An Introspective of Boeing Test & Evaluation Commercial Transport's Safety Risk Management Process

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Overview of Boeing’s Commercial Flight Test SRM (Safety Risk Management) Process

Areas of Refinement (2020 – 2022):

- Processes and Procedures | Flight Test Plan Quality Project
- Training | Onboard Troubleshooting Workshop
- Safety Culture | Psychological Safety in Flight Test

Takeaways for SRM
Overview of Boeing’s Commercial Flight Test (FT) SRM Process

Safety as the First Priority

SRM is a critical pillar in Boeing’s enterprise-wide Safety Management System

Boeing Commercial FT’s SRM process follows **FAA Order 4040.26C**

- Incorporated into internal Boeing Process Guide for Risk Assessment and Alleviation

2018 SRM Introspective at the Flight Test Safety Workshop

“**Constantly re-assess risk**. Risk contributors and assumptions should be checked for accuracy during the conduct of flight testing programs.” – FAA Order 4040.26C
Where has there been innovation and refinement in our SRM process?

SRM processes must be able to evolve as best practices, requirements, and organizations change over time

Areas of Refinement (2020 – 2022):

- Processes and Procedures | Flight Test Plan Quality Project
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- Safety Culture | Psychological Safety in Flight Test
Processes and Procedures
Flight Test Plan Quality Project

Flight Test Plans (FTPs) are a primary deliverable of the Flight Test Engineering Analysis team.

In 2020, internal and external reviewers identified opportunities to improve quality in the following areas:

- Standards
- Procedures
- Downstream usability

Addressing these areas reduces flight risks and rework, and improves downstream efficiencies and customer relationships.
Flight Test Plan Quality Project

How can we standardize and improve the quality of Flight Test Plans?
## Flight Test Plan Quality Project

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<tr>
<th>Situation</th>
<th>Challenge</th>
<th>Mitigation</th>
<th>Effects</th>
<th>Takeaways for SRM</th>
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<tr>
<td>1</td>
<td>FTP Style Guide</td>
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<td></td>
<td>Documents the philosophies and quality standard expectations for FTP authors</td>
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<td></td>
<td>Contains input and best practices from the organization’s engineers, leads, and technical fellows</td>
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<td>2</td>
<td>FTP Quality Office Hours</td>
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<td></td>
<td>Test Plan authors review their FTPs for technical, operational and formatting quality improvements with Subject Matter Experts</td>
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<td></td>
<td>Reviews are independent of the signature reviews</td>
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<td>3</td>
<td>FTP Quality Training Podcasts</td>
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<td>Knowledge sharing tool for the FTP Quality Project</td>
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<td>Communicates the best practices and philosophies on Test Plan authoring</td>
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Flight Test Plan Quality Project

Improvements in the quality of test deliverables across teams as well as increased cultural focus on quality in the organization

Test Plans revisions and new Test Plans are working to meet the quality standards set forth in the Style Guide
Flight Test Plan Quality Project

The office hours are *creating a space* for quality-only, independent reviews which foster better safety culture and practices.

The style guide has been an effective means of *documenting* quality standards and philosophies for knowledge sharing across teams.

The podcasts have been an effective means of *communicating* Safety Risk Management and test authoring expectations.
Training
Onboard Data Troubleshooting Workshop

Successful execution of flight tests is reliant on the functioning of the aircraft’s data acquisition systems.

These data acquisition systems can be susceptible to errors – either system or human errors.

For condition quality, test schedule, and most importantly crew safety, it is crucial that data system issues are identified and resolved as quickly as possible.

Opportunity to fill a skill gap across the team for onboard troubleshooting strategies.
Onboard Data Troubleshooting Workshop

How can we level-set an understanding of the data system and instill a strategy for onboard troubleshooting?
Onboard Data Troubleshooting Workshop

1. **Remove Risk**
   
   Need a way to expose people to troubleshooting scenarios without doing it on a real test sortie
   
   Utilize the telemetry room with data playback for practicing scenarios in a controlled environment

2. **Simulate Realness**
   
   Need a way to simulate the pressures that exist when troubleshooting onboard
   
   Gamify the scenarios to mimic a high pressure situation

3. **Knowledge Sharing**
   
   Need a way to bridge knowledge gaps and capture best practices
   
   Boeing Technical Fellows distilled strategies for troubleshooting
   
   Cross-functional collaboration enabled better documentation of the data system architecture
Onboard Data Troubleshooting Workshop

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Conducted two in-person workshops of the material in 2021 and recorded the workshop for future reference

- Explanatory lecture
- Practical Workshop

Documented best practices and expert insights in the presentation so this knowledge can be more effectively shared between teams

Received feedback that both new team members and experienced team members found value in participating in this training
Onboard Data Troubleshooting Workshop

Situation  Challenge  Mitigation  Effects  Takeaways for SRM

This workshop gives an example to how teams might better provide training which simulates the real pressures that occur in flight while reducing the risks.

Opportunities to integrate this training method into Risk Assessment evaluations and/or flight preparation training.
Safety Culture
Psychological Safety in Flight Test

Flight Test is a unique work environment in that people often need to be comfortable speaking up and raising concerns whilst:

- Under tight time pressures
- Onboard a test flight
- In front of many peers/co-workers

Examined Flight Test processes and procedures through the lens of Psychological Safety in order to better understand and ensure the safety of crew members.

“Psychological Safety is the belief that you won’t be punished or humiliated for speaking up with ideas, questions, concerns, or mistakes” – Dr Amy Edmondson
Psychological Safety in Flight Test

How can we improve the Psychological Safety of our team during Flight Test operations?
Psychological Safety in Flight Test

An Unexpected Case Study of Psychological Safety

**Boeing’s All-Women Flight**

In 2021, there was an active effort to assemble an all-women crew to highlight the representation of women in the Aerospace industry.

The crew noted they felt more comfortable [than usual] speaking up on this flight and this helped address a safety question in the pre-brief.

The comments gave an example of *increased* psychological safety onboard a Flight Test. This was not an intended consequence of the flight.
Psychological Safety in Flight Test

But why did Psychological Safety increase on this flight?

Being the only individual of a particular race, gender, ethnicity, age, etc. in a setting can be difficult

The women on this flight were no longer “only’s”

Note: The all-women crew was a unique inclusion initiative for women in FT. We are looking for diversity of thought, experience and perspective in our test crews. A homogenous team is NOT the goal
Psychological Safety in Flight Test

This all-women flight serves as an example that when Psychological Safety is increased, the overall safety of flight crews can be increased too.

Active effort to create awareness around Psychological Safety and investigate how cultural change can help increase test members’ Psychological Safety.
Psychological Safety in Flight Test

Increasing psychological safety increases overall safety during Flight Test

Opportunities to analyze the effectiveness of Safety Reporting and Safety Culture through the lens of Psychological Safety
Closing Thoughts

Three Case Studies Presented today for Flight Test SRM:

**Processes and Procedures** | Flight Test Plan Quality Project
- Documenting, communicating and evaluating quality standards for SRM

**Training** | Onboard Troubleshooting Workshop
- Developing training to better simulate the real pressures in flight whilst reducing risk

**Safety Culture** | Psychological Safety in Flight Test
- Incorporating an understanding of Psychological Safety into safety culture and practices

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*Safety Risk Management requires a holistic approach to safety. Where can we refine and innovate in how we mitigate risks?*
Thank you!

Questions? Comments?