Flight Test *Safety* Fact

Published for the Flight Test Safety Committee

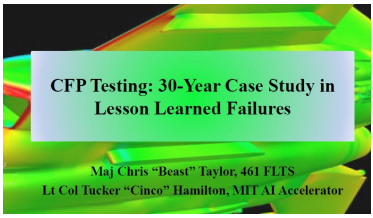
In This Issue

Podcast – Did you listen to the interview with the Air Force Test Center Commander?
Turbo Talk – Turbo shares insight regarding SETP's efforts to capture lessons learned
Symposium Recap – Sundry observations about how well we learn flight test lessons

Lessons Learned – a Recap of the SETP Symposium

Mark Jones Jr.

If I could use one word to describe the theme of the 2020 SETP Virtual Symposium, I would use two, and they would be "lessons learned." The words are familiar to all of us, but they are more familiar after SETP's late September event. Additionally, during his tenure as SETP president, Bill Gray has stood on the soap box of lessons learned for the past year. Consequently, he addressed some of his closing comments to the topic as well. Just days later, the FTSC Board of Directors discussed the topic together with comments on a white paper/proposal on lessons learned penned by one of its members. The Chairman's lengthy reply—which he has edited and included below—is like a lessons learned on the "lessons learned" issue.



First, however, I would like to draw your attention to one presentation in which two Air Force F-15 pilots argue convincingly that we are not doing our due diligence, that we are not remembering the lessons learned. They present that argument below in their column, ***Shifting our Paradigm on Sharing Lessons Learned***. They've also kindly included their slides and the original SETP Cockpit article as an attachment to this pdf.

For a counterexample, I turn first to my own experience. The HondaJet received its steep approach certification in 2019, though it began this testing much earlier. I can testify that the test team did a thorough review of the many presentations on Hard Landings from OEMs that had gone before, and we learned the lessons and avoided the common fate. (There is probably a paper worth writing on how hard it was to implement some of the lessons learned in our specific context, but that will have to wait.)

Lockheed Martin's Billie Flynn presented an even more relevant and timely challenge to the recurring theme during the Symposium. His presentation described the way the NAS Pax River and LM test team approached the edge of the envelope for weapons release testing. The focus of their technical discussion was real-time atmospheric

modeling to prevent the aircraft from exceeding limits, but ultimately, they proved that they had not forgotten the lessons of the past by safely and efficiently executing that test. It would have been easy to overlook the success of his test and miss the implicit relevance to the unofficial theme of the Symposium and the aforementioned presentation.

The point here is not to settle the argument but to encourage discourse. Many people have pondered the best ways to retain organizational memory and manage knowledge repositories. Others have attempted to solve the problem. That is the conversation we want you to have with your colleagues, mentors, and even subordinates. We'd love to hear your thoughts on the topic and your response to the positions presented herein.

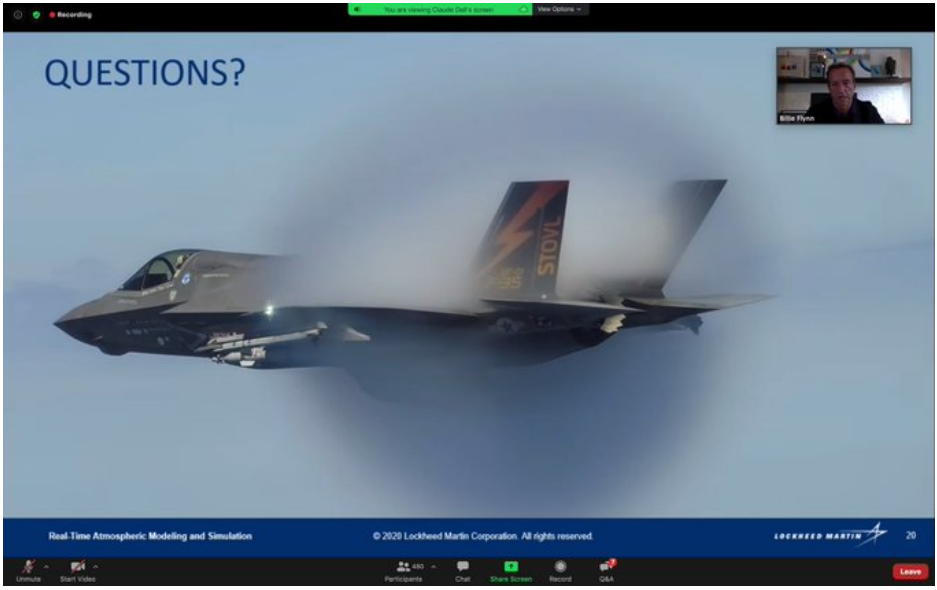


Figure 1 – Billie Flynn on Zoom during the 2020 SETP Symposium.

Turbo Talk – Chairman's Corner *Art "Turbo" Tomassetti*

During the recent SETP virtual Symposium one of the presentations focused on Lessons Learned. It caught my attention as this is a topic I still talk about to many audiences. One of the first steps with Lessons Learned is trying to ensure as many people as possible get the lesson. Doesn't do much good to have a lesson that doesn't get relayed to others. While we have conferences, workshops and symposia as venues to relay these lessons we also recognize the benefit of having them archived somewhere. Today various organizations have archives or databases of lessons learned they can reference. When I was President of SETP, we started a process to gather some of the key information with every paper that was cleared for release (every presentation approved for recorded videocast). We asked the author(s) to provide us key words and lessons

learned so that we could improve the SETP website search function. As long as the authors provide that information, we have a way to improve the ability to search for Lessons on the website going forward. We have also discussed working backwards through the videocasts and papers and trying to capture the same info, or using software to transcribe the videocasts into PDFs that would also be searchable. The former requires the author/presenter to fill in the release approval form for their archived paper/presentation. Yes, it sounds painstakingly slow, but there are quite a number of repeat presenters. Therefore, getting input from those individuals will likely yield more data than just one paper. In this latter case, we would still need to consider contacting the authors to ensure that we had release permission, if we want the information to be available to an audience wider than just SETP members. All of these efforts help us to build and grow a database.

One challenge we encounter is addressing exactly how one conducts a search for something that is not just a key word or phrase—in other words, it is a full sentence lesson learned from someone's presentation. Here is an example from the 2010 paper "Rapid development of the X-55A/Advanced Composite Cargo Aircraft and Initial Flight Test Results." The authors listed six lessons learned and this was the second:

> 2. We made the wrong assumption that AOA vanes were for aircraft AOA - they were not. They were stall warning vanes.

Trying to figure out how to make that "searchable" is a challenge. It is extremely unlikely that someone would type that exact sentence into a search box. A modern day search engine might match keywords and show you results with the most terms matched, but think of the results that would be returned from keywords like AOA or "wrong assumption." The other approach might be to simplify that lesson to something more basic like "Know your System," but I find it hard to believe that having "Know your System" as a search result would make a difference in anyone's test program. I don't think test teams need to be told or shown that lesson—Know your System—they just need to take the time to do it.

I do believe that we need to have a robust way to capture and make available Lessons Learned, because we want to ensure we are at least relaying the lessons. I think we started a better path towards that with our new SETP presentation release form, and can continue our efforts to work backward through the archive, maybe with a team of volunteers.

But while we continue to work lesson availability, I do not believe lack of a robust database is the biggest driver to "not learning lessons" and its corollary, repeating mistakes. I see as more problematic two major factors:

> 1. Not looking for lessons (that are available)
> 2. Got the lesson but… We are better/have better technology, can't relate to the lesson, lesson doesn't apply to me/us, misapplied/misunderstood lessons and the most concerning, "Got the lesson—ignored the lesson."

A larger database of lessons will not address either of those factors.

I have more than enough examples from my time at Pax River. More than once, I was told by test teams during a test plan review, "We didn't have time to research prior efforts," or "Schedule/Budget doesn't allow for all that prep/build up." Item number 1 might be helped if there was a database that spoon fed you what you needed, but I don't know how to do that. Furthermore, it still doesn't ensure the lesson is learned, accepted, and enforced. I think the only way to fix item number 1 is to hold people accountable for doing their homework. The second factor is much harder to address. It could be affected by leaders and managers getting the lessons—I mean really getting and appreciating the lesson and letting it factor into decision making. We know that is a challenge, but it is a challenge we must keep addressing and working. Something that would help is more testers in the executive wing (and by "wing, I mean a part of the building, not a part of the aircraft), more test professionals in leadership roles. Yes! More testers in senior management roles. Yes! Who's with me…let's hang up the flight suit and put on a coat and tie. Ye…wait, what?! Umm…no thanks.

In closing, I want to emphasize the efforts of SETP's past President Bill Gray. He encouraged operationalizing the lessons via procedures, rules, restrictions, SOPs, etc., and this is another area that will absolutely help. But that path has challenges as well and will take effort, teamwork, and in some cases courage. This all sounds hard, so what do we do? That part my friends is easy. We do the things we know work; communicate, train, share, mentor and lead by example.
Turbo ***Art Tomassetti***

Shifting our Paradigm on Sharing Lessons Learned

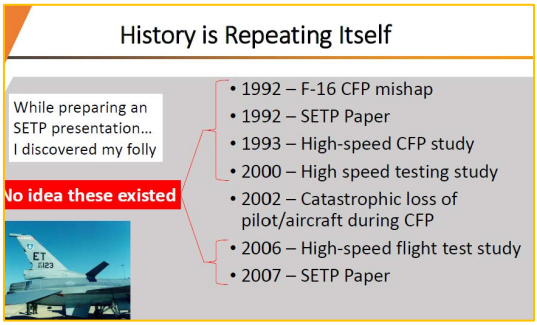
LtCol Tucker "Cinco" Hamilton ***Maj Chris "Beast" Taylor***

SETP and SFTE have a long history of supporting the flight test community. Membership includes the who's who of aviation and some of the brightest minds in aerospace. Over the years SETP and SFTE have made strides in more effectively sharing lessons learned and ensuring that other flight test professionals are safely and effectively executing missions while furthering techniques and approaches to gathering and analyzing data. It seems to us that it is time to propel the conversation further by addressing and tackling shortfalls – providing accountability and higher expectations while pursuing fight test data. This paper builds on the following paper published by *Cinco* in the Jul-Dec 2016 Cockpit Magazine, titled: *Compatibility Flight Testing in 30-Year-Old Aircraft – A Case Study on Ineffective Lesson Sharing*.

In most circumstances, history holds the keys to future success, from philosophy to politics to war to flight test. Not all test missions we fly require a deep analysis of past similar missions, but typically elevated risk or extensively planned missions have a history worth understanding. Often, these lessons learned may be overlooked due to

either a lack of appropriately referenced documents or a lack of time for research. These dilemmas present a challenge to sharing lessons learned for both societies. On the one hand, they both do a great job encouraging members to share their lessons learned. They conduct numerous conferences each year, reward those members who demonstrate flight test and lesson sharing excellence, and allow for a robust network that connects flight test professionals from around the globe. However, as great of a job as both societies do in furthering information sharing, we believe there is an opportunity for us to do better.

Back in 2013, *Cinco*, conducted a Compatibility Flight Profile missions on the F-15C, taking the AIM-120D to the corners of the flight envelope. It was a successful mission. Afterwards, he prepared for an SETP presentation to share some lessons learned and learned that he had missed an entire history of papers, risk assessments, and lessons learned that he and the Eglin team failed to address during execution. He then created a presentation discussing the importance of looking at this history when preparing for future high-speed flight test. A few years later, other F-15C test pilots reached out to ask *Cinco* questions about his high-speed testing experiences. This other team had not read his flight reports, nor seen his presentation, nor looked at any of the previous reports that he had discovered post-test execution. *Cinco* then elected to go further and write an article for Cockpit magazine challenging the way we, as professional flight test societies, shared lessons learned. Though the paper was championed by some, not many read it. Fast forward a few years later and *Cinco* was in a briefing from *Beast* about the F-15SA and challenges they experienced during the programs high speed testing. At the end of the briefing, *Cinco* approached *Beast* and found out he had an incomplete picture of all the previous high-speed testing by the F-15 and F-16 communities. While *Beast* was only involved at the tail end of the program after most of the high speed points had been completed, and it's possible that some previous members of the team may have done more research, we both realized that there was likely room for improvement.



As we dug deeper, we noted that similarities of past high speed testing reports. Many of the lessons learned through the long history of the F-15SA program were similar to a 1993 high-speed analysis report that included recommendations that were nearly identical to the recommendations from a 2006 high-speed report and again similar to recommendations from a 2013 report. Sadly, it was clear to us that the cycle is repeating itself. We, the authors, want to make it clear that we do not blame SETP/SFTE for these oversights and failures. There's an element of individual responsibility here that can't

be ignored. However, we strongly believe that SETP/SFTE can be the catalysts to disrupt this cycle.

It is hard to say if a deeper historical analysis would have measurably helped teams conducting high-speed test points. In other words, is the juice worth the squeeze? We argue that it *is* worth the effort to make information more readily available and challenge our profession to standardize expectations for sharing lessons learned. The key is taking the lessons learned and democratizing them to the entire fight test community. In order to do so we believe that the following recommendations should be seriously considered by SETP and SFTE.

1. **Include (require?) a slide highlighting historical papers/presentations that relate to your symposium briefing** – Do you and your team want to be considered for an SETP/SFTE presentation reward? Then you must include a slide that pulls out other SETP/SFTE papers/presentations that supported your testing. If professional societies want to communicate the importance of evaluating the past, then this is an easy way to force members to take this seriously.
2. **Make all conference presentations/slide shows available on the website** – Every year there are dozens of papers and presentations by flight test professionals. Each of these efforts equates to valuable data already cleared for public release and allows others to go back and learn from experience. Recording presentations and making them available to members is a small cost compared to the immeasurable benefit of creating a conduit to the past.
3. **Begin an SETP expert panel** – The SETP/SFTE Members, Associate Fellows, and Fellows have a lot of valuable experience. It may be worth creating an advisory panel, made up of experts in flight test fields, who support one or two-year tenures as Advisors. The role of the Advisor would include being available for other members to discuss their fight test missions. There would need to be care regarding proprietary information, but generic lessons learned and recommendations from an experienced flight test professional should always be welcome. Readily identifying this panel and their areas of expertise would be key to making sure that members have a known resource as they look for past lessons learned.
4. **Highlight presentations and lessons learned in Cockpit** – the Cockpit magazine is a great place to congregate lessons learned over the past 6-month period. Almost every presentation is required to identify primary lessons learned. It would be beneficial to gather the titles of the presentations with those lessons learned and have them in a document that is searchable for others; Cockpit magazine may be a good home for such a list.
5. **Tag SETP Archives with searchable key words** – this seems like it would be one the easiest and most valuable steps in sharing lessons learned. While papers can be thoroughly searched for words inside the document,

presentations should also be tagged with words that can easily direct a member searching for a certain topic.

6. **Bring back breakout sessions at symposia with open discussions relating to lessons learned in a certain field** – We know that this has been done at past conferences, mainly the Flight Test Safety Workshop. We also know that time during the annual symposium is valuable and hard to parse up. There may be an opportunity to turn the Wednesday of the symposium into a workshop day where certain mission sets are discussed in break-out rooms. This recommendation would need to be vetted by more experienced members.

We are certain there are other recommendations sitting out there, waiting to be unveiled and this paper and our subsequent presentation is a catalyst for the ideas and discussions that should follow. How can we be more effectively sharing lessons learned? That is the question we should never stop asking ourselves. As flight test missions continue to demand test professionals to safely, effectively, and efficiently gather data, we need to break the chain of ineffective sharing of our lessons…and SETP/SFTE should play an important role in furthering that conversation. We look forward to a day where all applicable symposia presentations have leveraged the immense body of knowledge of these two organizations BEFORE test execution and report not just technical success but also that past lessons learned led to safer and more effective testing.

Subscribe to our Podcast

If you listened to the last podcast, you would have heard—at 10 minutes 52 seconds time elapsed—a really good quote about testing more complex systems. It was something MGen Azzano (AFTC Commander) said in an interview with Turbo, our podcast host and Chairman. He said other profound things and a few things I disagreed with, but the point is this: Wisdom takes work, and podcasts are a way to work smarter. Any one of us can listen to this podcast on our commute or during a workout. It doesn't take long to subscribe, and it takes even less time to recommend it to a colleague. If you have suggestions, please email them to chairman@flighttestsafety.org. Please subscribe to the Flight Test Safety Podcast on the Apple or Google podcast app. You can also navigate directly to the recording in a web browser and leave comments on these platforms.

Contact Flight Test Safety Committee

Art "Turbo" Tomassetti, Chairman chairman@flighttestsafety.org
Susan Bennett, FTSC Administrator susan@setp.org
Society of Flight Test Engineers edir@sfte.org
Society of Experimental Test Pilots setp@setp.org
AIAA Flight Test Group derek.spear@gmail.com
Contact *Flight Test Safety Fact*
Mark Jones Jr, Editor mark@flighttestfact.com
Website: flighttestsafety.org Podcast: ftscchannel.podbean.com/
Connect with us by joining the LinkedIn Group: "Flight Test Safety Committee"