

Flight Test *Safety* Fact



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Two Things: Headlines and Hypotheses *Mark Jones Jr.*

“However beautiful the strategy, you should occasionally look at the results” (Winston Churchill). In light of the Englishman's pithy observation, consider the first section, Headlines, as a collection of “results.” In the second section, Hypotheses, I challenge the reader to see if the results match the elegance of the strategy—that is, if the strategies we proclaim and promote provide us with hypotheses that we can test and validate.

I. Headlines

Following is a limited collection of recent headlines and some top news from the past year, all of which should prove useful or interesting to the reader.

FAA Order 4040.26C is Available

Rod Huete shared this news from the FAA. This change includes significant revisions throughout the document due to the AIR realignment effected in 2017 and implementation of a [14 CFR Part 5 Voluntary] safety management system (SMS) within the AIR Flight Test Program. You can access the full Order [here](#).¹

I think there is much to discuss about the order. When I first presented two of these opinions, it generated a significant amount of discussion among the members of the Flight Test Safety Committee. Such much so, that much of this discussion will have to wait until the next issue. In January, I'll share Rod Huete's op-ed on “Subjective Probability and the 2d Risk Matrix,” but I will share this preview of his thoughts:

There appears to be a difference of opinion as to whether the probability of occurrence in the Risk Matrix should be based on subjective judgement (grey bearded approach) or based on a known database (e.g., contain numbers).

The second important fact that we will share next time is a brief history of SMS inside the FAA and the Flight Test Section. Early in the discussion, it became clear that I did not have all the facts, and other members of the committee were also confused about some of the nuances. Ultimately, I believe it aligns with the theme of this issue, that we should consider strategy and results, but it grew to a size more appropriate for its own issue. So next month, we will see that Jim Richmond and Bruce Remick invested a

significant amount of time laying out their thoughts and history of the FAA's SMS, and it will give us more opportunity to get deeper into 4040.26C.

FAA “on track to issue UAM concept of operations 2.0 in first quarter of 2022”

The [headline appears](#) on the Urban Air Mobility News aggregator website, and it reports highlights from an AUVSI webinar Reimagining Mobility: Update on UAM & AAM on 6 October 2021, presented by FAA Chief Scientist Steve Bradford.²

Other countries have developed solutions for integrating RPAs. Is the FAA moving fast enough to integrate RPAs in the US National Airspace System? What do you see as the biggest challenge and how do you think this will impact the Flight Test Community?

The topic of unmanned aircraft applies more widely than just urban, low altitude airspace. Some of the discussion generated by an early draft of the FTSF centered on the question of whether or not ATC and RPA topics should appear in a newsletter about flight test. I believe it is relevant today and will be even more relevant tomorrow. For example, consider the next headline which demonstrates that flight test and RPA ops have a significant amount of overlap.

Watch This Hypersonic Test Aircraft Wow a Crowd with Its Afterburner

The [headline](#) points out a significant milestone in the development of an unmanned aircraft prototype built by startup Hermeus.⁷ It is a test bed used to demonstrate technology and reduce risk for its hypersonic transport aircraft. The way the company demonstrated the engine run also reminds me of Turbo's two-podcast miniseries on safety in high visibility events. It's unclear whether or not the Hermeus prototype will operate as a remotely piloted aircraft or without less direct pilot input like a UAV. In either case, though, Hermeus will have to conduct flight in the NAS (National Airspace System) as well as the international airspace that the FAA controls. It is my opinion that the FAA will need to evaluate the RM associated with the complex airspace management plan. That is the first reason I think it is fair game for this newsletter, but



I try to expound on a second reason in Section II below.

*Photo credit:
Hermeus*

**Quarterhorse
UAV Prototype
Test Bed by
Hermeus**

The Red Warning Light on Richard Branson’s Space Flight

It’s not often that flight test safety news makes [headlines in the New Yorker](#). According to the byline, “The FAA is investigating the ship’s off-course descent.”³ The article addressed safety culture in this emerging part of our industry. If you read the article, what do you think?

Things Flight Testers Should Know about Batteries for Electric Propulsion

The presentation and paper by authors from Pipistrel and AeroTEC won honors at SFTE’s Annual Symposium in St Louis. It addresses emerging technical and safety challenges that most of us aren’t quite fully aware of. Turbo addressed a similar topic



earlier this year [in a podcast with a Joby test pilot](#).⁴ Thanks to SFTE’s Kevin Welch for the tip; the paper is available from SFTE or SETP (through a sharing agreement).

II. Hypotheses

In the mid “oughts” Col Andre Gerner, USAF TPS Commandant introduced a catchy phrase that captures an important principle about “hypotheses.” Three words, “Predict - test - validate,” became a common phrase at the schoolhouse. In some cases, the words were an obscenity muttered by old-timers. Others felt that the simple mantra was a memorable phrase that symbolized the importance of the scientific method, the depth of scholarship in the field of flight test, and many other things, which is, perhaps, why it was so catchy. Among those “other things,” the elementary phrase is a reminder to be deliberate in our approach to the profession, our stewardship and development of it.

As I look at the headlines above and the topics covered in these pages over the past year, I am convicted that we must consider our theory and strategy and subject them to closer examination. Sir Winston Churchill was not talking about science, but in his pithy statement he challenges us, just as the scientific method does, to use theory to make concrete predictions; create meaningful tests to demonstrate or disprove our predictions; and validate rigorously. I think both words are important as we consider the body of *theory* and *strategy* in the field of flight test safety. SMS and RM are strategies. I believe they should produce results—are they?

The next theory that needs us to move from hypothesis to results is the popular theme from the past year, Lucky or Good.⁵ The rich ideas in the September issue, together with reflections from a hang-glider test pilot, built on Turbo’s ideas in the May issue,

but these ideas are begging to be put to use. How can we make the theory useful by predicting and testing? I'd really like to print a follow up from an insightful reader on these "luck" charts sometime in the next year, so if you are up to the task, drop us a line.

Risk Management is the term we use these days to talk about the hazards present in the safety domain, the way we think about them, and the process of mitigating them. I believe that we generally agree that Safety Risk Management is a broad term and that flight test applies these broad principles in a specific way. I also think that aviation safety, with all its associated domains, provides a rich source of examples that we should consider. Sometimes those examples help us see things about our own specialty that we might not notice. Other times, the slightest bit of unfamiliarity—the kind we experience when considering other, closely related domains—is just what we need to force us to examine our thinking and strengthen our argument. I think these two things, the broad commonalities and the subtle experiential differences, make these a good reason to consider the closely related topics. I also think that it may help us adopt some good idea in our domain that we had not previously considered. But the term "Risk Management" does not get off unscathed.

Jim Wetherbee challenged this term in his [podcast interview](#) with Turbo this year, and he proposed the term "Controlling Risk."⁶ (He and I emailed back and forth, in which he gave me hundreds more words of explanation, and it was a delightful exchange. I will continue to beat the drum for these kinds of informal interactions. It is the best way for us to continue to Reach Everyone, getting a copy of this newsletter in human hands or email inboxes and delivering episodes of the podcast to earphones all over the world.)

At the root of Wetherbee's argument is the fact that words matter. Are we truly "managing risks"? Is Risk Management a useful theory that makes meaningful predictions? Can we use RM to "Predict – Test – Validate"?

Are Safety Management Systems worth it? This particular question is a classic and has appeared throughout history. The typical response usually sounds something like this: "How do you show someone accidents that didn't happen?" I think the continued growth and development of the field of flight test requires us to do the hard work of measuring results, of subjecting the strategy, however beautiful, to meaningful scrutiny. I think we ought to bring up examples where it seems like it's not working and ask why.

Finally, I think this audience contains the people who are up to the challenge. Subjecting ourselves to scrutiny and criticism isn't easy. I think the readers of this newsletter know the people who can sit together in a room and find a solution, but it requires us to email back and forth. Answer a text message, or pick up the phone and call. There is tremendous value in these small interactions, even though they aren't on our agendas or to do lists, not in the job description. These relationships compound

like interest, and that's a hypothesis I have put to the test with you, the readers of this newsletter and the members of this profession, over and over again.

I'll close with one last hypothesis of the lighter, whimsical variety: dual cue (cross pointer) flight directors are better than single cue (inverted v-bar). There, I said it.

Endnotes:

1. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.information/documentID/1040360
2. <https://www.urbanairmobilitynews.com/emerging-regulations/faa-on-track-to-issue-uam-concept-of-operations-2-0-in-first-quarter-of-2022-chief-scientist-steve-bradford/>
3. <https://www.newyorker.com/news/news-desk/the-red-warning-light-on-richard-bransons-space-flight>
4. <https://ftscchannel.podbean.com/e/ep-18-interview-with-justin-paines-thoughts-on-commercial-electric-aircraft/> or <http://www.flighttestsafety.org/ftsc-news/flight-test-safety-podcast-channel>
5. <https://flighttestfact.com/flight-test-safety-fact-21-05/> and <https://flighttestfact.com/flight-test-safety-fact-21-09/>
6. <https://ftscchannel.podbean.com/e/talk-with-capt-jim-wetherbee-usn-ret-author-and-commander-for-5-space-shuttle-missions/>
7. <https://www.thedrive.com/the-war-zone/43074/watch-this-hypersonic-test-aircraft-wow-a-crowd-with-its-afterburner>

Turbo Talk

Art "Turbo" Tomassetti

Recently I had the opportunity to attend the Society of Experimental Test Pilots (SETP) annual Symposium and Banquet (S&B). I have been a regular attendee since the late 90s and despite some changes for COVID this event was like most of the previous ones I had gone to. You get to hear two and a half days of technical presentations on things happening in flight test around the globe, challenges, accomplishments and of course lessons learned. There are also social and networking events in the evenings. Our lunch speaker was Mr. Jared Isaacman, commander of the Inspiration4 mission to space. The event concluded with a black-tie Awards banquet recognizing achievements and welcoming new Fellows of the Society. It is a great event, but if somebody asked me "Why did you go?" what would I tell them? Truth be told, it can be an expensive trip when you factor in travel, lodging, and conference fees. Additionally, I would have to say that the reason I go now is different than when I first started going, but attending has always had benefits.

I got to meet some big names in the world of Aviation and Space. I remember a funny conversation in the hotel elevator with Apollo astronaut Wally Schirra, learning things from Scott Crossfield, and an "interesting" conversation with Chuck Yeager. Meeting

interesting people is still true, as this year I got to talk with Jared Isaacman in the lobby of the hotel for a few minutes, connected with an old boss Mr. Greg Ulmer who is now the Executive Vice President for Lockheed Martin Aeronautics, and met actor Terrance Howard at the banquet. (Sorry, couldn't resist a little name dropping for effect.) So I guess one reason I continue to go is because you get to meet interesting people.

Early in my career I also wanted to learn as much about flight testing as I could. The technical sessions were tremendous opportunities to do that but also to pick up on a few tips, techniques, and tricks that might help me as a test pilot and maybe even save my life. Nevertheless, I don't perform flight test anymore—I haven't touched the controls of an airplane in 8 years. (I am not counting using the entertainment system on a commercial airliner.) So maybe the piece about helping me be a better safer test pilot isn't a thing anymore. But I still feel a professional responsibility to make others better and safer test pilots. So now these sessions have become a way to keep me connecting to new issues and challenges and, yes, to refresh me on the status of some long-standing issues and challenges. All in a hope I can maybe take this knowledge and figure out a way to turn it in to something useful for those still actively flying. To be honest many of these lessons apply to things in our lives beyond just flying airplanes.

Back as a young test pilot my contribution to the organization (SETP) and specifically this event was pretty much limited to presenting during the technical sessions. I am fortunate to have had more than a few opportunities to be on the stage trying to encourage people to think and inspire them to act. I still present from time to time, but I have also become involved in SETP in other ways. I volunteered to run for positions on the board of directors, volunteered to be part of the Committee that puts together the S&B, and over the last few years have had the honor of being the Master of Ceremonies for the awards banquet. I would count my current role, as Flight Test Safety Chairman and host of the Flight Test Safety podcast, in this category of being involved as well. There are a few other things that make attending worthwhile but I think these are the big three:

1. Meeting People/Networking
2. Learning/Sharing
3. Giving Back

After writing all these words, thinking I was explaining why attending an event like this is different for me now than early in my career, I am realizing that maybe it isn't actually all that different. When I look at the way I worded the three bullets they seem to stand the test of time since 1997. All three of those still matter to me in slightly different ways than they did 20 years ago, but all are still important.

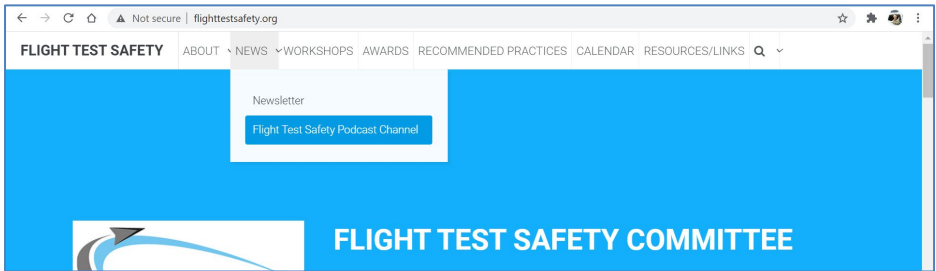
So this has been a long way around the block to get to the shop next door, but that's my sales pitch for getting involved in a professional organization. If Meeting People/Networking, Learning/Sharing, and Giving Back are important to you, then I

think you will find getting involved in organizations like FTSC, SETP, SFTE, AIAA and others are worthwhile. But of course, that is the challenge, the “big leap” – GETTING INVOLVED. But as someone who has swum (yes it’s a word) in this ocean for 20 years now I can tell you - come on in, the waters fine!

Turbo
Chairman

Art Tomassetti
Flight Test Safety Committee

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