



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

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Agenda

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
- Training | Onboard Troubleshooting Workshop
- Safety Culture | Psychological Safety in Flight Test

Processes and Procedures

Flight Test Plan Quality Project

Situation ● — ● Challenge ● — ● Mitigation ● — ● Effects ● — ● Takeaways for SRM

Flight Test Plans (FTP) 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

Situation ● — ● **Challenge** ● — ● Mitigation ● — ● Effects ● — ● Takeaways for SRM

How can we standardize and improve the quality of Flight Test Plans?

Flight Test Plan Quality Project

Situation ● Challenge ● **Mitigation** ● Effects ● Takeaways for SRM

1

FTP Style Guide

Documents the philosophies and quality standard expectations for FTP authors

Contains input and best practices from the organization's engineers, leads, and technical fellows

2

FTP Quality Office Hours

Test Plan authors review their FTPs for technical, operational and formatting quality improvements with Subject Matter Experts

Reviews are independent of the signature reviews

3

FTP Quality Training Podcasts

Knowledge sharing tool for the FTP Quality Project

Communicates the best practices and philosophies on Test Plan authoring

Flight Test Plan Quality Project

Situation ● — ● Challenge ● — ● Mitigation ● — ● **Effects** ● — ● Takeaways for SRM

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

Situation ● — ● Challenge ● — ● Mitigation ● — ● Effects ● — ● **Takeaways for SRM**

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

Situation ● — ● Challenge ● — ● Mitigation ● — ● Effects ● — ● Takeaways for SRM

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

Situation ● — ● **Challenge** ● — ● Mitigation ● — ● Effects ● — ● Takeaways for SRM

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

Onboard Data Troubleshooting Workshop

Situation ● Challenge ● **Mitigation** ● Effects ● Takeaways for SRM

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

Situation ● — ● Challenge ● — ● Mitigation ● — ● **Effects** ● — ● Takeaways for SRM

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

Situation ● Challenge ● Mitigation ● Effects ● Takeaways for SRM

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

Situation ● — ● **Challenge** ● — ● Mitigation ● — ● Effects ● — ● Takeaways for SRM

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

Psychological Safety in Flight Test

Situation ● Challenge ● **Mitigation** ● Effects ● Takeaways for SRM

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



Photo credit: Boeing Photo

Psychological Safety in Flight Test

Situation ● — ● Challenge ● — ● **Mitigation** ● — ● Effects ● — ● Takeaways for SRM

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

Situation ● — ● Challenge ● — ● Mitigation ● — ● **Effects** ● — ● Takeaways for SRM

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

Situation ● — ● Challenge ● — ● Mitigation ● — ● Effects ● — ● **Takeaways for SRM**

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

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

Thank you!
Questions? Comments?