Risk Management Handbook

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Change 1 (January 2016)

U.S. Department of Transportation
FEDERAL AVIATION ADMINISTRATION
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Record of Changes

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This is an updated version of FAA-H-8083-2, Risk Management Handbook, dated January 2016. This version contains error corrections, revised graphics, and updated performance standards. All pages containing changes are marked with the change number and change date in the page footer. The original pagination has been maintained so that the revised pages may be replaced in lieu of repurchasing or reprinting the entire handbook. The changes made in this version are as follows:

- Updated Table of Contents page numbers (page ix).
- Revised the bottom paragraph of the right column of page 1-2, "…which lists cloud clearance in Class E airspace as 1,000 feet below, 500 feet above, and 2,000 feet horizontally…": changed to "…which lists cloud clearance in Class E airspace as 1,000 feet above, 500 feet below, and 2,000 feet horizontally...."
- Revised Figure 1-1 (page 1-4): changed "nautical" to "statute."
- Revised the third sentence of the third paragraph in the left column of page 3-9: changed "access" to "assess."
- Revised the third paragraph of the right column of page 7-3 to include "or Airman Certification Standards (ACS)."
- Revised the first paragraph of the left column of page 7-4 to include "or Airman Certification Standards (ACS)."
- Revised the second paragraph of the right column of page 7-4 to include "...or ACS..."
- Revised the first paragraph on page 8-1 to include "or Airman Certification Standards (ACS)."
- Revised the Glossary (page G-1) to include a definition of "Airman Certification Standards (ACS)."
- Revised the Index (page I-1) to include "Airman Certification Standards (ACS)."

Table of Contents

E = External Pressures

External pressures are influences external to the flight that create a sense of pressure to complete a flight—often at the expense of safety. Factors that can be external pressures include the following:

- Someone waiting at the airport for the flight's arrival
- A passenger the pilot does not want to disappoint
- The desire to demonstrate pilot qualifications
- The desire to impress someone (Probably the two most dangerous words in aviation are "Watch this!")
- Desire to satisfy a specific personal goal ("get-home-itis," "get-there-itis," and "let's-go-itis")
- A pilot's general goal-completion orientation
- The emotional pressure associated with acknowledging that skill and experience levels may be lower than a pilot would like them to be. (Pride can be a powerful external factor.)

The following accident offers an example of how external pressures influence a pilot. Two pilots were giving helicopter demonstrations at an air show. The first pilot demonstrated a barrel roll in front of the stands. Not to be outdone, the second pilot (with passengers) decided to execute a hammerhead type maneuver. Flying past the stands at 90 knots, the pilot pulled the helicopter into a steep climb that ended at about 200 feet. When the speed dissipated to near zero, he rolled back to the ground in a nose-low attitude to regain airspeed with the obvious intention of pulling the aircraft out of the dive near the ground. An error in judgment led to the pilot being unable to pull the helicopter out of the dive. The helicopter struck the ground, killing all onboard.

The desire to impress someone can be a powerful external pressure, especially when coupled with the internal pressure of pride. Perhaps the pilot decided to perform a maneuver not in his training profile, or one in which he had not demonstrated proficiency. It appears there was nothing in this pilot's experiences to help him effectively assess the high risk of this maneuver in an aircraft loaded with passengers. It is not uncommon to see people motivated by external pressures who are also driven internally by their own attitude.

Management of external pressure is the single most important key to risk management because it is the one risk factor category that can cause a pilot to ignore all other risk factors. External pressures place time-related pressure on the pilot and figure into a majority of accidents.

Helicopter Emergency Medical Service (HEMS) operations, unique due to the emergency nature of the mission, are an example of how external pressures influence pilots. Emergency medical services (EMS) pilots often ferry critically ill patients, and the pilot is driven by goal completion. In order to reduce the effect of this pressure, many EMS operators do not to notify the EMS pilot of the prospective patient's condition, but merely confine the location of the patient pickup and restrict the pilot's decision-making role to the response to the question "Can the pickup and transportation to the medical care center be made safely?" Risking three or four lives in an attempt to save one life is not a safe practice.

The use of personal standard operating procedures (SOPs) is one way to manage external pressures. The goal is to supply a release for the external pressures of a flight. These procedures include, but are not limited to:

- Allow time on a trip for an extra fuel stop or to make an unexpected landing because of weather.
- Have alternate plans for a late arrival or make backup airline reservations for must-be-there trips.
- For really important trips, plan to leave early enough so that there would still be time to drive to the destination.
- Advise those who are waiting at the destination that the arrival may be delayed. Know how to notify them when delays are encountered.
- Manage passenger expectations. Ensure passengers know that they might not arrive on a firm schedule, and if they must arrive by a certain time, they should make alternative plans.
- Eliminate pressure to return home, even on a casual day flight, by carrying a small overnight kit containing prescriptions, contact lens solutions, toiletries, or other necessities on every flight.

The key to managing external pressure is to be ready for and accept delays. Remember that people get delayed when traveling on airlines, driving a car, or taking a bus. The pilot's goal is to manage risk, not increase it.

Chapter Summary

Risk can be identified and mitigated by using checklists such as PAVE and IMSAFE. Accident data offers the opportunity to explain how pilots can use risk management to increase the safety of a flight.

More pilots now rely on automated flight planning tools and electronic databases for flight planning rather than planning the flight by the traditional methods of laying out charts, drawing the course, identifying navigation points (assuming a visual flight rules (VFR) flight), and using the pilot's operating handbook (POH) to figure out the weight and balance and performance charts. Whichever method a pilot chooses to plan a flight, it is important to remember to check and confirm calculations.

Most of the aviation community believes automation has made flying safer, but there is a fear that pilots fail to see that automation is a double-edged sword. Pilots need to understand the advantages of automation while being aware of its limitations. Experience has shown that automated systems can make some errors more evident while sometimes hiding other errors or making them less obvious. In 2005, the British Airline Pilots Association (BALPA) raised concerns about the way airline pilots are trained to depend upon automation. BALPA felt the current training leads to a lack of basic flying skills and inability to cope with an inflight emergency, especially mechanical failures. The union believes passenger safety could be at risk.

Cockpit Automation Study

Concerns about the effect of automation on flight skills are not new. In 1995, the erosion of manual flight skills due to automation was examined in a study designed by Patrick R. Veillette and R. Decker. Their conclusions are documented in "Differences in Aircrew Manual Skills and Automated and Conventional Flightdecks," published in the April 1995 edition of the Transportation Research Record, an academic journal of the National Research Council. In the February 2006 issue of Business and Commercial Aviation (BCA), Dr. Patrick R. Veillette returned to this topic in his article "Watching and Waning."

The Veillette-Decker seminal study on automation came at a time when automated flight decks were entering everyday line operations and concern was growing about some of the unanticipated side effects. Deterioration of basic pilot skills was one of these concerns. While automation made the promise of reducing human mistakes, in some instances it actually created larger errors. When this study was undertaken, the workload in an automated flight deck in the terminal environment actually seemed higher than in the older conventional flight decks. At other times, automation seemed to lull the flight crews into complacency. Fears arose that the manual flying skills of flight crews using automation deteriorated due to an overreliance on computers. In fact, BALPA voiced a fear that has dogged automation for years: that pilots using automation have less "stick and rudder" proficiency when those skills were needed to resume direct manual control of the aircraft.

Thus, the Veillette-Decker study sought to determine what, if any, possible differences exist in manual flight skills between aircrews assigned to conventional and automated flight decks. Limited to normal and abnormal operations in terminal airspace, it sought to determine the degree of difference in manual flying and navigational tracking skills. Commercial airline crew members flying the conventional transport aircraft or the automated version were observed during line-oriented flight training.

The data set included various aircraft parameters such as heading, altitude, airspeed, glideslope, and localizer deviations, as well as pilot control inputs. These were recorded during a variety of normal, abnormal, and emergency maneuvers during 4-hour simulator sessions. All experimental participants were commercial airline pilots holding airline transport pilot certificates. The control group was composed of pilots who flew an older version of a common twin-jet airliner equipped with analog instrumentation. The experimental group was composed of pilots who flew newer models of that same aircraft equipped with a first generation electronic flight instrument system (EFIS) and flight management system (FMS).

When pilots who had flown EFIS for several years were required to fly various maneuvers manually, the aircraft parameters and flight control inputs clearly showed some erosion of flying skills. During normal maneuvers, the EFIS group exhibited somewhat greater deviations than the conventional group. Most of the time, the deviations were within the Practical Test Standards (PTS) or Airman Certification Standards (ACS), but the pilots definitely did not keep on the localizer and glideslope as smoothly as the conventional group. The differences in hand-flying skills between the two groups became more significant during abnormal maneuvers such as steeper than normal visual approaches (slam-dunks).

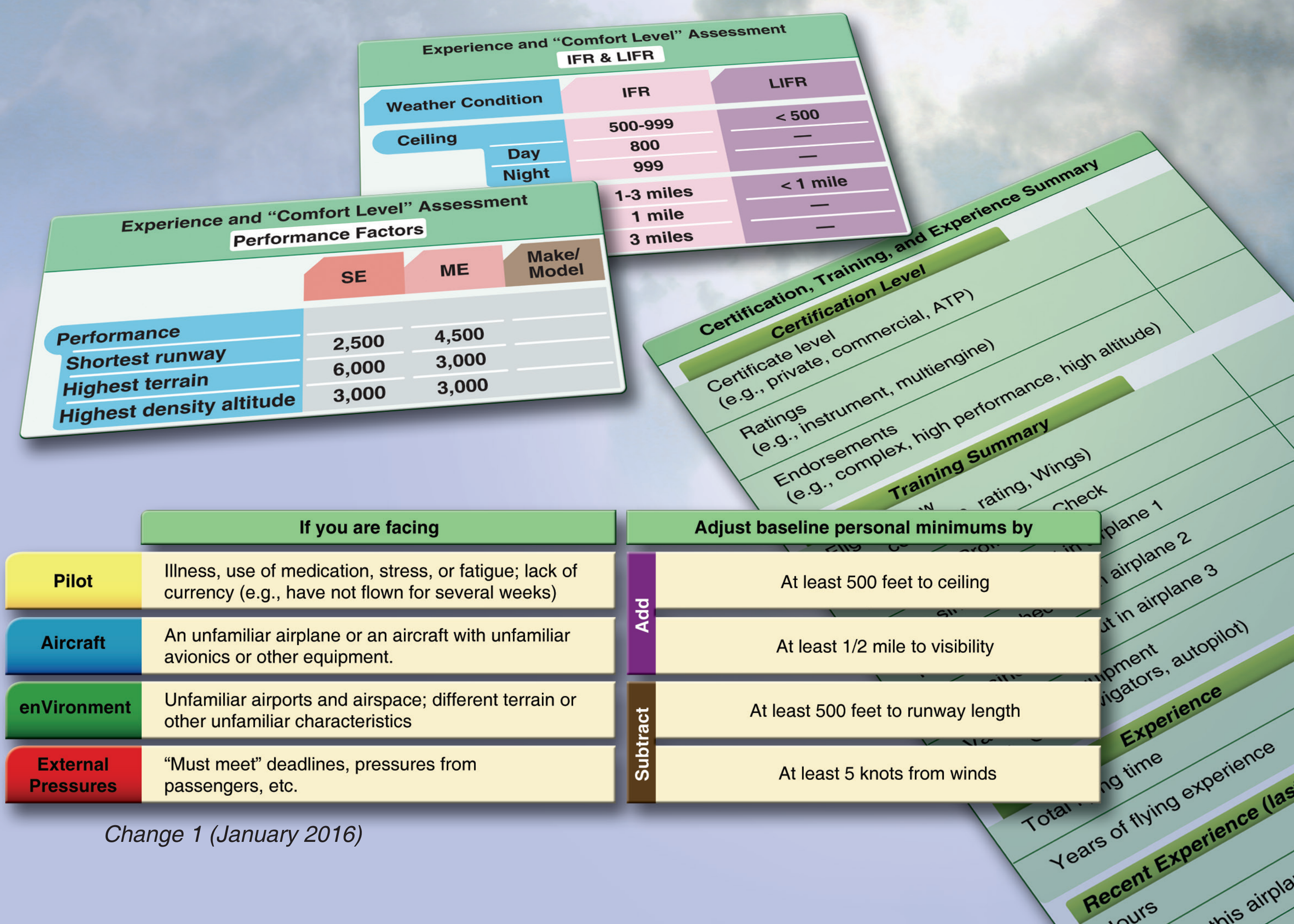
Analysis of the aircraft data consistently had pilots of automated aircraft exhibit greater deviations from assigned courses and aircraft state parameters, and greater deviations from normal pitch and bank attitudes, than the pilots of conventional flight deck aircraft. *[Figure 7-2]* The most

Chapter 8

Risk Management Training

Introduction

When introducing system safety to instructor pilots, the discussion invariably turns to the loss of traditional stick and rudder skills. The fear is that emphasis on items such as risk management, aeronautical decision-making (ADM), single-pilot resource management (SRM), and situational awareness detracts from the training that is so necessary in developing safe pilots. Also, because the Federal Aviation Administration's (FAA) current Practical Test Standards (PTS) or Airman Certification Standards (ACS) place so much emphasis on stick-and-rudder performance, there is concern that a shifting focus would leave flight students unprepared for that all-too-important check ride.



Glossary

14 CFR. See Title 14 of the Code of Federal Regulations.

Acceptable risk. That part of identified risk that is allowed to persist without further engineering or management action. Making this decision is a difficult yet necessary responsibility of the managing activity. This decision is made with full knowledge that it is the user who is exposed to this risk.

ADM. See aeronautical decision-making.

Aeronautical decision-making. A systematic approach to the mental process used consistently by pilots to determine the best course of action in response to a given set of circumstances. It is what a pilot intends to do based on the latest information he or she has.

Aerodynamics. The science of the action of air on an object, and with the motion of air on other gases. Aerodynamics deals with the production of lift by the aircraft, the relative wind, and the atmosphere.

Aircraft. A device that is used, or intended to be used, for flight.

A/FD. See Airport/Facility Directory.

Airman Certification Standards. A holistic, integrated presentation of specific knowledge, skills, and risk management elements and performance metrics for each Area of Operation and Task. The ACS defines what an applicant must know, consider, and do to pass the knowledge and practical tests for a certificate or rating.

Airplane Flight Manual (AFM). A document developed by the airplane manufacturer and approved by the Federal Aviation Administration (FAA). It is specific to a particular make and model airplane by serial number, and it contains operating procedures and limitations.

Airport/Facility Directory (A/FD). An FAA publication containing information on all airports, communications, and NAVAIDs.

ATC. Air Traffic Control.

Attitude management. The ability to recognize hazardous attitudes in oneself and the willingness to modify them as necessary through the application of an appropriate antidote thought.

Automated Surface Observing System (ASOS). Weather reporting system which provides surface observations every minute via digitized voice broadcasts and printed reports.

Automated Weather Observing System (AWOS). Automated weather reporting system consisting of various sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast weather data.

Automatic terminal information service (ATIS). The continuous broadcast of recorded non-control information in selected terminal areas. Its purpose is to improve controller effectiveness and relieve frequency congestion by automating repetitive transmission of essential but routine information.

Autopilot. An automatic flight control system that keeps an aircraft in level flight or on a set course. Automatic pilots can be directed by the pilot, or they may be coupled to a radio navigation signal.

Aviation medical examiner (AME). A physician with training in aviation medicine designated by the Civil Aerospace Medical Institute (CAMI).

Aviation Routine Weather Report (METAR). Observation of current surface weather reported in a standard international format.

AWOS. See Automated Weather Observing System.

Checklist. A tool that is used as a human factors aid in aviation safety. It is a systematic and sequential list of all operations that must be performed to accomplish a task properly.