Patuxent River Navy Flying Club



AERONAUTICAL DECISION MAKING

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INTRODUCTION

Aeronautical Decision Making (ADM)

- Background and History of ADM
- Risk Management
 - PAVE Checklist
- Human Factors and Behavior
- The Decision Making Process
 - The 5 Ps
 - The CARE Checklist
 - The TEAM Checklist
 - The DECIDE Model
- Decision Making in a Dynamic Environment
- Situational Awareness
- Automation

DEFINITION

Aeronautical Decision Making (ADM) is a systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances

Further information found in Aviation Circular 60-22, *Aeronautical Decision Making*.



Over 75% of all aviation accidents are "human factors" related

The "error chain"





Figure 2-1. The percentage of aviation accidents as they relate to the different phases of flight. Note that the greatest percentage of accidents take place during a minor percentage of the total flight.

BACKGROUND

Traditionally, pilots are well-trained to deal with emergencies requiring immediate, memorized response (covering the checklist)

Not as well trained to deal with situations requiring a more reflective response

HISTORY

Research into ADM led the FAA to require training to be produced.

- In 1987, six manuals were produced.
- Independent studies found that pilots that had received the training made 10% to 50% fewer judgment errors.
- Good judgment can be taught!

Steps for Good Decision-making:

- 1. Identifying personal attitudes hazardous to safe flight
- 2. Learning behavior modification techniques
- 3. Learning how to recognize and cope with stress
- 4. Developing risk assessment skills
- 5. Using all resources
- 6. Evaluating the effectiveness of one's ADM skills

RISK MANAGEMENT



PRINCIPLES OF RISK MANAGEMENT

- Accept no unnecessary risk.
- Make risk decisions at the appropriate level.
- Accept risk when benefits outweigh danger (cost).
- Integrate risk management into planning at all levels.

CRM & SRM

Crew Resource Management (CRM)

Single-pilot Resource Management (SRM)

- The art and science of managing all the resources (both onboard the aircraft and from outside sources) available to a single pilot (prior to and during flight) to ensure the successful outcome of the flight.
- SRM includes:
 - Aeronautical Decision Making
 - Risk Management
 - Task Management
 - Automation Management
 - Controlled Flight into Terrain Awareness
 - Situational Awareness

CRM IN PRACTICE

http://www.youtube.com/watch?v=qh42k3K vxck

HAZARDOUS ATTITUDES AND ANTIDOTES

The Five Hazardous Attitudes	Antidote
Anti-authority: "Don't tell me." This attitude is found in people who do not like anyone telling them what to do. In a sense, they are saying, "No one can tell me what to do." They may be resentful of having someone tell them what to do or may regard rules, regulations, and procedures as silly or unnecessary. However, it is always your prerogative to question authority if you feel it is in error.	Follow the rules. They are usually right.
Impulsivity: "Do it quickly." This is the attitude of people who frequently feel the need to do something, anything, immediately. They do not stop to think about what they are about to do, they do not select the best alternative, and they do the first thing that comes to mind.	Not so fast. Think first.
Invulnerability: "It won't happen to me." Many people falsely believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. However, they never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk.	It could happen to me.
Macho: "I can do it." Pilots who are always trying to prove that they are better than anyone else think, "I can do it—I'll show them." Pilots with this type of attitude will try to prove themselves by taking risks in order to impress others. While this pattern is thought to be a male characteristic, women are equally susceptible.	Taking chances is foolish.
Resignation: "What's the use?" Pilots who think, "What's the use?" do not see themselves as being able to make a great deal of difference in what happens to them. When things go well, the pilot is apt to think that it is good luck. When things go badly, the pilot may feel that someone is out to get them or attribute it to bad luck. The pilot will leave the action to others, for better or worse. Sometimes, such pilots will even go along with unreasonable requests just to be a "nice guy."	I'm not helpless. I can make a difference.

THE RISK MATRIX



- Probable—an event will occur several times
- Occasional—an event will probably occur sometime
- Remote—an event is unlikely to occur, but is possible
- Improbable—an event is highly unlikely to occur

- Catastrophic—results in fatalities, total loss
- Critical—severe injury, major damage
- Marginal—minor injury, minor damage
- Negligible—less than minor injury, less than minor system damage

PILOT SELF-ASSESSMENT



Ilness—Do I have any symptoms?

Medication—Have I been taking prescription or over-the-counter drugs?

Stress—Am I under psychological pressure from the job? Worried about financial matters, health problems, or family discord?

Alcohol—Have I been drinking within 8 hours? Within 24 hours?

Fatigue—Am I tired and not adequately rested?

Eating—Am I adequately nourished?

THE PAVE CHECKLIST

Pilot in Command – IMSAFE Checklist Aircraft

- What limitations will the aircraft impose upon the trip?
 - Familiarity
 - Fuel
 - Load carrying capacity
 - Navigation and Communications

EnVironment

- Weather
- Terrain
- Airport
- Airspace
- Nighttime

External Pressures

- Influences external to the flight that create a sense of pressure to complete a flight—often at the expense of safety.
- PIC needs to manage expectations.

HUMAN FACTORS AND BEHAVIOR

Human Factors - a multidisciplinary field incorporating contributions from psychology, engineering, industrial design, statistics, operations research, and anthropometry (understanding human capability)

Traits of pilots prone to having accidents:

- Have disdain toward rules
- Have very high correlation between accidents on their flying records and safety violations on their driving records
- Frequently fall into the "thrill and adventure seeking" personality category
- Are impulsive rather than methodical and disciplined, both in their information gathering and in the speed and selection of actions to be taken
- Have a disregard for or tend to under-utilize outside sources of information, including copilots, flight attendants, flight service personnel, flight instructors, and ATC



Done at:

- Preflight
- Pre-takeoff
- Hourly or at mid-point of the flight
- Pre-descent
- Prior to entering the traffic pattern

The 3P Model

- Perceive the given set of circumstance for a flight.
- **Process** by evaluating their impact on flight safety.
- **Perform** by Implementing the best course of action.
- Evaluate

The six step of risk management (slide 8) can be implemented through the use of the 3P model while accomplishing:

- Perceive \rightarrow PAVE Checklist (slide 15)
- Process \rightarrow CARE Checklist (slide 19)
- Perform \rightarrow TEAM Checklist (slide 20)

The CARE Checklist (the Process step)

- Consequences departing after a full workday creates fatigue and pressure
- Alternatives delay until morning; reschedule meeting; drive
- Reality dangers and distractions of fatigue could lead to an accident
- External pressures business meeting at destination might influence me

TEAM Checklist: Choose and Implement Risk Controls Perceive the given set of circumstance for a flight. (The Perform Step)

- Transfer Should this risk decision be transferred to someone else (e.g., do you need to consult the chief flight instructor?)
- Eliminate Is there a way to eliminate the hazard?
- Accept Do the benefits of accepting risk outweigh the costs?
- **Mitigate** What can you do to mitigate the risk?

The DECIDE model

- 1. Detect. The decision maker detects the fact that change has occurred.
- 2. Estimate. The decision maker estimates the need to counter or react to the change.
- 3. Choose. The decision maker chooses a desirable outcome (in terms of success) for the flight.
- 4 Identify. The decision maker identifies actions which could successfully control the change.
- 5. Do. The decision maker takes the necessary action.
- 6. Evaluate. The decision maker evaluates the effect(s) of his/her action countering the change.



DECISION MAKING IN A DYNAMIC ENVIRONMENT

Automatic Decision Making — reflexive style based on patterns and experience

Operational Pitfalls — development of behavior patterns contrary to safety, despite experience. (see the next slide)

Stress Management — the key to stress management is to stop, think, and analyze before jumping to a conclusion.

Use of Resources

- Internal
 - Thorough understanding of all aircraft equipment and systems
 - Checklists
 - Airplane Flight Manual/Pilot's Operating Handbook
 - Aeronautical Charts
 - Airport Facility Directory
 - Passengers
- External
 - Air traffic controllers
 - Flight service specialists

OPERATIONAL PITFALLS

Peer Pressure

Mind Set

Get-There-itis

Scud Running

Continuing VFR into Instrument Conditions

Getting Behind the Aircraft

Loss of Positional or Situational Awareness

Operating Without Adequate Fuel Reserves

Flying Outside the Envelope

Neglect of Flight Planning, Preflight Inspections, and Checklists

SITUATIONAL AWARENESS

FAA Definition: The accurate perception and understanding of all the factors and conditions within the five fundamental risk elements (flight, pilot, aircraft, environment, and type of operation that comprise any given aviation situation) that affect safety before, during, and after the flight.

Example: Monitoring ATC communications can build SA.

Obstacles to Maintaining SA

- Fatigue & Stress
- Distraction

Workload Management

- Accomplished by planning, prioritizing, and sequencing tasks
- Learn to recognize task saturation.

Managing Risks — aided by procedures and checklists

WORKLOAD MANAGEMENT

Staying ahead of the aircraft

Prioritization of tasks – "Aviate, Navigate, Communicate"

Recognizing task saturation



MANAGING AUTOMATION

Technically Advanced Aircraft (TAA)

- Primary Flight Display (PFD)
- Multifunction Display (MFD)
- GPS
- Fully-integrated autopilot



MANAGING AUTOMATION

The following are two simple rules for use of an Electronic Flight Display (EFD):

• Be able to fly the aircraft to the standards in the Aircraft Certification Standards (ACS).

• Read and understand the installed electronic flight systems manuals to include the use of the autopilot and the other onboard electronic management tools.

The FAA advanced avionics aircraft safety study found that poor decision-making seems to afflict new advanced avionics pilots at a rate higher than that of GA as a whole.

MANAGING AUTOMATION

Ways to maintain good SA:

- Perform callouts when running checklists.
- Perform verification check of all programming. Before departure, check all information programmed while on the ground.

• Check the flight routing. Before departure, ensure all routing matches the planned flight route. Enter the planned route and legs, to include headings and leg length, on a paper log. Use this log to evaluate what has been programmed. If the two do not match, do not assume the computer data is correct, double check the computer entry.

- Verify waypoints.
- Make use of all onboard navigation equipment. For example, use VOR to back up GPS and vice versa.
- Match the use of the automated system with pilot proficiency. Stay within personal limitations.
- Plan a realistic flight route to maintain situational awareness. For example, although the onboard equipment allows a direct flight from Denver, Colorado, to Destin, Florida, the likelihood of rerouting around Eglin Air Force Base's airspace is high.
- Be ready to verify computer data entries. For example, incorrect keystrokes could lead to loss of situational awareness because the pilot may not recognize errors made during a high workload period.

GOING TO DESTIN, FL?



SUMMARY

How to integrate all of this:

- Preflight a good time to do risk assessment and management
 - PAVE
 - IMSAFE
 - CARE
 - TEAM
- Inflight
 - 5 Ps done with checklists
 - DECIDE at decision points
- SRM
 - Keep SA high
 - Be the Pilot in Command