Failure to Follow Procedures
Part 1

Maintenance Personnel
and Repair Stations

Presented to:
By:
Date:

PP 07020101

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Introduction

- Failure to Follow Procedures
- Causal Factors
- Maintenance Errors
- Registration at www.faasafety.gov
Overview

- FAASTeam introduction
- FAASafety.gov registration
- Regulation Overview
- Accident Scenario
- Maintenance Error Findings
- Chain of Events
- Safety Nets
- Safety Motivation
- Safety Tools
Objective

Provide awareness of risk associated with failing to follow procedures and prevention of contributing or causal factors so as to reduce maintenance errors.
Failure to Follow Procedures

January 17, 2007
Geographical Statistics Tool

This tool allows you to select any geographical or user information and retrieve statistical information based on your selections. When selecting geographic parameters, you may click the \( \times \) icon to remove a specific selection.

Distribution Criteria

User preference: Ignore All User Preferences

Total Distribution Statistics

- FAA Safety.gov Users: 35
- Users which are Opted Out: 0
- Total Emails to be Sent: 35
- Airmen from the Registry: 154
- Invalid Postal Addresses: 5
- Total Postcards to be Sent: 149
- Grand Total Notified: 184

Geographic Criteria

- Zip & Radius: 61265, 40 miles (Moline, IL)

Certificates and Ratings

- Click to Add or Remove Certificates & Ratings
- Include users with NO ratings selected
- ME (Mechanic with Airframe and Powerplant)

User Types

- Click to Add or Remove User Types
- All selected
Online Registration

Registration for FAASafety.gov is free! After registration and receipt of your temporary password, you’ll be able to customize your event notification preferences, as well as be automatically notified of new events in your area.

Registration Process

To begin the registration process, enter your email address and indicate whether you are a currently certificated airman in the box below. Please use an email address that you check frequently and have easy access to. We do not use your email address for purposes outside of FAASafety.gov. For more information regarding the FAA’s privacy policy, click here.

Don’t have an email address?

If you do not have an email address there are several freely available web based services. Click here to see a list of free providers.

(● indicates a required field, ○ indicates an error)

• Current Email Address
  If you do not have an email address, CLICK HERE.

• Are you an airman with a current certificate?
  You are NOT required to have a current certificate to register.
  ○ Yes  ○ No

Continue

System Requirements

In order to use the system we require that you have the following:

IE 5.5, Firefox 1.07, Netscape 7, or greater
A personal Email account that you have access to
Account Preferences

You may change any of your account preferences below.
(● indicates a required field, ❌ indicates an error)

**General**  **Certificates & Ratings**  **Password**  **Change Email Address**

### Home Page Event Zip Codes
These zip codes represent the events that will appear on your home page. This does not control which events you will receive by email.

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>Radius (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>53207</td>
<td>150</td>
</tr>
<tr>
<td>60520</td>
<td>50</td>
</tr>
</tbody>
</table>

### Email Preference Type
Most modern email clients support HTML. If unsure, select "plain text".

- HTML
- Plain text

### Email Notification Preferences
Select the types of notifications you wish to receive automatically.

- Airworthiness
- ATC Notices
- FAA Charting Information
- FAA Newsletters
- FAR Part 91/135 Turbojet Operators
- Flight Schools & CFIs
- General Information
- Local Air Safety Information
- Modified Event Notifications
- New Airspace Concerns
- New Event Notifications
- New faasafety.gov Features
- Repair Station
- Unapproved Parts Notification

To remove your FAASafety.gov account, click here.
Online Resources

Below you may find an organized list of various related links and web sites. Please select from below a category in which to browse online resources.

For information regarding the Visual Warning System, click here.

Resources for Pilots

Resources for Mechanics

Published Notices
Online Resources

Below is a list of online resources available in the Tools & Training Courses category. The FAA is not responsible for the contents of the non-government sites listed. The list is provided only as a convenience to the users of this site. Click here to return to the category list.

Aircraft and Avionics Equipment Mechanics and Service Technicians
This site provides information on the nature of the work done by aircraft and avionics equipment mechanics and service technicians.
- http://www.bls.gov/oco/cc0179.htm

Aviation Mechanic Schools
This site provides links to and information on aviation mechanic schools.
- http://www.flight-school.org/mechanicschools.html

Change of Address Notification
This link goes to the change of address notification form.
- http://www.faa.gov/licenses_certificates/armen_certification/update_address/

Electronic Maintenance Library
This link goes to an online maintenance library used by the FAA's Aircraft Maintenance and Engineering Division.

How to Become a Mechanic
This page goes to FAA's web pages on becoming an aviation mechanic.
- http://www.faa.gov/mechanics/become/

How to Become a Repairman
This link goes to FAA advisory circular AC 65-24 on procedures for certification as a repairman.

Human Factors in Aviation Maintenance and Inspection
Introduction

Overview

Life is full of decisions. Some (e.g., deciding what to wear to work) are so routine that we are hardly aware of making them. Others (e.g., changing jobs) take more effort because they have significant and lasting implications.

Flying is also full of decisions. Many appear to be routine, but even “small” decisions made in the cockpit can have a large impact on flight safety. Good aeronautical decision-making (ADM) is therefore an essential pilot skill.

This course offers a practical framework to help you develop this vital pilot skill and use it to stay safe in all of your flying activities. After completing the course, you will have a chance to practice with the flight scenarios that appear in Chapter 7.

At the end of the course is a short quiz drawn primarily from these scenarios. The point of the quiz is to give you a chance to practice making decisions about flight scenarios. Just as in the real world, there may not always be a single “right” answer to quiz questions. If your answer differs, you may want to discuss some of the questions and answers with a flight instructor or another pilot. The most important thing is to understand how, and why, you reached the answer you provided.

Course Table of Contents

Introduction

Chapter 1 – What is Aeronautical Decision-Making?

Chapter 2 – The 3-P Model for ADM
# Event Details and Registration

Below you will find the details for this event. You may register by clicking the "Register" link.

<table>
<thead>
<tr>
<th>Title</th>
<th>&quot;Garmin GNS 430 and 530 Basic Operation. Aeronautical Decision Making. Failure to follow Maintenance Procedures.&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>Garmin GNS 430 and 530 Basic Operation. Aeronautical Decision Making. Failure to follow maintenance procedures. The FAASTeam</td>
</tr>
<tr>
<td>Date and Time</td>
<td>Tuesday, November 14, 2006, starting at 7:00 pm</td>
</tr>
<tr>
<td>Speaker(s)</td>
<td>William Law, Scott R. Landorf and a Representative from Garmin</td>
</tr>
<tr>
<td>Brief Description</td>
<td>FAASTeam Operations Program Manager (William Law) will be discussing Aeronautical Decision Making and FAASTeam Airworthiness Program Manager (Scott R. Landorf) will be discussing the FAASTeam web site and failure to follow procedures in maintenance. Garmin will cover basic operations of the GNS430 and 530. Register on line at <a href="http://www.faa%C2%ADsafety.gov">www.faa­safety.gov</a></td>
</tr>
<tr>
<td>Select Number</td>
<td>GL0312268</td>
</tr>
<tr>
<td>Location of Event</td>
<td>Whiteside County Airport</td>
</tr>
<tr>
<td>Directions to Venue</td>
<td>10924 Hoover Road</td>
</tr>
<tr>
<td></td>
<td>Rock Falls, IL 61071</td>
</tr>
<tr>
<td>Fly-in Event?</td>
<td>Yes</td>
</tr>
<tr>
<td>Seating</td>
<td>100 seats at the facility, 75 remaining for online registration.</td>
</tr>
<tr>
<td>Registration</td>
<td><a href="#">Click here to register online now!</a></td>
</tr>
<tr>
<td>Venue</td>
<td>Whiteside County Airport is located 1/2 mile South of Interstate 88 on Highway 40, Rock Falls, Illinois.</td>
</tr>
<tr>
<td></td>
<td><a href="#">View Map</a></td>
</tr>
</tbody>
</table>
Mental Limits: Disassembly

Your task here is to remove these nuts from the bolt. Now reassemble them back into alphabetical order.

There is only one way to disassemble the nuts, but over 40,000 wrong ways to reassemble.
Lets Get Started

But before we do!
Regulatory Overview

First – Let us read from the good book of regulations
PERFORMANCE STANDARDS

• 14 CFR Part 43.13(a) requires all maintenance to be performed using the methods, techniques and practices prescribed in the current manufacturer’s maintenance manual.

• Tools and equipment and test apparatus in accordance with accepted industry practice and the manufacturer.
43.13 (continued)

• 14 CFR Part FAR 43.13(b) Each person maintaining an aircraft shall do that work in such a manner and use the materials of such a quality, that the condition of the aircraft, airframe, aircraft engine, propeller, or appliance worked on will be at least equal to it’s original or properly altered condition…
14 CFR Part FAR.43.13(c) A Part 121,127,129, or 135 Air Carriers operating manual and operation specifications are considered an acceptable means of complying with this section.
ADDITIONAL PERFORMANCE RULES FOR INSPECTIONS
14 CFR Part 43.15

(c) ANNUAL AND 100 HOUR INSPECTIONS.

(1) EACH PERSON PERFORMING AN ANNUAL OR 100 HOUR INSPECTION SHALL USE A CHECKLIST… THAT INCLUDES THE SCOPE AND DETAIL OF APPENDIX D OF (FAR PART 43).

(2) BEFORE APPROVING A RECIPROCATING ENGINE POWERED AIRCRAFT FOR RETURN TO SERVICE AFTER AN ANNUAL OR 100 HOUR, EACH PERSON SHALL RUN THE ENGINE(S) TO DETERMINE SATISFACTORY PERFORMANCE OF:

(i) POWER OUTPUT (STATIC AND IDLE R.P.M.)
(ii) MAGNETOS
(iii) FUEL AND OIL PRESSURE
(iv) CYLINDER AND OIL TEMPERATURE
ADDITIONAL PERFORMANCE RULES FOR INSPECTIONS
14 CFR Part 43.15 (cont)

(3) BEFORE APPROVING A TURBINE ENGINE POWERED AIRCRAFT FOR RETURN TO SERVICE AFTER AN ANNUAL OR 100 HOUR, EACH PERSON SHALL RUN THE ENGINE(S) TO CHECK SATISFACTORY PERFORMANCE IAW THE MANUFACTURER’S RECOMMENDATIONS.
Question

14 CFR Part 43.13 discusses?

1. Industry approved tools and when we have to use them.
2. Methods, techniques and practices.
Additional procedures may include:

- Service Bulletins
- Service Instructions
- Airworthiness Directives
- Type Certificate Data Sheets
- Supplemental Type Certificates
- Instructions for Continued Airworthiness
- Advisory Circulars (AC 43.13-1B etc.)
- Inspection procedures (Appendix D, Part 43)
- Air Carrier Procedures
Air Carrier procedures

- 14 CFR Part 121.367 requires each certificate holder to have an inspection program and a program covering other maintenance, preventive maintenance, and alterations that ensures that maintenance, preventive maintenance and alterations performed by it or by other persons are performed in accordance with the certificate holder’s manual.
Accident Statistics and Scenarios

• Lets look at National Statistics and an NTSB investigated accident that has identified failure to follow procedures as a causal factor.
Causes of Aviation Accidents

• Significant accident causes in 93 major airline accidents: (Graeber & Marx)
  33% – Pilot deviated from basic operational procedures
  26% – Inadequate cross-check by second crew member
  13% – Design faults

12% – Maintenance and inspection deficiencies

  10% – Absence of approach guidance
  10% – Captain ignored crew inputs
  9% – Air traffic control failures or errors
  9% – Improper crew response during abnormal conditions
  8% – Insufficient or incorrect weather information
  8% – Runways hazards
  7% – Air traffic control/crew communication deficiencies
  6% – Improper decision to land
National Aircraft Accidents Statistics

• 12% of all accidents are results of maintenance errors
NTSB Aviation Accident and Incident Data System (2001-2005)
Part 135 and Part 121 Reports by Subject
Maintenance Personnel Causes

- Maintenance, Installation: 12
- Maintenance Inspection: 6
- Maintenance: 5
- Maintenance, Service of Aircraft/Equipment: 3
- Maintenance, Service Bulletin/letter: 3
- Maintenance, Adjustment: 2
- Procedure/directive: 2
- Throttle/Power Control: 1
- Aircraft Preflight: 1
- Improper Use of Procedure: 1
- Ice/Frost Removal from Aircraft: 1
- Taxi Speed: 1

Failure to Follow Procedures
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Maintenance Related Accidents

Maintenance related accidents are a result of causal factors that include failure to follow procedures.

The failure to follow procedures can result in the death, injury, occupational illness of persons or damage to or loss of equipment, property or damage to the environment.
Aviation Accidents

Human Causes

Machine Causes

TIME

1903

Today

0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Human error is the unintentional act of performing a task incorrectly which can potentially degrade the system.
Human Error

Three types of human error:

– **Error of omission**
  - Not performing an act or behavior — just didn’t do it

– **Error of commission**
  - Performing a different act or behavior - not the norm

– **Extraneous error**
  - Performing an additional action - change from the norm
Human Error

Levels of consequence of human error

- Little or no effect
- Physical damage to equipment
- Personal injury
- Catastrophic event
Failure to Follow procedures are results of human errors related to:

- Lack of Knowledge
- Lack of Current Technical Data
- Lack of Experience
- Lack of Proper tools and equipment
- Lack of Training
- Lack of Proper preparation
- Lack of Resources
- Failure to take Safety Precautions
- Failure to research FAR’s
Flight 5481, January 8, 2003

Failure to Follow Procedures
January 17, 2007
Flight 5481, January 8, 2003

Beechcraft 1900D with 19 passengers/2 crew, lost pitch control during takeoff and crashed killing all onboard

Probable Cause: Airplane’s loss of pitch control during takeoff resulting from the incorrect rigging of the elevator control system compounded by the airplane’s aft center of gravity

Contributing Factors: Operator’s lack of oversight of the work being performed at the maintenance station, maintenance procedures and documentation, and weight and balance program. . .
Flight 5481, January 8, 2003

- The mechanic who adjusted the flight-control cables on the Beech 1900 turboprop was doing the job on that type of airplane for the first time, sources said. He expected an inspection by his supervisor. Whether the inspection ever occurred is part of the investigation.

- "(The mechanic) was told to do the job," the source said. "The inspector/supervisor told him some steps to follow and said he would watch him. But that guy was busy, inspecting and managing (and) trying to hold the operation together." At bigger maintenance bases, including some third-party shops, there is typically more support for a mechanic, including inspectors, more supervisors and experienced co-workers.
Failure to Follow Procedures
January 17, 2007

Detail 6 Inspection Work Card
(Aft fuselage/empennage)
- Nonspecific references
- Inadequate instructions

Aircraft Maintenance Manual
- Inapplicable steps
- Inadequate instructions
Cable Misrigged Altered Relation Between FDR Sensor and Elevator

- Rig pin holds elevator in one position
- Turnbuckles alter overall cable lengths
- FDR senses shift in column position
NTSB Findings

• Failure to follow procedures
  – Company
  – Manufacturer

• Failure to document actions

• Failure to communicate
  – Turnover process
  – Supervisory oversight
  – Regulatory oversight

• “Safety Culture”
NTSB Recommendations
Flight 5481

Manufacturers of Part 121 Aircraft: identify appropriate procedures for a complete functional check of each critical flight system; determine which maintenance procedures should be followed by such functional checks.

Manufacturers & Part 121 Air Carriers: modify existing maintenance manuals. to contain procedures at the end of maintenance for a complete functional check of each critical flight system.

Part 121 Air Carriers: implement a program in which air carriers and aircraft manufacturers review all work card and maintenance manual instructions for critical flight systems. ensure the accuracy and usability of these instructions to the level of training of the mechanics.
Chain of Events

Multiple contributing factors can lead to an accident.

- Training
- Current Data
- Supervision

Failure to follow procedures

Accident
Break the Chain of Events

Preventing any event could prevent the accident

If we can break the chain, the accident doesn’t happen
Preventive Measure

Break the chain of events by employing the performance standards set forth by regulatory, manufacturer’s and operator’s procedures.
Safety Nets

Employing the mechanism of performance standards to break the chain of events.

What Safety Nets Can we put in place to prevent a failure to follow procedures?
Safety Nets

- Perform the task to best of your abilities
- Perform the task to be equal to it’s original condition
- Perform the task in accordance with appropriate data
- Perform the task using methods, techniques and practices acceptable to industry and the administrator
- Perform the task without pressure, stress, and distractions
Safety Nets (cont.)

• Re-inspect or have someone inspect your work before return to service
• Make the proper record entries for the work performed
• Perform the operational checks in accordance with the manufacturer’s or air carrier’s approved procedures
Motivation

• Your motivation is to do the job to the best of your ability
• Self Regulation - Integrity
• Lower your risk - liability
• Pride in ownership – your character
• Professionalism - Responsibility
• Good for the company - profit and loss
• It’s just good business - Public Confidence
• Bottom line - Safety
SAFETY TOOL

Failure to Follow Procedures
January 17, 2007
Mental Limits: Reassembly

Your task is to reinstall these nuts on the bolt, placing them back into alphabetical order based on the elements of this presentation.

Prevention of Failure to Follow Procedures - Recognizing and managing contributing factors - Breaking the Chain of Events – Mitigating maintenance related accidents in aviation
Question Number 1 (Nut A)

• What Federal Aviation Regulation identifies the Performance Rules for persons performing maintenance?

• 14 CFR Part 43.13
Question Number 2 (Nut B)

- Performance Rules contained in 14 CFR Part 43.13 apply to what functions or tasks?
  - Maintenance, Alteration, or Preventive Maintenance
Question Number 3 (Nut C)

- Additional Performance Rules are found in what Federal Aviation Regulation?
  - Answer: 14 CFR Part 43.15
- Additional Performance Rules apply to what tasks or functions?
  - Answer: Inspection
Question # 4 (Nut D)

- What is the number 1 maintenance error that results in or contributes to aircraft accidents?
  - Answer: Failure to Follow Procedures

- National aircraft accident statistics indicate what percentage (%) of all aviation accidents are results of maintenance error?
  - Answer: 12%
Question number 5 (Nut E)

- The Chain of events that can lead to an accident. What four examples of those contributing factors have we looked at today?
  1. Training
  2. Current Data
  3. Supervision
  4. Failure to Follow Procedures
Question 6 (Nut F)

• What Safety Nets can we put in place to prevent a failure to follow procedures?
  1. Perform the task to the best of my abilities
  2. Perform the task to be equal to its original condition
  3. Perform the task IAW appropriate data
  4. Perform the task using acceptable techniques, methods and practices
Question number 7 (Nut G)

- Safety Motivation to perform your job to the best of your ability must include what practices and or traits?
  1. Self regulation – Integrity
  2. Lower your risk – Liability
  3. Pride in ownership – Your character
  4. Professionalism – Responsibility
  5. Bottom line - Safety
Final Question – Number 8 (Nut H)

- What safety tool can you employ to prevent or mitigate the likelihood of a failure to follow procedures?
Prevention of Failure to Follow Procedures

- Performance Rules 43.13
- Additional Performance Rules Inspection 43.15
- Chain of Events
- Safety Motivation
- 12% of Accidents
- Safety Nets
- Safety Tools

Failure to Follow Procedures
January 17, 2007
Summary:

- FAASTeam introduction
- FAASAFETY.GOV registration
- Regulation Overview
- Chain of Events
- Safety Nets
- Safety Motivation
- Safety Tools
The End