maneuver. It is more likely and probable that there was a yawed attitude encountered.

Mr. Schwartz: The airplane was broken apart terrifically in the air. I think it could have tumbled in any direction. It could have done almost anything. Like a stick in the air. The flaps came off and were torn up and that's hard for me to see. The fins probably went with them. The tail cone — the rearmost portion — was bashed in an torn off. It was found at least 3/4 mile from the burned area. Something had hit it and smashed it.

At this point there was a discussion held regarding the meeting of 12 June 1948, and who would attend same.

Mr. Lien: We plan to pick up the parts, bring them in, and lay them out; arrange them in the plan form for further study. That, in itself, will take a couple of days. Beyond that, there is no program set up.

Major Cardenas: Have there been wind tunnel tests on the 49 or the 35?

Captain Methe: A spin test on the model of the 35, and tumble tests on the N9M.

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Major Cardenas: No tumbling tests on the 49 model?

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Captain Methe: No.

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Mr. Anderson: They have run tumbling tests on the 35.

Lt. Col. Collins: How about fixing the canopy so that the pilot can get out through the top?

Mr. Myers: That is in the mill now, — the problem of jettisoning the canopy over the pilot.

Major Rhoads: I suggest that consideration be given to the shifting of the fuel load with respect to the center of gravity, in regard to the different maneuvers encountered. That would be quite a load.

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Mr. Bates: No, because in operation, the main tanks are kept full until the auxiliary tanks are used up. This limits the partially full tanks to a small number.

Captain Wethe: Could you figure out probably fuel shifting?

Mr. Krieger: I don't have those figures. Lt. Swindell was familiar with the center of gravity transfer problem. There is a possibility of shifting fuel position, due to attitude, but I don't have the figures here now. As for usage of fuel from tanks, Lt. Swindell always had that under control. He was very familiar with that problem.

Captain Wethe: He had over 50 hours as Flight Engineer on the airplane. He knew the fuel system and how it should be used. If it is used properly, there is relatively miner shifting, particularly considering the little time they had been up.

Major Cardenas: Swindell could have nailed the center of gravity down to 1/2 of 1 percent.

Captain Wethe: He has held it between 23 and 24 1/2 percent.

Captain Roth: I believe that for the record, we should say that we can conclude that there was no fire in the air, or explosion. There is a possibility of tumble; possibility of high speed failure; also center of gravity and fuel load could have been a factor in it. We have not arrived at any conclusion in any way.

Mr. Anderson: I suggest we lift the restriction on flying the 35. There will be a restriction against stalling it.

Captain Wethe: We didn't contemplate stalling in the service test program.

Mr. Harrington: When we spoke of tearing the wing tips off in recovery from stall — would it be possible to get this vertical attitude by climbing into a stall to start tumbling? The nose-up tendency is noted in the flight reports.

Mr. Krieger: I have the pilots reports from stall tests of the N9M. With the cg back, the pilot on the N9M reported that the nose tended to come up to the stall. Even if it were true, it only comes up enough until the stall is reached, at which time it has powerful rolling motion which drops the wing, and noses it down. The stall angle doesn't vary. Upon reaching full stall, it would snap back down.

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Lt. Col. Collins: There is no possibility of its going over on its back.

Mr. Krieger: Right. From observing tumbling tests, when the model was thrown horizontally into a vertical airspeed, it snapped its nose down. All wind tunnel tests indicate violent nose down at full stall.

Captain Fethe: There is very little evidence that the airplane was in a vertical attitude. We can almost preclude the possibility of tumble out of a stall.

Mr. Anderson: We have data on the P-55. Wind tunnel tests prove that the thing would settle almost vertically. There is considerable difference between the P-55 and the 49, of course. But, I feel that there is some evidence that the center of pressure will tend to go forward once it starts the stall, but I am not convinced that it is not also likely to go back.

Mr. Ashkenas: What sort of centrifugal force would be required to tear off the wings?

Mr. Schwartz: I have no idea. It would seem a remote possibility.

Captain Roth: I believe that we have about covered everything that can be discussed at this time.

Sidney [illegible] Smith

SIDNEY [illegible] SMITH
Lt. Col., USAF
Chief Technical Engineering Division

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