Welcome !

"Safety Management, Airworthiness, Quality Escapes;

"Victim or Enabler"

Presented by:
Len Beauchemin
Managing Director
AeroTechna Solutions

ACSF SAFETY SYMPOSIUM
APRIL 7–9, 2025
EMBRY-RIDDLE | DAYTONA BEACH, FL

Len Beauchemin – *Who is this guy?*

- **43 years: CFR Operating Environments: 91,135,145**
- **A&P/IA/Private Pilot, Aircraft Owner**
- **FAA National AMT & PAMA 1997**
- **Industry Steering Committee Chair – MSG-3 1994 to current**
- **IBAC – IS-BAO Standards Board Vice Chair/member – 2001 to current**
- **NBAA – Maintenance charter member 1996 to current , previous chair 1998**
- **A4A Maintenance Program Industry Group board member 2000 to current**
- **Scheduled Maintenance Program Development, MSG-3, training provider FAA/TCCA/ (contracts) Military, Airline, Industry**
- **Operations/Acquisitions/Auditor/Expert Witness – CFR 91, 125,135,145**
- **Current operator of international/foreign registered aircraft**

ACSF SAFETY SYMPOSIUM

Safety is a Deliverable!

Session Assumptions

- **The audience has some basic understanding of:**
  - ✓ **Safety Management Systems**
  - ✓ **The Hazard and Risk relationship**
  - ✓ **In some form has an operational manual or guide**
- **Reducing the possibility of a maintenance related failure is important to you.**
- **Avoidance of the following is important you:**
  - ✓ **Personal injury or fatality**
  - ✓ **Maintenance related failure with equipment disruption**
  - ✓ **Regulatory non-compliance violation**
  - ✓ **Costs related to damage repair and diminution of the aircraft value**
  - ✓ **Testifying at an NTSB hearing**

AIR CHARTER SAFETY FOUNDATION

3

Safety is a Deliverable!

Session Goals

What is Maintenance failure? What can create maintenance failure patterns?

Managing maintenance failures in a method where the **thought process must be first and the behavior second.**

The goal of avoiding maintenance failure **is not** analytics of process, reports, measuring, policies, etc. Seek and achieve continuous performance standards.

The goal is the **realistic management of the risk to an acceptable level of occurrence** with respect to the nature of the risks and the nature of failures, in that some type of loss is possible.

Review tools available to mitigate risks to **an acceptable level**

AIR CHARTER SAFETY FOUNDATION

4

Workshop Overview Journey

1. General Intro
2. Safety is a Deliverable
3. Quality Escapes – Industry Perspective
4. Global Harmonized Safety
5. Safety in the "Wild Blue Yonder" Primary Elements
6. The "Airworthiness Concept"
7. "Perspectives" that frame the mind – "Failures"
8. Aviation Maintenance Synopsis
9. Define Failure "Expectations"
10. Aviation Maintenance SMS
11. "Choices" and Risks
12. Safety is a Deliverable - *closing*

5

Safety is a Deliverable!

Quality Escapes: "Victim or Enabler"

Presented by:
Len Beauchemin
Managing Director
AeroTechna Solutions

6

Safety is a Deliverable!

Be a leader, normalize your knowledge level to drive greater success for others.

Safety is a Deliverable!

Takeaways:
Failure Mitigation Choices
SMS Maintenance Debrief
Training Brief Document

Safe

Airworthy

Compliance

Failure

ELEVATE YOUR DELIVERABLE

Safety is a Deliverable!

*First, engage with some self-reflection on "**your**" current behavioral norms, as these will underpin your career*:

Perspectives

Expectations

Choices

Responsibility & Accountability

Safety is a Deliverable!

Industry Perspective:

- Commercial
- Military
- Private

Safety is a Deliverable!

Tools to escape the "quality escape"

Who has experienced a quality escape occurrence on an aircraft?

Safety is a Deliverable!

Do "quality escapes" exist in all aircraft? …in what form?

- Assembly nonconformance
- Material flaws
- Mistakes & errors
- Physical damage

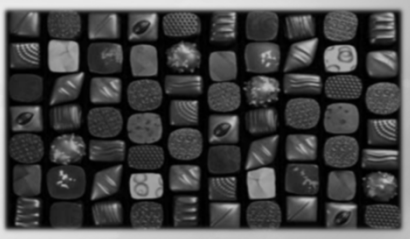
What is preventable?

What is acceptable?

What is a "quality escape" event?

Safety is a Deliverable!

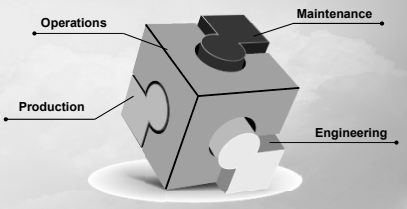
Aircraft "Quality Escapes" like a box of chocolates…



13

Safety is a Deliverable!

Box of "quality escapes"



14

Safety is a Deliverable!

Technical preparedness of the aircraft to complete the mission.

An assembly of defects, errors and mistakes ready for flight!

Airworthy & Mission Ready

15

Quality Escapes an Industry Challenge

- What you can prevent?
- Why you can prevent?
- How you can prevent?

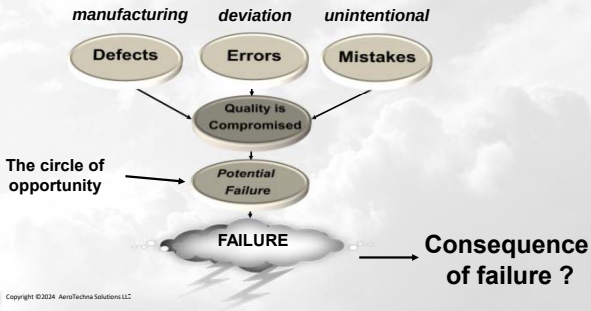
I will strive to:

Elevate your perspective, expectations and choices related to aircraft technical preparedness for a mission.

Incentivize your initiative

16

Quality Escapes



17

Quotes to frame the mind

"What we hope ever to do with ease we may learn first to do with diligence."

Samuel Johnson, author

"We make our world significant by the courage of our questions and by the depth of our answers."

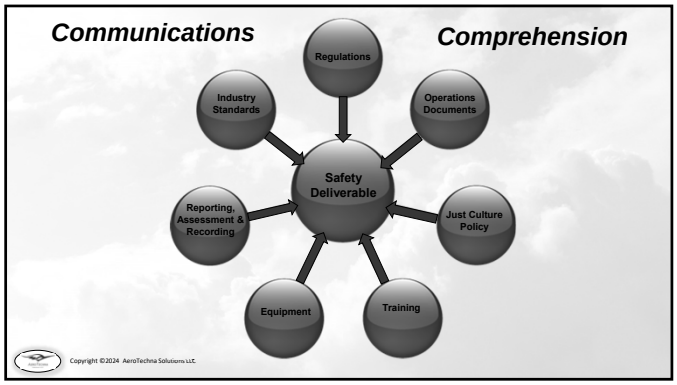
Carl Sagan, astronomer and writer

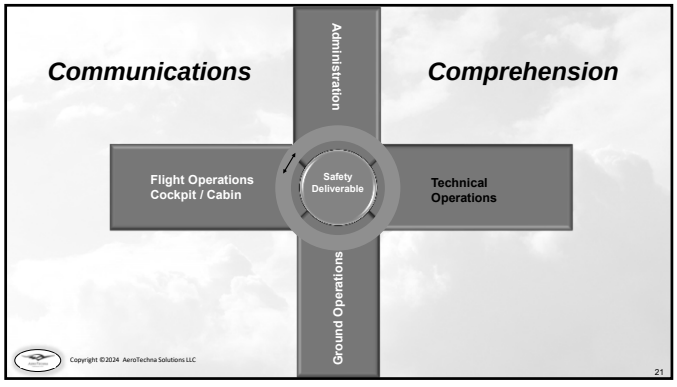
18

Thoughts on awareness

…let's be situationally aware.

19





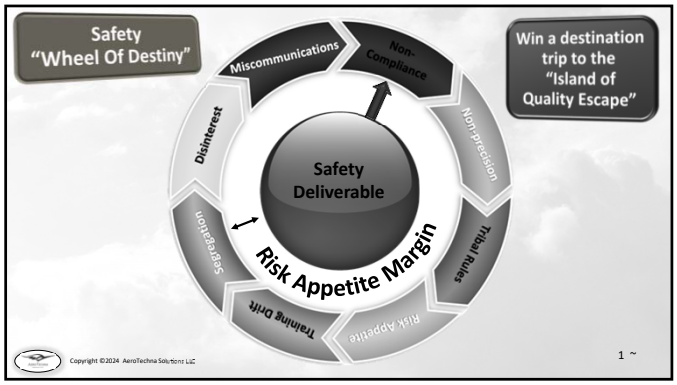
Communication

1. Regulations
2. Operations Documents
3. Just Culture Policy
4. Training
5. Equipment
6. Reporting, Assessment & Recording
7. Industry Standards

Comprehension

1. Disinterest
2. Miscommunications
3. Non-Compliance
4. Non-precision
5. Tribal Rules
6. Risk Appetite
7. Training Drift
8. Segregation

22



1 ~

You crash landed on the Island of "Quality Escapes". You survived…

You have 5 minute to send this message to a colleague whom will do your job until you return:

Please ensure that you do this task/action to keep our operation running smoothly.

?

Does your team have aligned priorities?

Global Harmonized Safety

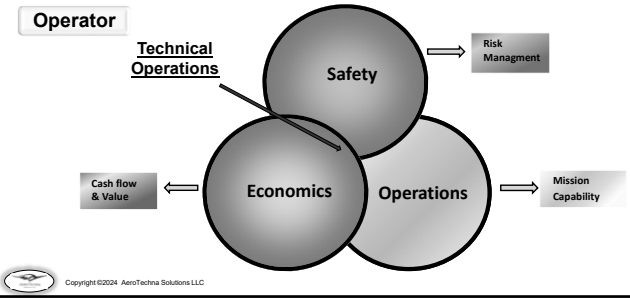
Aircraft management objectives

and opportunities for failure!

Global Harmonized Safety

Aviation Universe

Global Harmonized Safety



Global Harmonized Safety

Primary Operating Metrics

CASM – cost per available seat mile

RASM – revenue per available seat mile

DOC – direct operating cost

Reliability – on time delivery

Availability – on demand access

Compliance – meeting the standard

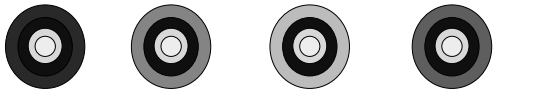
Readiness – ability to accomplish mission

SAFELY

Are we in the business of "safety?

Global Harmonized Safety

Objectives: 4 Strategic Performance Targets



Regulatory	Operational	Financial	Owner/PAX Expectation
Compliance • Operations • Maintenance • Records	Reliability Availability Capability Maintainability SMS (RISK) User Friendly Use Configurations (i.e. seats, cargo, etc.)	DOC/CASM/RASM Market Value Tax Impact Capital Investment Cash Flow Lease Cycle Liquidity Insurance	Travel Experience Efficiency Return on Investment Product Quality Ramp Appeal Flexibility Safety

Global Harmonized Safety

Compliance a path to "Airworthiness" to achieve "Safety"

- **Compliance to what? …and why?**
- **Is Airworthiness a point in time?**
- **Must I sustain "type design"?**
- **Who determines condition for safe operation?**
- **Who establishes the standards of risk?**

REGULATORY

Global Harmonized Safety

Compliance Environment

- **Does compliance matter, why?**

  Avoidance of dramatic variation

- **Why is that important?**

  To avoid being vulnerable

Compliance with what?

Global Harmonized Safety

What am I required to do ?

Regulatory

Compliance
- **Operations**
- **Maintenance**
- **Records**

What is

- **Regulatory**
- **Mandatory**
- **Advisory**
- **Optional**

14 CFR § 91.409 - Inspections.
(f) Selection of inspection program under paragraph (e) of this section. The registered owner or operator of each airplane or turbine-powered rotorcraft described in paragraph (e) of this section must select, identify in the aircraft maintenance records, and use one of the following programs for the inspection of the aircraft:

- Scheduled Maintenance (ATA Chapter 5, Maintenance Planning Document, OPSPEC)?
- Airworthiness Limitations?
- Service Bulletins?
- Airworthiness Directives?
- Component: Technical Standard Order Maintenance (Component Maintenance Manual) ?
- Operational Maintenance Regulations CFR 91,121,135?
- Loose Equipment service recommendations?
- STC/Alteration Instructions for Continued Airworthiness?
- Structural Repair Limitations Special Inspections and limitations?

Global Harmonized Safety

Scheduled Maintenance: The Maintenance Planning Document

Consist of

- Airworthiness Directives,
- Service Bulletins (SB/Service Letters)
- Replacement of Life-Limited Parts (LLPs)
- Replacement of components for periodic overhaul or repair
- Special inspections
- Lubrication and servicing
- Tasks identified in the Maintenance Review Board Report (MRBR)
- Airworthiness Limitations Items (ALIs)
- Certification Maintenance Requirements (CMRs)
- Critical Design Configuration Control Limitations (CDCCL) requirements
- Supplemental Structural Inspection Documents (SSID)
- Electrical Wiring Interconnection System (EWIS) tasks
- Off wing engines/major assemblies tasks identified by OEMs
- Aircraft detailing and cleaning

Global Harmonized Safety

Typical Aircraft Technical Work

- Servicing
- Scheduled Maintenance
- Unscheduled Maintenance
- Inspection
- Modifications
- Structural Repairs
- Avionic system software
- Cabin Systems/ IT/ Connectivity
- Paint
- Corrosion Protection Control Program (CPCP)
- Engine Heavy Maintenance
- Interior Refurbishment
- Component Repairs and Servicing
- Detailing and Cleaning

WHAT STANDARD(s) MUST THIS WORK MEET?

Global Harmonized Safety

Compliance!

- ***Regulatory***
- ***Operational***
- ***Financial***
- ***Owner/Passenger***

Workshop

Safety in the
"Wild Blue Yonder"

AIR CHARTER SAFETY FOUNDATION

Safety in the "Wild Blue Yonder"

For an aircraft to be "Safe", to be <u>operated</u> for flight, what <u>two</u> basic regulatory conditions must be met?

37

Safety in the "Wild Blue Yonder"

Compliance with:

1. **Airworthiness Certificate requirements**
2. **Aircraft Flight Manual requirements**

38

Safety in the "wild blue yonder"

- What **<u>three</u>** FAA certificates <u>ensure</u> all the necessary aircraft requirements were met at point of aircraft delivery to the owner operator?

  - Type Certificate
  - Production Certificate
  - Airworthiness Certificate

  <u>Other Assurances</u>
  - Supplemental Type Certificates
  - Technical Standard Orders
  - Part Manufacture Approvals

*…which certificate **do we as operators** have **direct control** over?*

39

Safety in the "wild blue yonder"

Airworthiness & Continuous Airworthiness

- What does that mean ?
- Airworthiness Certificate validates standards have been met and sustained.

…what two activities can we conduct that impact the validation of an issued airworthiness certificate?

***Operations** (CFR 91) **& Maintenance** (CFR 43)*

Safety in the "wild blue yonder"

Crucial knowledge !

- What is an Instruction for Continued Airworthiness (ICA)?

CFR 25.1529, 23.1526 Appendix H

- What is the purpose of an ICA?
- Who has authority over ICA's? *(can I deviate from an ICA?)*
- ICA's validate compliance with what two certificates?

Type Certificate & Airworthiness Certificate

Safety in the "wild blue yonder"

What does all this mean?

Compliance matters?

…is it risk management?

…is it safety management?

Flight operations / maintenance / alterations

Workshop

The Airworthiness Concept

AIR CHARTER SAFETY FOUNDATION

43

The Airworthiness Concept

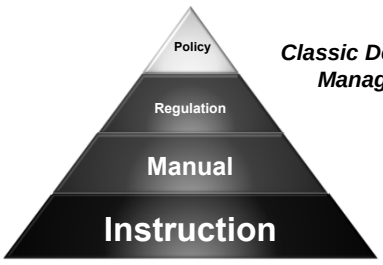
- **How do we decide an aircraft is safe for flight?**
- **What does it mean when we say the aircraft is airworthy?**
- **What is the purpose of an "airworthiness" credential?**
- **How does "airworthiness" credential make you feel about flying?**

Acceptable level of risk?

Who defines the "airworthiness" condition of the aircraft?

44

The Airworthiness Concept



Classic Deliverable Management

45

The Airworthiness Concept

Global Management

The Airworthiness Concept

Safety Through Airworthiness

Regulation entity accountable organization, agency, person

Regulations (compliance) standards and practices

Regulator (enforcement) verifies processes and behaviors conform (conformance) to the regulations

1

Original Airworthiness

AIR: Air Certification Services

ACO –CMO – MIDO

- Aircraft Specification
- TCDS
- Production Certificate
- Airworthiness Certificate

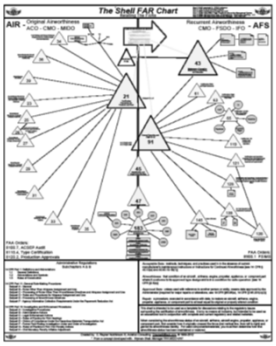
2

Recurring Airworthiness

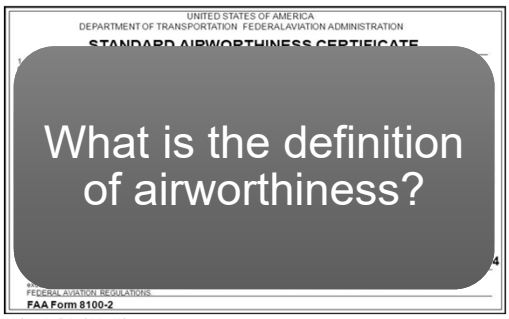
AFS: Flight Standards Services

CMO –FSDO – IFO

- Aircraft Specification
- TCDS
- Airworthiness Certificate



Standard Airworthiness Certificate


UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION FEDERALAVIATION ADMINISTRATION
STANDARD AIRWORTHINESS CERTIFICATE
FEDERAL AVIATION REGULATIONS
FAA Form 8100-2

What is the definition of airworthiness?

The Airworthiness Concept

Issuance of Airworthiness Certificate.

The United States Code 49 U.S.C. § 44704(d) states that there are <u>two</u> conditions that <u>must be</u> met for issuance of an airworthiness certificate.

TC = Type Certificate

(1) An **aircraft must conform** to its TC. An aircraft conforms to its TC when its configuration and the installed components are as described in the drawings, specifications, and other data that are part of the TC, including all supplemental type certificates (STCs), applicable airworthiness directives (AD), and field-approved alterations incorporated into the product; and

(2) The aircraft **must be in a condition** for safe operation.

FAA Order 8110.116

The Airworthiness Concept

Compliance through Certified Release Statement

Maintenance Release
Return to Service
Airworthiness Release
Approved for Return to Service
Authorized Release Certificate

Aircraft "airworthiness" a point in time

The Airworthiness Concept

Compliance through Certified Release Statement

Aircraft Maintenance Record Entry Requirements

Title 14 CFR 91.417,
a) Except for work performed in accordance with 91.411 and 91.413, each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:

The records must include—

(i) A description (or reference to data acceptable to the Administrator) of the work performed; and

(ii) The date of completion of the work performed; and

(iii) The signature, and certificate number of the person approving the aircraft for return to service.

All work defined In Accordance With (IAW) …data reference or specific description

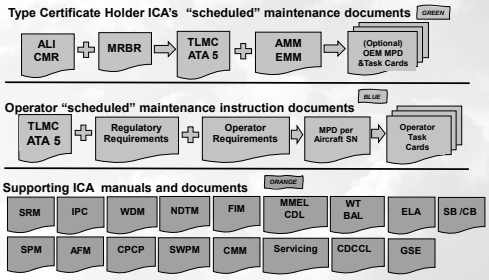
The Airworthiness Concept

Instructions for Continued Airworthiness

What is an Instruction for Continued Airworthiness?

Reference Title 14 CFR 23.1529 or 25.1529 Appendix H

Instructions for Continued Airworthiness



ALI: Airworthiness Limitation
CMR: Certified Maintenance Requirement
MRBR: Maintenance Review Board Report
TLMC: Time Limits Maintenance Checks
AMM: Aircraft Maintenance Manual
EMM: Engine Maintenance Manual
SRM: Structural Repair Manual
SPM: Standard Practices Manual
NDTM: Non Destructive Testing Manual
AFM: Aircraft Flight Manual
WDM: Wiring Diagram Manual
CPCP: Corrosion Protection Control Program
IPC: Illustrated Parts Catalog
SWPM: Standard Wiring Practices Manual
FIM: Fault Isolation Manual
CMM: Component Maintenance Manual
MMEL: Master Minimum Equipment List
CDL: Configuration Deviation List
WT & BAL: Weight & Balance Manual
SWPM: Standard Wiring Practice Manual
ELA: Electrical Load Analysis
STC: Supplemental Type Certificate
SB: Service Bulletin
CB: Customer Bulletin
MPD: Maintenance Planning Document
GSE: Ground Support Equipment
CDCCL: Critical Design Configuration Control Limitations

The Airworthiness Concept

Compliance through Certified Release Statement

An Airworthiness Release is a certification, issued by certified maintenance "person" to certify that the aircraft is in an airworthy condition. When the Airworthiness Release is signed, it is verification that no known condition exists that would make the aircraft unairworthy and so far as the work performed is concerned the aircraft is in a condition for safe operation.

The Airworthiness Concept

Compliance through Certified Release Statement

Maintenance Release
Return to Service
Approved for Return to Service
Authorized Release Certificate
Airworthiness Release

AIRWORTHINESS RELEASE examples:

- "I certify the above referenced maintenance was accomplished and **inspected in accordance with** the manufacturer's specifications, [COMPANY ABC] [NAME of DOC Continuous Airworthiness Maintenance Program] and current Federal Aviation Administration regulations, and is **approved for return to service**.

- "I certify that this aircraft has been inspected in accordance with (**insert type of inspection/maintenance program, document number as revised**) inspection and **was determined to be in airworthy condition**." Daniel Johnson AP123456789IA

The Airworthiness Concept

Compliance through Certified Release Statement

Maintenance Release
Return to Service
Approved for Return to Service
Authorized Release Certificate
Airworthiness Release

A Maintenance Release is a certification for return to service of an aircraft, engine, propeller, component, and appliance. The release certifies that the aircraft and/or its component has been undergone maintenance and found in an airworthy condition. Issuance of Maintenance Release is mandatory upon completion of the maintenance service.

A certificated repair station must provide a copy of the maintenance release to the owner or operator of the article on which the maintenance, preventive maintenance, or alteration was performed.

The Airworthiness Concept

Compliance through Certified Release Statement

Maintenance Release
Return to Service
Approved for Return to Service
Authorized Release Certificate
Airworthiness Release

A release can be certified as compliant by:

- ***The signature of the certificated "person"***
- ***A registered stamp of a certificated "person"***
- ***A registered electronic signature***
- ***The signature or stamp, by an approved Continuous Airworthiness Maintenance Program entity, may represent the airworthiness release in itself***

Maintenance Log Example

The above described maintenance is certified airworthy and a detailed record is on file under work order: **189652.** All Work Completed In Accordance With CL605 AMM, Revision 41 dated Aug. 30/2016.

I Certify That This Aircraft Has Been Inspected In Accordance With the CL605 TLMC, Revision 14 Dated Jun. 09/2016 and The CL605 MPD, Revision 14 Dated Jun. 09/2016 and That a 48/96 Month Itemized Threshold Inspection Was Complied With and Comply With The Requirement of 14CFR 91.409 f(3) and Is Approved For Return to Service.

The Airworthiness Concept

Compliance through Certified Release Statement

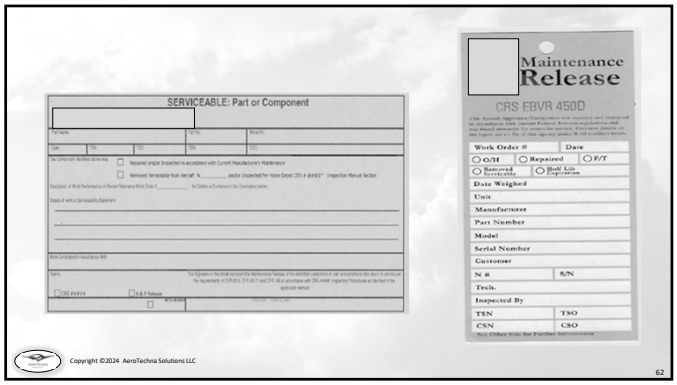
Maintenance Release
Return to Service
Approved for Return to Service
Authorized Release Certificate
Airworthiness Release

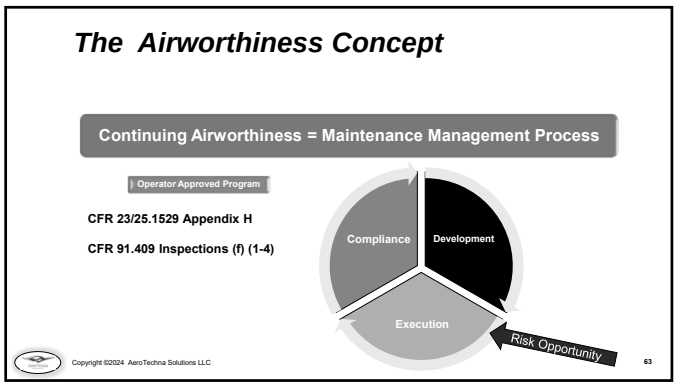
Authorized Release FAA Form 8130, EASA Form 1, "others formats"

FAA Form 8130-3 is titled "AUTHORIZED RELEASE CERTIFICATE / AIRWORTHINESS APPROVAL TAG" and can be used to approve an article for return to service after repair, overhaul, or inspection. It can also be used for the purpose of exporting engines, propellers or other aviation articles.

As an authorized release certificate, this form can be issued by FAR 145 repair stations, FAR 121 or 135 air carriers, or FAR 21 production approval holders.


AUTHORIZED RELEASE CERTIFICATE
FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG
FAA/United States
Details to include MRBR /MPD task(s) compliance, reference to work order, CMM, 8110-3, serviceability document, etc.
Copyright ©2024 AeroTechna Solutions LLC
61


SERVICEABLE: Part or Component
Maintenance Release
CRS EBVR 450D
Work Order #
Date
Date Weighed
Unit
Manufacturer
Part Number
Model
Serial Number
Customer
Tech.
Inspected By
TSN
TSO
CSN
CSO
Copyright ©2024 AeroTechna Solutions LLC
62


The Airworthiness Concept
Continuing Airworthiness = Maintenance Management Process
Operator Approved Program
CFR 23/25.1529 Appendix H
CFR 91.409 Inspections (f) (1-4)
Compliance
Development
Execution
Risk Opportunity
Copyright ©2024 AeroTechna Solutions LLC
63

The Airworthiness Concept

Regulation Essentials

Responsible for Airworthiness

CFR 91.403 - General

(a) The owner or operator of an aircraft is primarily responsible for maintaining that aircraft in an airworthy condition, including compliance with part 39 of this chapter.

The Airworthiness Concept

Regulation Essentials

- **91.405** , (b) Shall ensure that maintenance personnel make appropriate entries in the aircraft maintenance records indicating the aircraft has been approved for return to service
- **91.407** No person may operate any aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration **unless**
  (1) It has been approved for return to service by a person authorized under 43.7 of this chapter, and
  (2) The maintenance record entry required by 43.9 or 43.11, as applicable, of this chapter has been made.

Compliance by Certified Release Statement

"Perspectives" that frame the mind

Consequence of failure?

Consequence of failure

Engineering Design

2018 - Flight Control System
Maneuvering Characteristics Augmentation System

Error Source: *Type Certificate*

Fatal

Manufacturing

2024 - Structural Door Plug

Error Source: *Production Certificate*

Reputation nonfatal

67

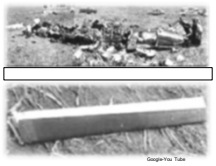
Consequence of failure

Maintenance

1991 - Missing fasteners for the horizontal leading edge

Error Source: *Airworthiness Certificate*

... there is no evidence from the morning preflight that the flight crew was aware of any of the work performed on the horizontal stabilizer.



Fatal

68

Consequence of failure

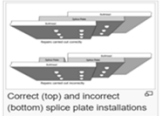
Maintenance - Latent Failure

1978 - Tail skin splice repair ...Failure 1985

➡

Error Source: *Airworthiness Certificate*

Simulated picture of tail loss



Correct (top) and incorrect (bottom) splice plate installations

Fatal

69

Consequence of failure

Maintenance – Improper repair

2000 - DC10 nonconformant repair strap fails and falls to runway

***Error Source**: Airworthiness Certificate*

DC10 TR Strap — **Failure Transfer** — Concorde

Fatal

70

Consequence of failure

Maintenance – Alteration

2007 - Vinyl registration number covers fuel vent

***Error Source**: Airworthiness Certificate*

Date: Wednesday 19 December 2007
Time: 18:00

Type: Cessna 510 Citation Mustang

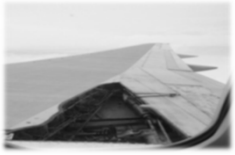
temporarily applied to the plastic sheet on the tail of the aircraft. Descending towards Pittsburgh-Allegheny County Airport, PA (AGC), while passing 18,000 feet the crew heard a bang and nothing unusual was noticed with the aircraft at that time. A short time later the left engine fuel pressure low light illuminated. During the review of the low fuel pressure procedures, the top of the left wing was observed to be distorted and a second bang was heard. The aircraft continued the descent and landed at AGC at 20:00 with no further incident. Inspection revealed the plastic covering the fuel vent and the Croatian registration numbers was still in place. The left wing's upper and lower skin making the upper and lower sections of the fuel tank was collapsed.

Damage, Reputation

71

Consequence of failure

How do you know when a quality escape will become catastrophic?

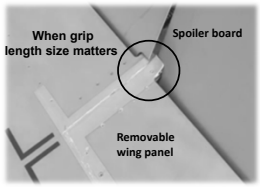


Are any quality escapes acceptable?

72

Consequence of failure

Spoiler board contacts upper wing panel



AOG Remote location

Passed 3 levels of quality assurance

Unairworthy

73

Consequence of failure

Inlet cowl retaining fastener unapproved repair

Airworthy?

Self-locking feature destroyed

Unairworthy

Economic burden; $10,000 nut plate

74

Consequence of failure

Intermittent caution message Crew Alerting System (CAS)

Economic burden extensive flight checks and downtime

75

Consequence of failure

Accidental damage – walk away

Maintenance access damage

Economic Burden

Ground handling damage gear squat switch

AOG Remote Location

76

"Perspective" Summary

There are many points of entry for a "quality escape" on an aircraft.

Consequences of a failure are random

"Quality escape" to failure mode can impact:

-Safety
-Operations
-Economics
-Passenger Expectations

77

ARE YOU SCARED?

78

Workshop

Aviation Maintenance Synopsis

AIR CHARTER SAFETY FOUNDATION

79

Aviation Maintenance Synopsis

Aircraft Work Activity

- **Scheduled tasks** - *mandatory*
- **Unscheduled tasks** - *mandatory*
- **Servicing tasks** – *mandatory*
- **Asset sustainment tasks** - *optional*

Approved "Person"

- **Manufacturer**
- **MRO – Repair Station**
- **CFR 121,125 & 135 Operator**
- **Airframe & Powerplant Technician**
  - *Company Employed*
  - *Independent Contractor*

80

Aviation Maintenance Synopsis

Work Elements

1. **Place to do the work**
2. **Qualified, Trained, Experienced**
3. **Tooling, Equipment, Parts, Materials**
4. **Information**
5. **Scheduled time to do the work**
6. **Record of work performed**

Human impact on the Socio-Technical Systems Environment

Provided by Google 2020

81

Aviation Maintenance Synopsis

Socio-Technical Systems Environment

The term **socio-technical systems** was originally coined by Emery and Trist (1960) to describe **systems** that involve a complex interaction between humans, machines and the **environmental** aspects of the work… Oxford Academic 2010

The interaction between people and technology in workplaces.

Maintenance Program Execution

- **An Art**
- **A Science**
- **A Philosophy**

Lindley R. Higgins, Maintenance engineering Handbook

Aviation Maintenance Synopsis

Socio-Technical Systems Environment

- **Risk Profile - Hazards**
- **Consequences - Nature of Risks**
- **Mitigation - *"Your Actions"***

Consider that Flight Operations – Dispatch/Scheduling – Maintenance:

- ***Are different environments***
- ***Use different tools***
- ***Have different hazards and consequences***
- ***Have different knowledge bases***
- ***Have different work behavioral and personal interaction profiles***
- ***Failures have different consequences***

Aviation Maintenance Synopsis

What is Maintenance Failure?

Maintenance Failures can be:

- ***Active***
- ***Potential***
- ***Latent***

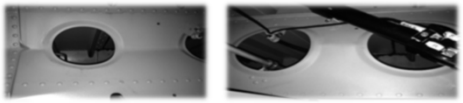
- **Technical** – related to: damage accident, part installation, workmanship, etc.
- **Compliance** – related to: record keeping, ICA requirements, approved parts or materials to include configuration (i.e., software), etc.

…and not all consequences are the same

Aviation Maintenance Synopsis

What is Maintenance Failure?

Aviation Maintenance Synopsis



What is an obvious “maintenance failure”?

Your experiences ? ...think of one.

Aviation Maintenance Synopsis

Performance Factors impacting probability of failure

- Knowledge base
- Experience
- Training
- *Tribal Rules*
- Tools
- Environment
- Motor Skills
- Critical Thinking Skills
- Detail Orientation
- Task Attitude
- Behavioral Preferences

Performance ⟷ Impacts

The Dirty Dozen

• Communication	• Lack of Resources
• Complacency	• Pressure
• Lack of Knowledge	• Assertiveness
• Distraction	• Stress
• Teamwork	• Lack of Awareness
• Fatigue	• Norms

Dirty Dozen- Human Error in Aircraft Maintenance — Federal Aviation Administration

Aviation Maintenance Synopsis

Managing the probability of failure

Safety Management System – (SMS)

Hazard: ***Object, situation, procedure, circumstance***, etc. which may bring a harmful or undesirable consequence to personal, environment or material, if engaged, exposed or experienced.

Risk: The ***probability*** of engaging, exposing or experiencing the hazard.

Risk Assessment: The ***process*** of assessing the probability and severity.

Risk Mitigation: ***Actions taken*** to reduce the risk exposure to an acceptable level.

Basic Safety Management:

Safety = Freedoms from unacceptable risk

88

Aviation Maintenance Synopsis

Common defects and errors leading to failures?

- **Non-compliance with ICA requirements**
- **Non-compliance with Type Design**
- **Creative maintenance**
- **Missing parts**
- **Incorrect parts, hardware, materials**
- **Poor workmanship**
- **Suspect unapproved parts**

89

Aviation Maintenance Synopsis

Be aware of the changing workforce performance and behaviors

90

Define Failure "Expectations"

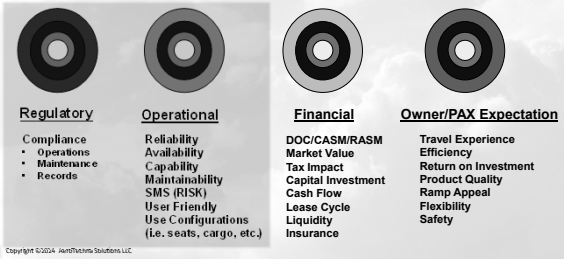
Do you have confidence with aircraft failure management?

Do you have a process and/or plan, …a thought process?

91

Define Failure Expectations

Target Failure Management Opportunities



Regulatory

Compliance
- Operations
- Maintenance
- Records

Operational

Reliability
Availability
Capability
Maintainability
SMS (RISK)
User Friendly
Use Configurations
(i.e. seats, cargo, etc.)

Financial

DOC/CASM/RASM
Market Value
Tax Impact
Capital Investment
Cash Flow
Lease Cycle
Liquidity
Insurance

Owner/PAX Expectation

Travel Experience
Efficiency
Return on Investment
Product Quality
Ramp Appeal
Flexibility
Safety

92

Define Failure Expectations

Failure behaviors

Active: any functional loss evident to the flight crew

Latent/Hidden: dormant system (example: electrostatic discharge induced to data cards)

Potential: the defect, error, mistake has not currently created a failure event

INDUCED BY:
- *Design*
- *Manufacturing*
- *Ground Support Equipment*
- *Operations*
- *Human Activity (i.e., maintenance, servicing, detailing, passenger use)*

How are these failures created ?

93

Define Failure Expectations

Quality Management "Life Cycle"

Type Certificate Holder management of safety related failures

Failure Source TCH/OEM	Oversight Mitigation Entity	Corrective Action Resources
Engineering	Audits by AIR	AD / SB / Modification Summary
Manufacturing	Audits by MIDO	AD / SB / Modification Summary
Maintenance	Audits by AED	AD / ICA Change (limits, scheduled, task procedure, etc.)

Operational management of safety related failures

Failure Source Maintenance	Oversight Mitigation Entity	Corrective Action Resources
TCH / OEM	Audits by AFS	AD/Procedural changes
Certified MRO / RS	Audits by AFS, Industry Groups	AD/Procedural changes
Certified Operator	Audits by AFS, Industry Groups	Procedural changes
Certified Individual	Audits by Industry Group or none	Procedural change or none

AFS- Flight Standards Services, **AIR** - Aircraft Certification Service
MIDO - manufacturing inspection district offices , **AED** - Aircraft Evaluation Division
CMO - Certificate Management Office
AD - Airworthiness Directive, **SB** - Service Bulletin, **ICA** Instruction for Continued Airworthiness

94

Define Failure Expectations

Aircraft Defects : TYPES

Physical DEFECTS

- Part/Item damaged = not to specification
- Manufacturing flaw = non-conformance to required standard
- Component failure = random infant mortality
- Wiring, plumbing, attachment = random accidental/environmental induced
- Operational flight damage = external random deformity
- Suspect Unapproved Parts = not to serviceable certification requirements
- Foreign Object Damage = not to operational cleanliness standards
- Ramp and hangar damage = operational neglect induced

95

Define Failure Expectations

Maintenance errors and mistakes: TYPES

ERRORS & MISTAKES

- Installation = not per ICA material requirements and/or specifications
- Design = not meeting regulatory standards 14 CFR 23 or 25
- Servicing = incorrect required material and/or quantity limits
- Maintenance = incomplete task steps, incorrect procedures used
- Tooling = incorrect tool, improper use, out of calibration
- Non-compliance = actions not taken per requirements
- Operational Negligence = required actions ignored/unknown

96

Define Failure Expectations

Rigorous layers of failure prevention and management

- Regulations (i.e., certification, operational, maintenance standards)
- Rigorous Engineering (i.e., design, simulation, testing, sampling)
- System Safety Assessments
- Critical Design Configuration Control Limitations
- Design Assurance Levels
- Functional Hazardous Assessments
- Failure Modes Effects Analysis

97

Define Failure Expectations

Rigorous layers of failure prevention and management

- Failure Reporting Corrective Action System
- Scheduled Maintenance – MSG-3 methodology
- Process to identify unsafe conditions ***(Airworthiness Directive Process)***
- Standard Operating Procedures
- Quality Assurance Programs
- Regulatory and Industry Auditing Standards
- Training Certifications

98

Define Failure Expectations

Mitigation tools per "Type Certificate"

Damage Tolerance Design

Functional Preservation

Crew Awareness

Crew Workload Avoidance

- Aircraft Flight Manual
- Operating Manuals
- Weight & Balance / Loading Manuals
- Crew Alerting System
- Placards & Warnings
- Designs in redundancy (i.e., Master Minimum Equipment List)
- Aircraft Health Monitoring and Data Systems
- **Scheduled Maintenance**

99

Define Failure Expectations

MSG-3 Scheduled Maintenance driven by risk mitigation

Regulatory Leaders: International Maintenance Review Board Policy Board

Regulatory Body representation for each National Aviation Authority where aircraft / rotor wing are being manufactured, **11** member countries) FAA, TCCA and EASA are primary leaders

Industry Leaders: A4A Maintenance Program Industry Group MPIG

Operators TCH Manufacturers Suppliers and Vendors

Industry Groups NBAA, SAE, IATA, NATA, GAMA, etc.

#1 GOAL = global standard level of acceptable risk = Safety

Increased: **Availability, Reliability, Maintainability**

Reduce: Cost, Maintenance Intrusion and Program Complexity

EXAMPLE: Hydrostatic testing of pressure cylinders: not effective – intrusive – destructive test- reduced maintenance intrusion and cost – no change in risk level

"Expectation" Summary

"Quality escape" can be physical defects, errors or mistakes.

Aircraft certification uses "failure management" mythologies.

Maintenance ICA activities do not institute a "failure management" methodology. !

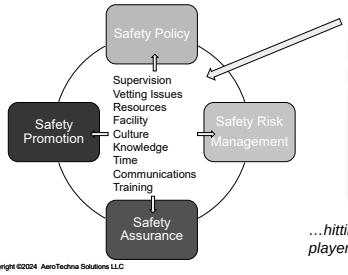
ICA – Instruction for Continued Airworthiness

Workshop

Aviation Maintenance SMS

Aviation Maintenance SMS

Mitigating Threats to Safety



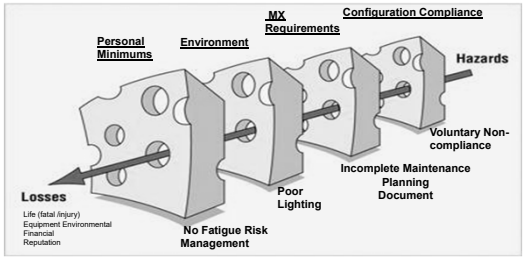
Are you playing Jarts?

…hitting the target or endangering the players

103

Aviation Maintenance SMS

Basic Aviation Maintenance Risk Profile



104

Probability and Severity

Sample Risk Assessment per MIL-STD-882E

SEVERITY LEVELS					LIKELIHOOD LEVELS				
					A	B	C	D	E
RATING	PHYSICAL INJURY	Operational Impact	DAMAGE TO ASSETS	DAMAGE TO CORPORATE REPUTATION	Improbable - Unlikely to occur, but possible.	Remote - Unlikely but can reasonably be expected to occur.	Occasional - Will occur several times.	Probable - Will occur often.	Frequent - Continuously experienced.
0	No Injury	No Effect	No Damage	No Implication					
1	Minor Injury	Minor Effect	Minor Damage <$25K	Limited Localized Implication					
2	Serious Injury	Moderate Effect	Substantial Damage <$150K	Regional Implication					
3	Single Fatality	Major Effect	Major Damage <$500K	National Implication					
4	Multiple Fatalities	Massive Effect	Catastrophic Damage ≥$500K	International Implication					

105

Aviation Maintenance SMS

Hazard List -Registry "source of harm"

- Impact hazard
- Loss of control
- Falling/slips/trips
- Fall from vehicle
- Vehicle braking loss
- Aircraft not configured for tow/taxi
- Personal operations hazard
- Etc.

Lack of, or poor maintenance release
Impact movement of aircraft/run-ups
Use of unqualified outsourced maintenance
Installation of SUPS (Suspected Unapproved Parts)
Lack of or poor lighting
Noisy work environment
Poor health of facility HVAC
Task Distraction
Technician Fatigue
Lack of Critical Communication
Lack of Training
Incorrect aircraft configuration
Defueling spills
Engine Thrust Damage
Falling Objects from Aircraft/Hangar
Inadequate instructions for tools and equipment
Inappropriate use of tools for the task
Lack of or unsafe equipment, tools and safety equipment
Lack of, or poor tool accountability
Mis-calibrated tools
Jacking Aviation- tipping, lowering on objects

106

Aviation Maintenance SMS

Top Threats:

- Communicating
- Compliance
  - Lack of compliance knowledge
  - Willful / purposeful / procedural non-compliance
- Distraction
- Tools and equipment; proper use and control
- Norms and "Tribal Rules"

107

Workshop

THE RISKY OPERATOR

Operator verses Operational Aircraft

AIR CHARTER SAFETY FOUNDATION

108

What's your very first thought about this?

109

The risky "operator"

Operator

How do we define "safety"?

Safety

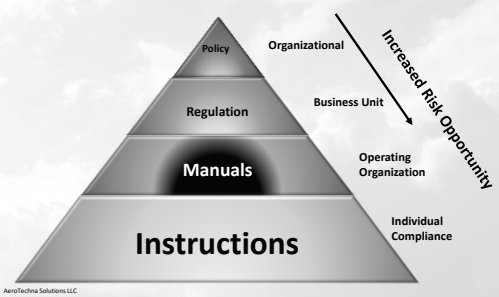
Risk Managment

Probability & Severity

"Freedom from unacceptable risk"

110

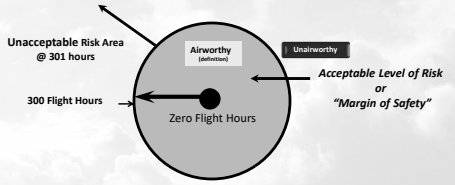
The risky "operator"



111

The risky "operator"

Safety Management and the Consumption of the Scheduled Maintenance Program



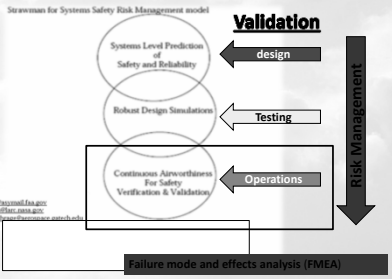
***Standards** Approved or Acceptable to the Administrator*

Set By Whom?

112

The risky aircraft "life cycle"

Systems Approach to System Safety Risk Assessment



113

The risky aircraft "life cycle"

The risky "operator"

Risk: Service Adjustment

2017-05-10 Airbus: Amendment 39-18821; Docket No. FAA-2016-9069; Directorate Identifier 2016-NM-012-AD.

(a) Effective Date

This AD is effective April 17, 2017.

(b) Affected ADs

This AD replaces AD 2015-16-02, Amendment 39-18227 (80 FR 48019, August 11, 2015) ("AD 2015-16-02").

(c) Applicability

This AD applies to Airbus Model A330-201, A330-202, A330-203, A330-223, A330-243, A330-223F, A330-243F, A330-301, A330-302, A330-303, A330-321, A330-322, A330-323, A330-341, A330-342, and A330-343 airplanes, certificated in any category, with an original certificate of airworthiness or original export certificate of airworthiness issued on or before October 19, 2015.

(d) Subject

Air Transport Association (ATA) of America Code 05, Time Limits/Maintenance Checks.

(e) Reason

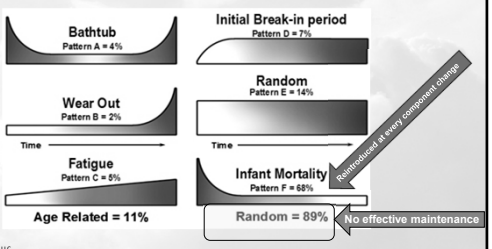
This AD was prompted by a revision of the airworthiness limitations items (ALI) document, which provides new and more restrictive maintenance requirements and airworthiness limitations for airplane structures and systems. We are issuing this AD to prevent reduced structural integrity and reduced control of these airplanes due to the failure of system components.

114

RCM 1978

The risky aircraft "life cycle"

Reliability Centered Maintenance: Component Failure Approach



115

Risk Class for "Severity"

Engineering-Certification	Engineering-Maintenance
Catastrophic	Safety - Evident
Hazardous	Safety - Hidden
Major	Operational Impact
Minor	Economic
No Safety Effect	Hidden non-Safety

116

Conclusion !

It is NOT safety at any cost….

IT'S FOCUSING ON "STRATEGIC MANAGEMENT"

117

Workshop

"Choices" and Risks

Can I choose an "acceptable level of risk"?

118

Escaping the "quality escape" and potential failure!

Active - Potential - Latent

What is in your scope of control?

119

Quality Escapes

120

Why do failures occur when there are rigorous layers of protection?

- Regulations (i.e., certification, operational, maintenance standards)
- Rigorous Engineering (i.e., design, simulation, testing, sampling)
- System Safety Assessments
- Critical Design Configuration Control Limitations
- Design Assurance Levels
- Functional Hazardous Assessments
- Failure Modes Effects Analysis
- Failure Reporting Corrective Action System
- Scheduled Maintenance – MSG-3 methodology
- Process to identify unsafe conditions *(Airworthiness Directive Process)*
- Standard Operating Procedures
- Quality Assurance Programs
- Regulatory and Industry Auditing Standards
- Training Certifications

Establish "Crucial Knowledge" requirements

- **An understanding of airworthiness**
- **Understanding the consequence of failure types**
- **Recognize the performance culture of your service providers**

- **Recognize that you could possibly create a situation with a professional that could result in a quality escape**
- **Align risk appetites with yours, the regulator, employer, owner and outsourced providers to ensure an "acceptable level of risk"**
- **Identify your aircraft's typical condition, configuration and system performance**

Failure ➡ Root Cause

- ***Human Performance:*** *communications, focus, precision, non-compliance, etc.*
- ***Material composition***
- ***Manufacturing tooling and process***
- ***Engineering limitations related to design science***
- ***Random environmental events***
- ***Infant mortality***
- ***Unapproved parts***

What is controllable and when?

What we <u>cannot</u> control during the return service of the aircraft ?

- Engineering defects or failures
- Structural repair engineering designs
- Inadequate Instructions for Continued Airworthiness
- Infant mortality
- Material property failure

But can we control human performance weaknesses ?

- Work disruption
- Distraction / Inattention
- Lack of knowledge
- Lack of experience
- Complacency
- Willful non-compliance / Negligence
- Social pressure
- Distraction
- Impaired judgement
- Arrogance or overconfidence
- Working for memory
- Inadequate skill level for the task

Personal Minimums vs Risk Appetite

Risk perspectives to consider yours vs your owners

- **Effort to find the mistake**
- **Effort to prevent the mistake**
- **Stop the culture of mistakes**
- **Normalize deviations to SOPS and ICAs**
- **Ignoring human factors**
- **Making your own rules**
- **Effort to staying current**

Aircraft Defects: Types

Physical DEFECTS

- Part/Item damaged = not to specification
- Manufacturing flaw = non-conformance to required standard
- Component failure = random infant mortality
- Wiring, plumbing, attachment = random accidental/environmental induced
- Operational flight damage = external random deformity
- Suspect Unapproved Parts = not to serviceable certification requirements
- Foreign Object Damage = not to operational cleanliness standards
- Ramp and hangar damage = operational neglect induced

Maintenance errors and mistakes

ERRORS & MISTAKES

- Installation = not per ICA material requirements and/or specifications
- Design = not meeting regulatory standards CFR 23 or 25
- Servicing = incorrect required material and/or quality limits
- Maintenance = incomplete task steps, incorrect procedures used
- Tooling = incorrect tool, improper use, out of calibration
- Non-compliance = actions not taken per requirements
- Operational Negligence = required actions ignored/unknown

Control Opportunities

- New/Pre owned Aircraft delivery procedures
- MRO Selection
- Return to service procedures
- Flight check procedures
- Post flight check after first Return to Service

What can you control ?

YOUR

…Maintenance source selection
…Risk appetite
…Standards and expectations
…Exposure to unnecessary maintenance
…Management of FOD
…Management of aircraft protection
…Managing negative behavioral influence
- **Work Interruptions**
- **Transferring emotional stress**

Choices and Risks

Most common "maintenance errors"

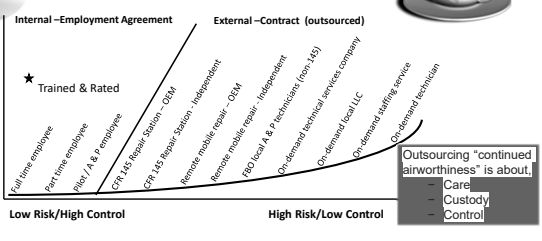
1. **ICA discontinuity** (Instruction for Continued Airworthiness)
2. **Noncompliance with Type Design**
3. **Self created maintenance procedures**
4. **Poor quality of workmanship**
5. **Improper (nonequivalent) tool used**
6. **Use of unapproved/expired materials**
7. **Use of suspect unapproved parts**

Most common "quality escapes"

1. **Cockpit flight configuration / damage**
2. **Elements of a system malfunctions**
3. **Missing items or parts**
4. **Servicing levels inaccurate**
5. **Damaged or missing hardware**
6. **Accidental damage structure and interior**
7. **Foreign Object Damage – *items left in aircraft***

Choices and Risks

Maintenance Options: Risk and Control



Outsourcing "continued airworthiness" is about,
- Care
- Custody
- Control

Maintenance Provider Audit

Standards

- Facilities and equipment
- Repair station authority and limitations versus actual practice, including controls over any deviation authority
- Personnel qualifications, training, and staffing levels
- Manuals and airworthiness data
- Continuity of work and supervision during personnel changes
- Supplier selection, approval, and surveillance
- Parts and materials handling
- Inspection and QC processes
- Tool adequacy and calibration
- Maintenance release process
- Defect reporting
- Records and recordkeeping procedures
- Return to service process

How to recognize compliancy

Talk about it . ..yes, it is an attitude but there are signs

Some of the actions that result from these attitudes:

- NOT Following Instructions
- Using wrong equipment or equipment that needs repair
- NOT looking
- NOT listening
- NOT recognizing limitations
- NOT paying attention
- Bypassing/Ignoring a rule or procedure
- Failing to use safeguards (ex. Protective equipment)
- NOT think of consequences
- Quality of task completion
- Inadequate aircraft protection and tool placement
- Etc.

Control maintenance failure exposer

Are your standards set high enough?

- Do you have Foreign Object Damage protocols?
- Should you establish your own Required Inspection Item, Critical Inspection, Independent Inspection criteria?
- Do you get regular debriefs related to the maintenance work scope?
- Do you brief on seasonal adjustments due to human behavior changes during weather extremes?
- Do you observe for risky “tribal rule” activities?

Control maintenance failure exposer

Have you read:

- **Aircraft Type Certificate Data Sheet**
- **Aircraft Maintenance Program Rules**
- **Aircraft Flight Manual (AFM)**
- **CFR 43 and 91 Regulations**

- SMS debrief risk assessment
- Completion of all AFM requirements
- Observation
- Ask questions
- Departure debrief related to service work
- Avoid a post maintenance departure preflight outside in the dark
- Maintenance Risk Assessment Tool

Choices and Risks

What are controllable procedural elements?

- **Post maintenance SMS briefing meeting**
- **Return to service document review process**
- **Maintenance release standards:**
  - **Weather**
  - **Time of day**
- **Flight check plan/profile, conditions and requirements, *as appropriate***
- **Subsequent flight "open panel" examination areas**

- **Aircraft delivery process:**
  - **AFM preflight precision**
  - **Cabin system checks**
  - **Loose equipment review**
  - **Open panel request**
- **Maintenance entity selection:**
  - **(MRO, A&P contractors)**
- **Delivery conditions related to:**
  - **Facility and aircraft access**
  - **Lighting**
  - **Weather**
  - **Power sources**
  - **FOD surveillance**

Choices and Risks

SMS Post Maintenance Debrief: Technical

1. What was the scope of scheduled maintenance?
2. What aircraft structure was repaired or removed?
3. What aircraft panels were removed?
4. What corrosion was found? …Level 1?, …Level 2?, …Level 3?
5. What components were removed and/or replaced?
6. What operational systems were interfered with?
7. What safety emergency systems had maintenance activity?
8. Were the fuel tanks opened for maintenance or inspection?
9. Was the aircraft placed on jacks for maintenance?
10. Was a hydraulic mule used during the maintenance?
11. Were circuit breakers pulled or reset? …which systems?
12. Were any ground engine runs performed?
13. Was any safety equipment removed or serviced? …which items?
14. Was the emergency exit door removed?
15. What interior maintenance was performed?
16. Was the cabin connectivity system checked after maintenance?
17. Were any customer cabin loose items removed?
18. Is the water and lavatory serviced?
19. Have the cabin waste containers been emptied?
20. Was a full service check and walk around completed? …with or without a light check? …interior and exterior?

Choices and Risks

SMS Post Maintenance Debrief: Operating Documents

1. Were any service bulletins completed that impact flight operations?
2. Were any modification completed that impact flight operations?
3. Was the content of the AFM changed?
4. Were any AFM supplements added?
5. Was the WT & BAL manual updated?
6. Was the Equipment List updated?
7. Was the FMS updated for weight/performance changes?
8. Was any software updated for aircraft systems and navigation?
9. Were any new placards installed?
10. Are there any new inspections resulting from structural repairs?
11. Are the aircraft records and documents onboard the aircraft?
12. Is the aircraft released from maintenance?
13. Anything else we should know about this maintenance event?

Choices and Risks

SMS Post MX Debrief

I am communicating to ensure our flight crew is aware of any post maintenance failure exposure resulting from the work performed. Thus, they should debrief in consideration of an SMS post maintenance review to assess possible induced additional risk levels.

The maintenance was nonintrusive, in that no significant disassembly or system interruptions were completed.

The CVR and EVAS (RH) components were replaced neither of which impacts the direct normal operation of the aircraft.

Additional attention during the preflight should be given to engine cowling latches, accidental/FOD damage to the engine and inlet/nacelle areas.

Water system filter was replaced thus attention to water system levels and notice of any leaks.
Cockpit was accessed thus attention to CB's and typical operational configuration standards is advised.
Please note any induced accidental damage on the interior and report to XXXX.

If you have any questions please free to contact myself or the XXX technical team.

Choices and Risks

SMS Post MX Debrief

Below is a recap of the significant work which relates to the safety with risk awareness, additionally system operational performance monitoring:

1. The inspections completed were not intrusive thus, very few areas experienced intrusive maintenance activities
2. Emergency Power supplies were removed and serviced - *monitor per post flight*
3. #2 & #3 accumulators found b-nuts under torqued- *monitor*
4. RH Nav light delamination was repaired and erosion tape replaced on lower winglet area - *monitor attachment*
5. LH down lock LDG assist actuator, B-nut found under torque - *monitor leak*
6. Total wing fuel quantity, all systems checked normal, gear struts found uneven height/pressure, reserviced- *monitor fueling*
7. Copilot windshield upper 12 inch section of seal repairs - *monitor attachment*
8. Fuel transfer system (93%) found normal- *monitor inflight*
9. Airshow loading software updated successfully- *monitor inflight*
10. VG Actuators 2 each on both engines have been replaced (failed SB check) - ***FLIGHT Monitor on TO and flight segments***
11. SB FMS Erroneous 650-34-015 CW - *info*
12. Belly Fairing Corrosion Prevention - Applied MODSUM IS604-53-0004, fairing required removal and reinstall - *monitor attachment*
13. Jump seat lock, OK locks per CMM with back rest locked -*monitor flight check*
14. Trash bin drawer binds, plastic bag lodged in mechanism- *monitor flight check*

I trust the above will provide information in the contact of SMS for the next flights. Please feel free to contact me with any questions.

Choices and Risks

Do you enable a "quality escape" by accepting these workforce standards?

- *Lack of knowledge, training and skill on the aircraft type*
- *Compliancy attitudes*
- *Chaotic environment*
- *Willful non-compliance with maintenance performance requirements*
- *Applying or transferring behavioral stress to direct performance*
- *Applying excessive time pressure to meet deadlines*
- *Lack of a "Just Culture" environment*

Avoid being that "**negative**" behavioral influence

142

Choices and Risks

How can you have an opportunity of control ?

- Ask the classic "dumb" questions
- Know the details of your aircraft
- Conduct SMS debriefs with specified crew
- Review AFM and AFM Supplements
- Observation for accidental damage
- Establish RII/ Critical Item task list
- Obtain an understanding of alterations and major repairs
- Obtain knowledge of what TCH documents are altered

Pre-maintenance and in-process mitigation actions

(RII – Required Inspection Items)

What is or could be different about the aircraft after a maintenance event?

143

Choices and Risks

How can you have an opportunity of control ?

- AFM compliance to include detailed preflight
- CAS *(crew alerting system)* bootup review
- Fault history review and clear
- Assessment of environmental conditions at delivery
- Departure debrief related to service work
- Post maintenance departure at the arrival location conduct an expanded postflight check
- Subsequent flight observation management for infant mortality on items recently replaced
- FOD management and protective covers audit
- Cabin audit and checks

Departure mitigation actions

What is or could be different about the aircraft after a maintenance event?

144

Choices and Risks

Bring the aircraft home in perfect condition for continued operations

1. **Recognize high risk environments and activities…**
2. **Manage your maintenance release policies/procedures…**

…to identify and discuss possible error chains!

145

"Choice" Summary

- **There are many entry points for "quality escapes"**
- **Failures by type design are <u>not</u> unexpected**
- **Failures by maintenance <u>are</u> unexpected with unpredicted outcomes**

Consider the Maintenance Risk Assessment Tool - MRAT

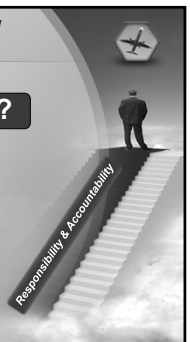
146

Safety is a Deliverable!

Is it time to evaluate your… ?

- **Perspectives**
- **Expectations**
- **Choices**

Critical Thinking is an activity!



147

Safety is a Deliverable!

Use active "Critical Thinking"

- What does think critically mean?
- **Critical thinking means** making reasoned judgments that are logical and well-thought out. It is a way of **thinking** in which you don't simply accept all arguments and conclusions you are exposed to but rather have an attitude involving questioning such arguments and conclusions. Study.com Dec 22, 2014

Use a systemic approach for random failure management

148

Safety is a Deliverable!

Use "CFO":

- ***Control***
- ***Focus***
- ***Organization***

149

Safety is a Deliverable!

Control: *establish your scope and limits of tolerance*

Focus: *establish a method to ensure monitoring and review*

Organization: *establish procedures of structure*

Care, Custody and Control !!!

Set accountable standards

150

Safety is a Deliverable!

Use "CFO":

Prepare for the "top events" during your "departure debrief"

- engine/power loss issues
- landing gear functionality
- loss of critical flight controls
- non-engine system/component failure

151

Safety is a Deliverable!

Use "CFO":

How to bring a "quality escape" to a failure

- Lack of knowledge for the situation
- Compliancy, as nothing ever goes wrong
- Not assuring comprehension
- Tolerating willful non-compliance
- Stress transfer to meet external expectations
- "Speed kills", going too fast
- No "Just Culture" environment

152

Safety is a Deliverable!

Use "CFO":

Thoughtful Considerations:

- Maintenance induces maintenance
- Seek end-to-end control
- Trust but verify

153

Safety is a Deliverable!

Take aways

- ***Complete a post maintenance SMS debrief***

"Quality escapes" are unacceptable !

Do you want to return to service a "quality escape"?

- ***Use a "Threat and Error" perspective***
- ***Be consistently precise***

154

Safety is a Deliverable!

If you are in the industry long enough you will see patterns related to performance, regulation and aircraft design.

Take responsibility be accountable for continuous improvement!

155

Safety is a Deliverable!

156

Safety is a Deliverable!

"To love what you do and feel that it matters -- how could anything be more fun?"

Katharine Graham

Thank you for your time to learn

157

END

?

158