AFTER-MARKET FLIGHT TESTING - SAFETY COMPROMISES OR NOT ?

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FLIGHT RESEARCH INC.

OUTLINE

- After – Market Dilemma
- Issues
- Some techniques/Tools available
- Case study
- Discussion

After – Market Dilemma

- OEM Prototypes
  - Organizational structure
  - Early design safety features
  - Can address safety concerns early in the program
  - In-house personnel / expertize
  - Management support / understanding
- After-Market
  - Modifications to existing designs
  - Usually quick-reaction
  - Budget-limited
  - Schedule-limited
  - TC change or STC
  - TC Change – still under OEM organization
  - STC – most of the time by third party companies (e.g. DERs)

STC Approvals – Safety Concern

Ref: FAA presentation FTSW 2008

- **Little or no development flight testing**
- **Applicant's tests often not done by experienced flight test personnel**
- **Generally the applicant's pilot will not be a Test Pilot:**
  - Will usually have a good operational understanding of the aircraft; but,
    - May not understand the need for the test
    - May not understand the test
    - Can be resentful
- **Higher probability of unexpected results during FAA certification tests**

After – Market Dilemma

- After-Market Safety Dilemma
  - Same safety provisions as original prototype?
    - Spin chute, helmets/parachutes, escape hatch, etc.

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  - Available airspace

Challenge – Test Site

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  - Cost / schedule of modifications
  - Available airspace
  - Crew training / proficiency
  - How much safety

After – Market Dilemma Cont'

- After-Market Safety Dilemma
  - There is a temptation to cut corners
  - Sometimes risk assessment is not as deliberate

Lessons learned

- Are we exposed to re-learn lessons learned ?
- Miles O'Brien: "*We don't properly evaluate our risks*"
- *The most dangerous phrase in the language is:*
  "We've always done it this way"

  (…and got away with it..)

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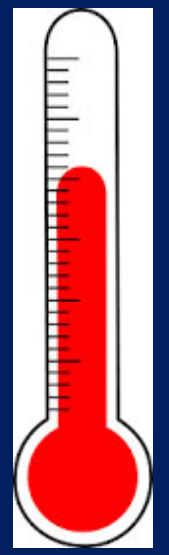
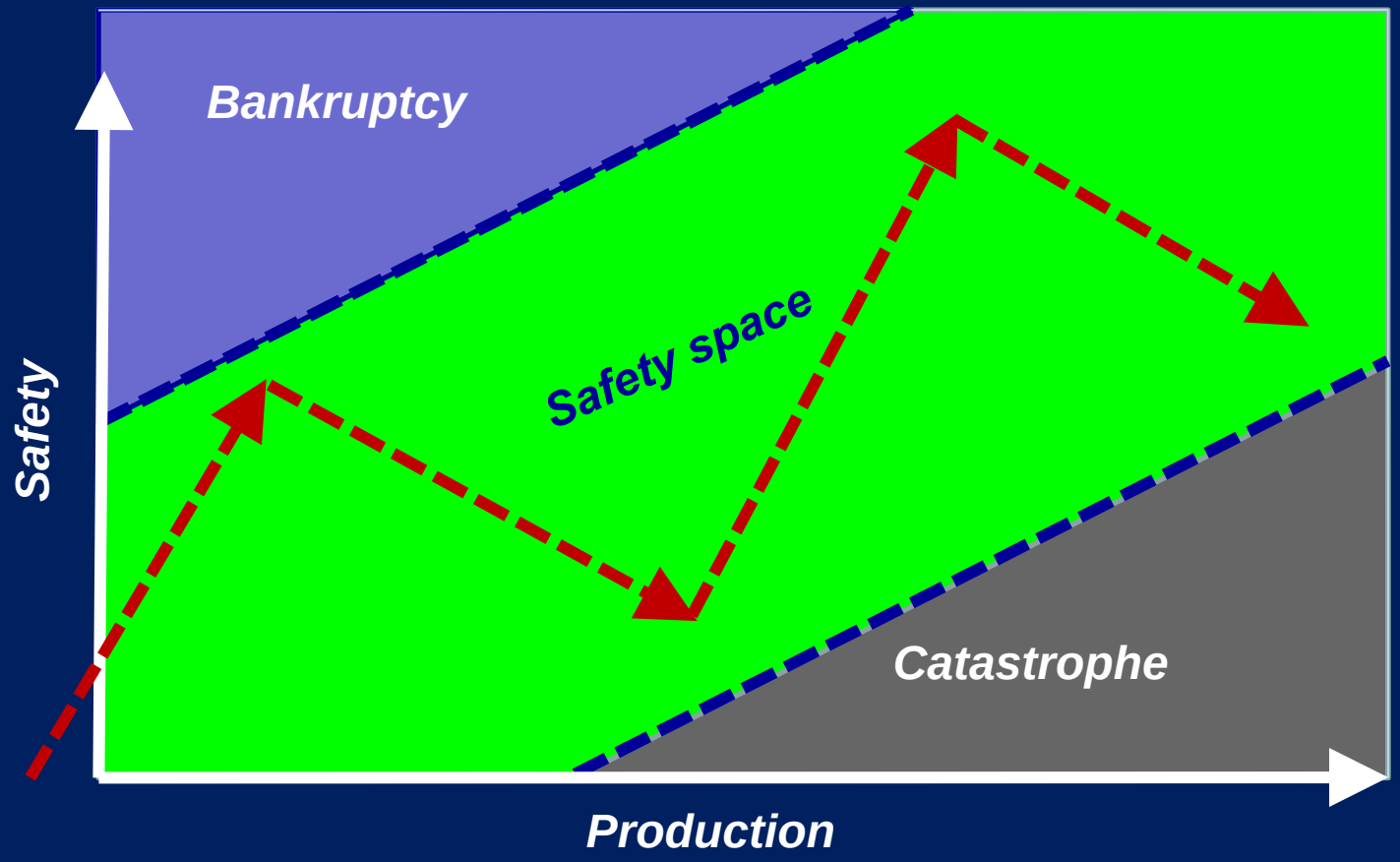
Safety is Relative



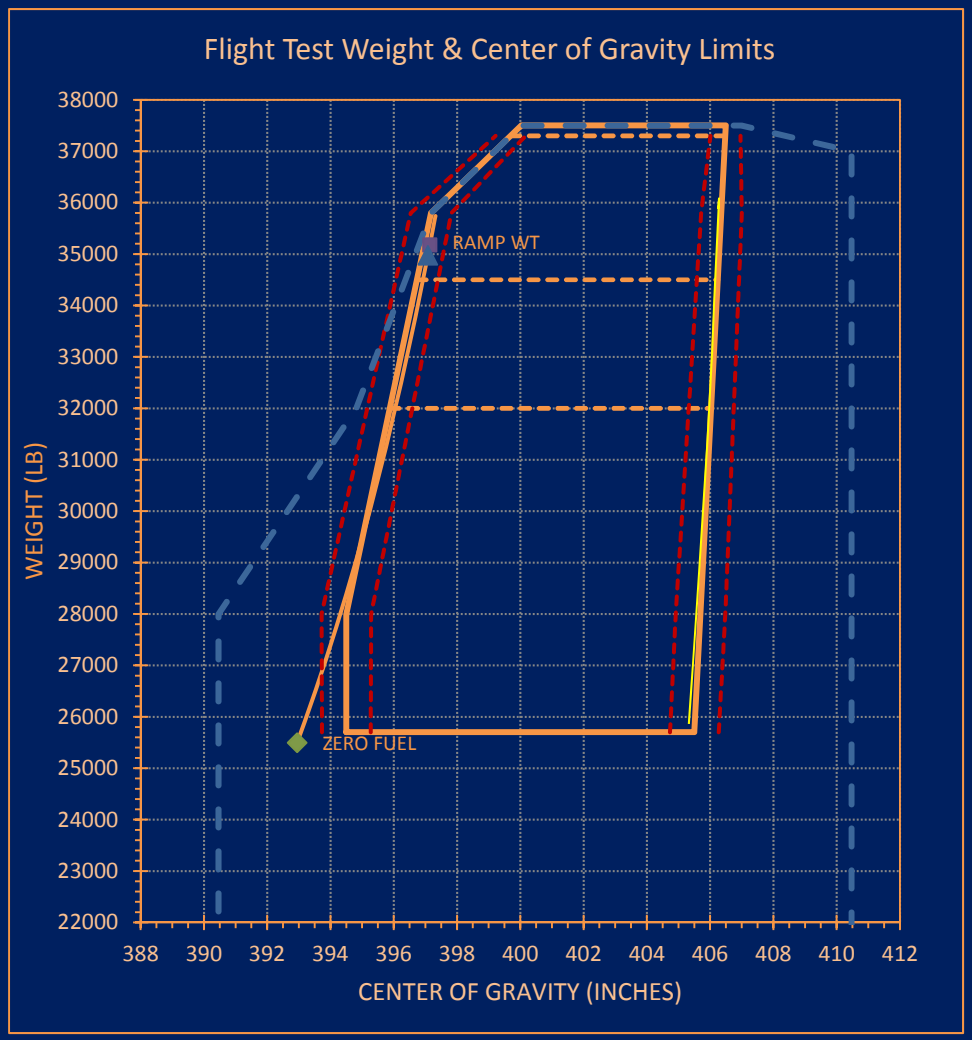
- There are no hard rules
- Evaluate each project on it's own merit
- The key question is: when is the risk acceptable
- Best practice : A deliberate process to reach acceptability


Bankruptcy
Safety space
Catastrophe
Safety
Production

Some techniques to mitigate risks

- Limit GW/CG

Limited C.G.


Flight Test Weight & Center of Gravity Limits
WEIGHT (LB)
38000
37000
36000
35000
34000
33000
32000
31000
30000
29000
28000
27000
26000
25000
24000
23000
22000
RAMP WT
ZERO FUEL
388
390
392
394
396
398
400
402
404
406
408
410
412
CENTER OF GRAVITY (INCHES)

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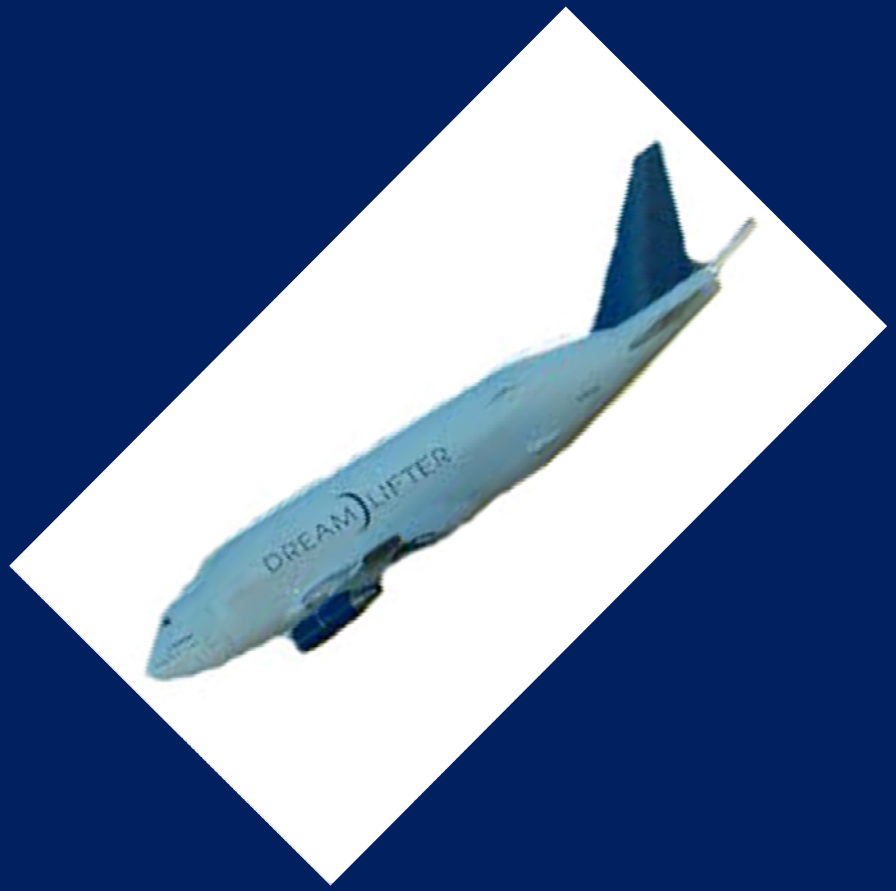
- Limit GW/CG
- Limt Mmo / Vmo

Drag is good !!



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- Evaluate margins WRT baseline (e.g. icing)

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- Analysis
- Evaluate margins WRT baseline (e.g. icing)
- Instrumentation (e.g. nose boom)

Some techniques to mitigate risks

- Limit GW/CG
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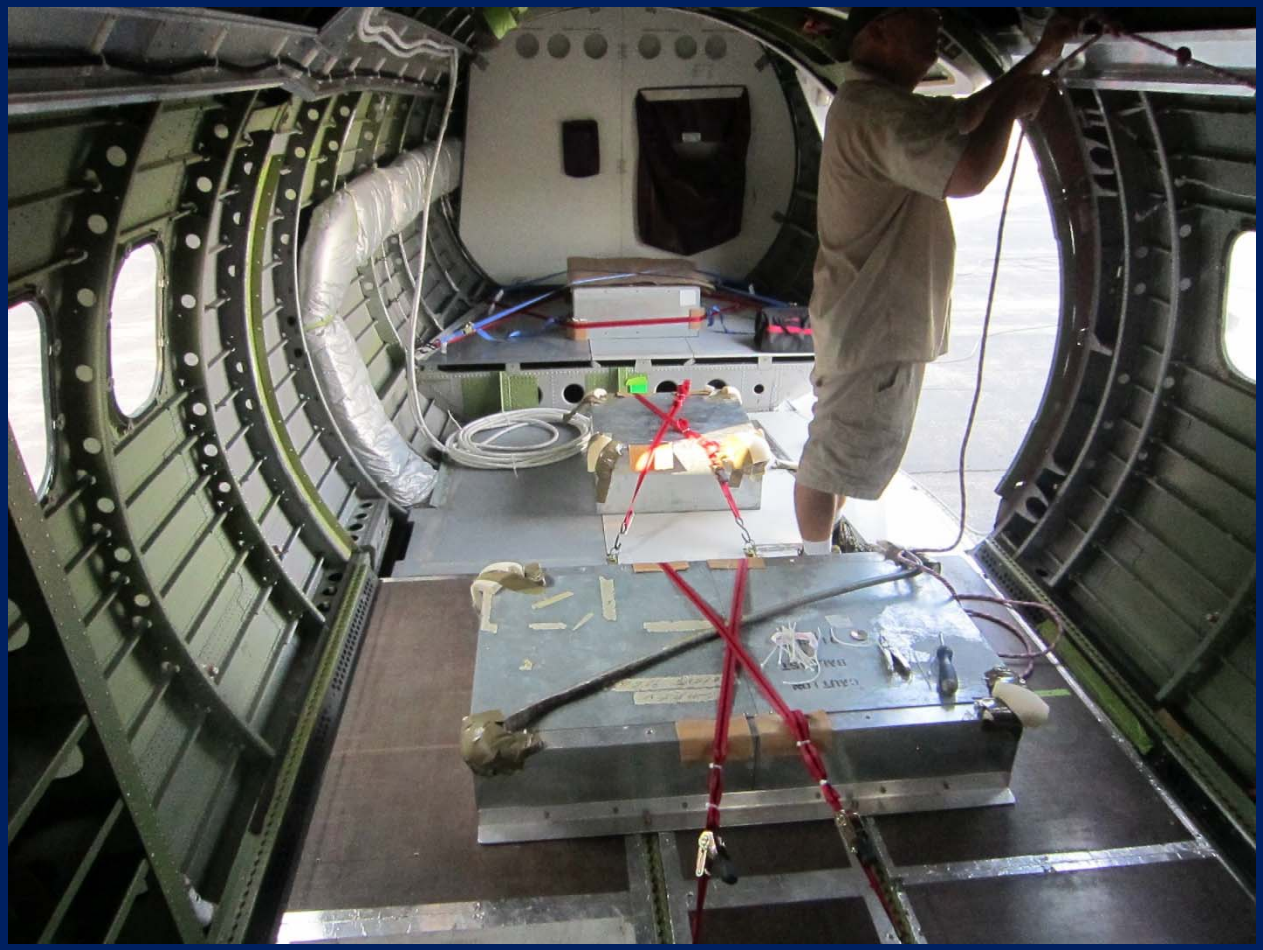
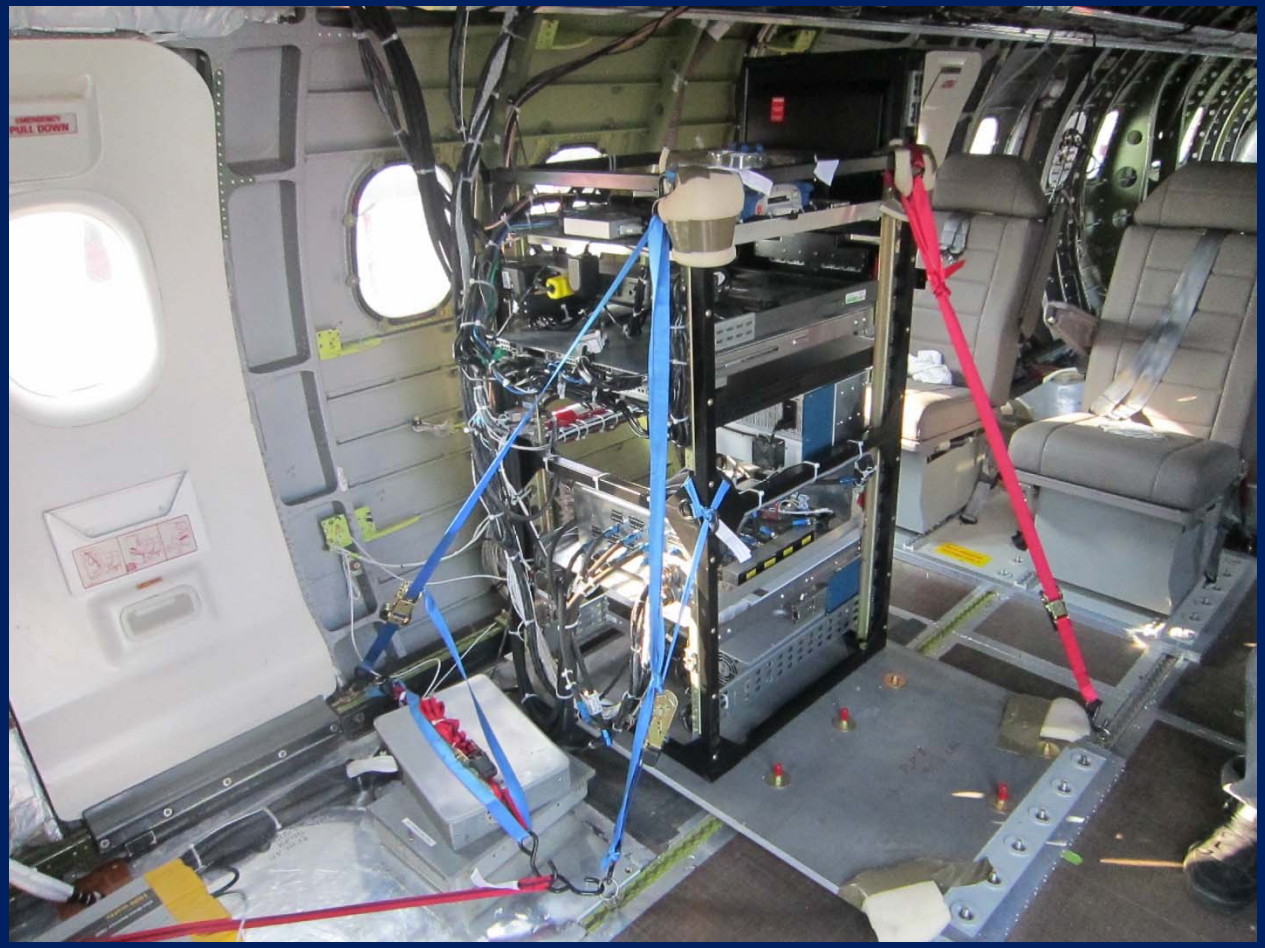
- Buildup
- Analysis
- Evaluate margins WRT baseline (e.g. icing)
- Instrumentation (e.g. nose boom)
- Emergency egress





Case Study