CRM TRAINING

Excerpts From

FAA-H-8083-9

AVIATION INSTRUCTOR'S HANDBOOK

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Excerpts From FAA-H-8083-9 - AVIATION INSTRUCTOR'S HANDBOOK

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The Aviation Instructor's Handbook is designed for ground instructors, flight instructors, and aviation maintenance instructors. It is developed by the Flight Standards Service, Airman Testing Standards Branch in cooperation with aviation educators and industry. This handbook provides the foundation for beginning instructors to understand and apply the fundamentals of instructing. This handbook also provides aviation instructors with up-to-date information on learning and teaching, and how to relate this information to the task of conveying aeronautical knowledge and skills to students. Experienced aviation instructors also may find the new and updated information useful for improving their effectiveness in training activities.

AERONAUTICAL DECISION MAKING

Aeronautical decision making (ADM) is a systematic approach to the mental process used by aircraft pilots to consistently determine the best course of action in response to a given set of circumstances. The importance of teaching students effective ADM skills can not be overemphasized. The flight instructor can make a difference! While progress is continually being made in the advancement of pilot training methods, aircraft equipment and systems, and services for pilots, accidents still occur. Despite all the changes in technology to improve flight safety, one factor remains the same-the human factor. It is estimated that approximately 75% of all aviation accidents are human factors related.

Historically, the term pilot error has been used to describe the causes of these accidents. Pilot error means that an action or decision made by the pilot was the cause of, or contributing factor which lead to, the accident. This definition also includes the pilot's failure to make a decision or take action. From a broader perspective, the phrase "human factors related" more aptly describes these accidents since it is usually not a single decision that leads to an accident, but a chain of events triggered by a number of factors.

The poor judgment chain, sometimes referred to as the error chain, is a term used to describe this concept of contributing factors in a human factors related accident. Breaking one link in the chain normally is all that is necessary to change the outcome of the sequence of events. The best way to illustrate this concept to students is to discuss specific situations which lead to aircraft accidents or incidents. The following is an example of the type of scenario which can be presented to students to illustrate the poor judgment chain.

A private pilot, who had logged 100 hours of flight time, made a precautionary landing on a narrow dirt runway at a private airport. The pilot lost directional control during landing and swerved off the runway into the grass. A witness recalled later that the airplane appeared to be too high and fast on final approach, and speculated the pilot was having difficulty controlling the airplane in high winds. The weather at the time of the incident was reported as marginal VFR due to rain showers and thunderstorms. When the airplane was fueled the following morning, 60 gallons of fuel were required to fill the 62-gallon capacity tanks.

By discussing the events that led to this incident, instructors can help students understand how a series of judgmental errors contributed to the final outcome of this flight. For example, one of the first elements that affected the pilot's flight was a decision regarding the weather. On the morning of the flight, the pilot was running late, and having acquired a computer printout of the forecast the night before, he did not bother to obtain a briefing from flight service before his departure.

A flight planning decision also played a part in this poor judgment chain. The pilot calculated total fuel requirements for the trip based on a rule-of-thumb figure he had used previously for another airplane. He did not use the fuel tables printed in the pilot's operating handbook for the airplane he was flying on this trip. After reaching his destination, the pilot did not request refueling. Based on his original calculations, he believed sufficient fuel remained for the flight home.
Failing to recognize his own limitations was another factor that led the pilot one step closer to the unfortunate conclusion of his journey. In the presence of deteriorating weather, he departed for the flight home at 5:00 in the afternoon. He did not consider how fatigue and lack of extensive night flying experience could affect the flight. As the flight continued, the weather along the route grew increasingly hazardous. Since the airplane's fuel supply was almost exhausted, the pilot no longer had the option of diverting to avoid rapidly developing thunderstorms. With few alternatives left, he was forced to land at the nearest airfield available, a small private airport with one narrow dirt runway. Due to the gusty wind conditions and the pilot's limited experience, the approach and landing were difficult. After touchdown, the pilot lost directional control and the airplane finally came to a stop in the grass several yards to the side of the runway.
On numerous occasions during the flight, the pilot could have made effective decisions which may have prevented this incident. However, as the chain of events unfolded, each poor decision left him with fewer and fewer options. Teaching pilots to make sound decisions is the key to preventing accidents. Traditional pilot instruction has emphasized flying skills, knowledge of the aircraft, and familiarity with regulations. ADM training focuses on the decision-making process and the factors that affect a pilot's ability to make effective choices.

ORIGINS OF ADM TRAINING

The airlines developed some of the first training programs that focused on improving aeronautical decision making. Human factors-related accidents motivated the airline industry to implement crew resource management (CRM) training for flight crews. The focus of CRM programs is the effective use of all available resources; human resources, hardware, and information. Human resources include all groups routinely working with the cockpit crew (or pilot) who are involved in decisions which are required to operate a flight safely. These groups include, but are not limited to: dispatchers, cabin crewmembers, maintenance personnel, and air traffic controllers. Although the CRM concept originated as airlines developed ways of facilitating crew cooperation to improve decision making in the cockpit, CRM principles, such as workload management, situational awareness, communication, the leadership role of the captain, and crewmember coordination have direct application to the general aviation cockpit. This also includes single pilots since pilots of small aircraft, as well as crews of larger aircraft, must make effective use of all available resources-human resources, hardware, and information.
Crew resource management training has proven extremely successful in reducing accidents, and airlines typically introduce CRM concepts during initial indoctrination of new hires. Instructors in the general aviation environment can learn from this example

when conducting ADM training. In the past, some students were introduced to ADM concepts toward the completion of their training or not at all. It is important that these concepts be incorporated throughout the entire training course for all levels of students; private, instrument, commercial, multi-engine, and ATP. Instructors, as well as students, also can refer to AC 60-22, Aeronautical Decision Making, which provides background references, definitions, and other pertinent information about ADM training in the general aviation environment.

These terms explain concepts used in ADM training.

DEFINITIONS

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.

ATTITUDE is a personal motivational predisposition to respond to persons, situations, or events in a given manner that can, nevertheless, be changed or modified through training as sort of a mental shortcut to decision making.

ATTITUDE MANAGEMENT is the ability to recognize hazardous attitudes in oneself and the willingness to modify them as necessary through the application of an appropriate antidote thought.

CREW RESOURCE MANAGEMENT is the application of team management concepts in the flight deck environment. It was initially known as cockpit resource management, but as CRM programs evolved to include cabin crews, maintenance personnel, and others, the phrase crew resource management was adopted. This includes single pilots, as in most general aviation aircraft. Pilots of small aircraft, as well as crews of larger aircraft, must make effective use of all available resources; human resources, hardware, and information. A current definition includes all groups routinely working with the cockpit crew who are involved in decisions required to operate a flight safely. These groups include, but are not limited to pilots, dispatchers, cabin crewmembers, maintenance personnel, and air traffic controllers. CRM is one way of addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities.

HEADWORK is required to accomplish a conscious, rational thought process when making decisions. Good decision making involves risk identification and assessment, information processing, and problem solving.

JUDGMENT is the mental process of recognizing and analyzing all pertinent information in a particular situation, a rational evaluation of alternative actions in response to it, and a timely decision on which action to take.

PERSONALITY is the embodiment of personal traits and characteristics of an individual that are set at a very early age and extremely resistant to change.

POOR JUDGMENT CHAIN is a series of mistakes that may lead to an accident or incident. Two basic principles generally associated with the creation of a poor judgment chain are: (1) One bad decision often leads to another; and (2) as a string of bad decisions grows, it reduces the number of subsequent alternatives for continued safe flight. ADM is intended to break the poor judgment chain before it can cause an accident or incident.

RISK MANAGEMENT is the part of the decision making process which relies on situational awareness, problem recognition, and good judgment to reduce risks associated with each flight.

RISK ELEMENTS IN ADM take into consideration the four fundamental risk elements: the pilot, the aircraft, the environment, and the type of operation that comprise any given aviation situation.

SITUATIONAL AWARENESS is the accurate perception and understanding of all the factors and conditions within the four fundamental risk elements that affect safety before, during, and after the flight.

SKILLS and PROCEDURES are the procedural, psychomotor, and perceptual skills used to control a specific aircraft or its systems. They are the stick and rudder or airmanship abilities that are gained through conventional training, are perfected, and become almost automatic through experience.

STRESS MANAGEMENT is the personal analysis of the kinds of stress experienced while flying, the application of appropriate stress assessment tools, and other coping mechanisms.

THE DECISION-MAKING PROCESS

An understanding of the decision-making process provides students with a foundation for developing ADM skills. Some situations, such as engine failures, require a pilot to respond immediately using established procedures with little time for detailed analysis. Traditionally, pilots have been well trained to react to emergencies, but are not as well prepared to make decisions which require a more reflective response. Typically during a flight, the pilot has time to examine any changes which occur, gather information, and assess risk before reaching a decision. The steps leading to this conclusion constitute the decision-making process. When the decision-making process is presented to students, it is essential to discuss how the process applies to an actual flight situation. To explain the decision-making process, the instructor can introduce the following steps with the accompanying scenario that places the student in the position of making a decision about a typical flight situation.

DEFINING THE PROBLEM

Problem definition is the first step in the decision-making process. Defining the problem begins with recognizing that a change has occurred or that an expected change did not occur. A problem is perceived first by the senses, then is distinguished through insight and experience. These same abilities, as well as an objective analysis of all available information, are used to determine the exact nature and severity of the problem.

One critical error that can be made during the decision-making process is incorrectly defining the problem. For example, failure of a landing-gear-extended light to illuminate could indicate that the gear is not down and locked into place or it could mean the bulb is burned out. The actions to be taken in each of these circumstances would be significantly different. Fixating on a problem that does not exist can divert the pilot's attention from important tasks. The pilot's failure to maintain an awareness of the circumstances regarding the flight now becomes the problem. This is why once an initial assumption is made regarding the problem, other sources must be used to verify that the pilot's conclusion is correct.

While on a cross-country flight, you discover that your time en route between two checkpoints is significantly longer than the time you had originally calculated. By noticing this discrepancy, you have recognized a change. Based on your insight, cross-country flying experience, and your knowledge of weather systems, you consider the possibility that you have an increased headwind. You verify that your original calculations are correct and consider factors which may have lengthened the time between checkpoints, such as a climb or deviation off course. To determine if there is a change in the winds aloft forecast and to check recent pilot reports, you contact Flight Watch. After weighing each information source, you conclude that your headwind has increased. To determine the severity of the problem, you calculate your new groundspeed, and reassess fuel requirements.

CHOOSING A COURSE OF ACTION

After the problem has been identified, the pilot must evaluate the need to react to it and determine the actions which may be taken to resolve the situation in the time available. The expected outcome of each possible action should be considered and the risks assessed before the pilot decides on a response to the situation.

You determine your fuel burn if you continue to your destination, and consider other options, such as turning around and landing at a nearby airport that you have passed, diverting off course, or landing prior to your destination at an airport on your route. You must now consider the expected outcome of each possible action and assess the risks involved. After studying the chart, you conclude that there is an airport which has fueling services within a reasonable distance ahead along your route. You can refuel there and continue to your destination without a significant loss of time.

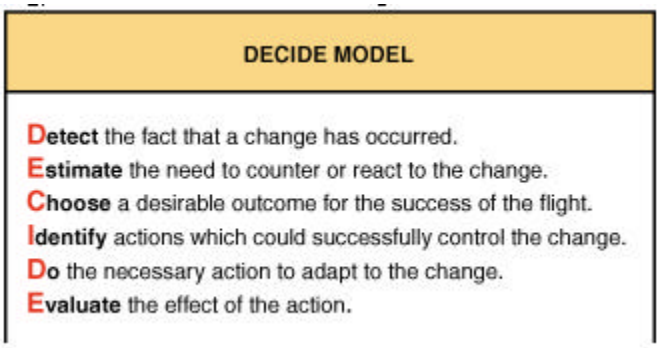
IMPLEMENTING THE DECISION AND EVALUATING THE OUTCOME

Although a decision may be reached and a course of action implemented, the decision-making process is not complete. It is important to think ahead and determine how the decision could affect other phases of the flight. As the flight progresses, the pilot must continue to evaluate the outcome of the decision to ensure that it is producing the desired result.

To implement your decision, you plot the course changes and calculate a new estimated time of arrival, as well as contact the nearest flight service station to amend your flight plan and check weather conditions at your new destination. As you proceed to the airport, you continue to monitor your groundspeed, aircraft performance, and the weather conditions to ensure that no additional steps need to be taken to guarantee the safety of the flight.

To assist teaching pilots the elements of the decision-making process, a six-step model has been developed using the acronym "DECIDE." The DECIDE model has been used to instruct pilots of varying experience levels, as well as analyze accidents.

During initial training, the DECIDE model can provide a framework for effective decision making.



RISK MANAGEMENT

During each flight, decisions must be made regarding events which involve interactions between the four risk elements-the pilot in command, the aircraft, the environment, and the operation. The decision-making process involves an evaluation of each of these risk elements to achieve an accurate perception of the flight situation.

One of the most important decisions that the pilot in command must make is the go/no-go decision. Evaluating each of these risk elements can help the pilot decide whether a flight should be conducted or continued.

To reinforce the risk elements and their significance to effective decision making, the instructor can ask the student to identify the risk elements for a flight. The student should also be able to determine whether the risks have been appropriately evaluated in the situation.

A pilot schedules to fly to a business appointment with a client in a nearby city. She is a noninstrument-rated private pilot with no experience in marginal weather conditions, although she did gain some attitude instrument flying experience during her private pilot flight training. She intends to fly in a small four-seat, single-engine airplane with standard communication and navigation equipment. However, the VOR receiver is inoperative. The pilot plans to leave in the morning and return early in the afternoon. When she receives her weather briefing, she is informed that marginal VFR conditions with possible icing in the clouds are forecast for late afternoon. Having been delayed at the office, the pilot departs later than planned. While en route, the pilot encounters low ceilings and restricted visibility and she becomes spatially disoriented due to continued flight by ground reference.

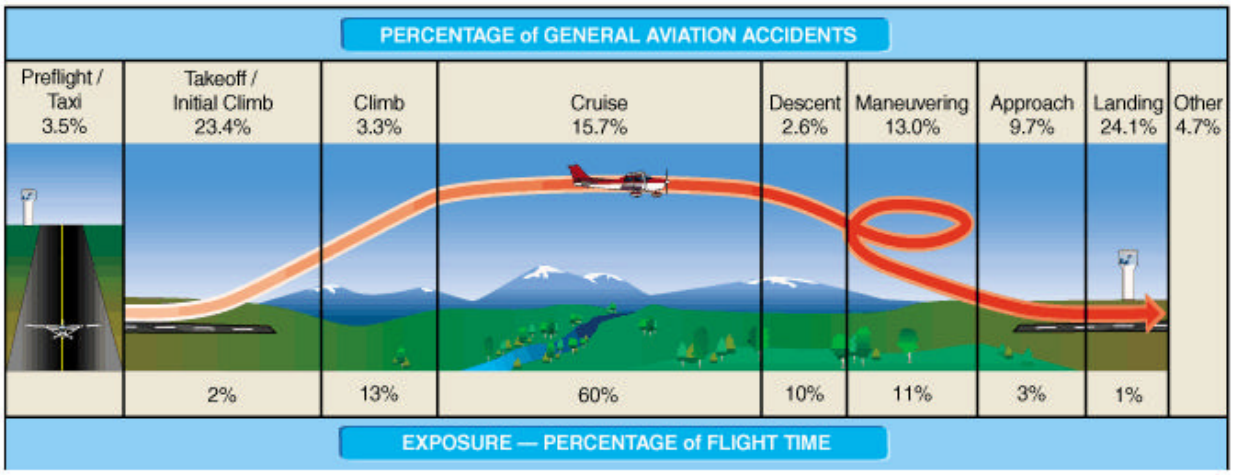
In this case, the pilot did not effectively evaluate the four risk elements when making decisions regarding this flight. When assessing her fitness as a pilot, she overestimated her flying abilities by attempting to fly in marginal VFR conditions. The capability of her airplane was not properly evaluated. The inoperative VOR receiver limits her options if she becomes lost, or is required to navigate with limited visual reference to the ground. In addition, her airplane did not contain sophisticated navigation equipment which may have helped her locate an airport in an emergency situation. The flying environment was less than optimal when she decided to depart despite the threat of marginal conditions. When faced with deteriorating weather, she

did not enlist the assistance of air traffic control (ATC) or use her instruments as references to turn around. Since she was trying to reach her destination for a business appointment, the operation affected her decision to undertake and continue the flight.

ASSESSING RISK

Examining NTSB reports and other accident research can help students learn to assess risk more effectively. Instructors can point out the phases of flight when accidents are most likely to occur and when risk is the greatest. For example, the majority of accidents occur when approaching or departing airports.

Workload is highest during takeoff and landing, which increases the chance of error.



Studies also indicate the types of flight activities that are most likely to result in the most serious accidents. The majority of fatal general aviation accident causes fall under the categories of maneuvering flight, approaches, takeoff/initial climb, and weather. Delving deeper into accident statistics can provide some important details that can help students understand the risks involved with specific flying situations. For example, maneuvering flight is one of the largest single producers of fatal accidents and many of these accidents are attributed to maneuvering during low, slow flight, often during buzzing or unauthorized aerobatics. Fatal accidents which occur during approach often happen at night or in IFR conditions. Takeoff/initial climb accidents frequently are due to the pilot's lack of awareness of the effects of density altitude on aircraft performance or other improper takeoff planning resulting in loss of control or stalls during, or shortly after takeoff. The majority of weather-related accidents occur after attempted VFR flight into IFR conditions.

In addition to discussing these facts, instructors can increase student awareness of these risks by setting positive examples. For instance, ensuring that students obtain weather briefings before every flight develops good habits and emphasizes the importance of the weather check. Instructors should take the time to discuss the conditions, and require the student to arrive at a go/no-go decision. Ignoring a marginal forecast or continuing a flight in poor weather may be sending the message that

checking the weather serves no practical purpose. During the flight planning phase, the flight instructor can introduce situations that are different from those planned. The student should be asked to explain the possible consequences of each situation. Even if a flight lesson is canceled based on forecast conditions that never materialize, a lesson in judgment has been accomplished.

FACTORS AFFECTING DECISION MAKING

It is important to point out to students that being familiar with the decision-making process does not ensure that they will have the good judgment to be safe pilots. The ability to make effective decisions as pilot in command depends on a number of factors. Some circumstances, such as the time available to make a decision, may be beyond the pilot's control. However, a pilot can learn to recognize those factors that can be managed, and learn skills to improve decision-making ability and judgment.

PILOT SELF-ASSESSMENT

The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft. In order to effectively exercise that responsibility and make effective decisions regarding the outcome of a flight, pilots must have an understanding of their limitations. A pilot's performance during a flight is affected by many factors, such as health, recency of experience, knowledge, skill level, and attitude.

Students must be taught that exercising good judgment begins prior to taking the controls of an aircraft. Often, pilots thoroughly check their aircraft to determine airworthiness, yet do not evaluate their own fitness for flight. Just as a checklist is used when preflighting an aircraft, a personal checklist based on such factors as experience, currency, and comfort level can help determine if a pilot is prepared for a particular flight. Specifying when refresher training should be accomplished, designating weather minimums which may be higher than those listed in Title 14 of the Code of Federal Regulations (14 CFR) part 91, and setting limitations regarding the amount of crosswind for takeoffs and landings are examples of elements which may be included on a personal checklist. Instructors set an example by having their own personal checklists and can help students create their own checklists. In addition to a review of personal limitations, pilots should use the I'M SAFE Checklist to further evaluate their fitness for flight.

Prior to flight, pilots should assess their fitness, just as they evaluate the aircraft's airworthiness.

RECOGNIZING HAZARDOUS ATTITUDES

Being fit to fly depends on more than just a pilot's physical condition and recency of experience. For example, attitude will affect the quality of decisions. Attitude can be defined as a personal motivational predisposition to respond to persons, situations, or events in a given manner. Studies have identified five hazardous attitudes which can interfere with a pilot's ability to make sound decisions and exercise authority properly.

Pilots should examine their decisions carefully to ensure that their choices have not been influenced by a hazardous attitude.

THE FIVE HAZARDOUS ATTITUDES

1. Antiauthority:

"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.

2. Impulsivity:

"Do something 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.

3. Invulnerability:

"It won't happen to me." Many people feel that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. 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.

4. Macho:

"I can do it." Pilots who are always trying to prove that they are better than anyone else are thinking, "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.

5. 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 me, 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."

Hazardous attitudes can lead to poor decision making and actions which involve unnecessary risk. Students must be taught to examine their decisions carefully to ensure that their choices have not been influenced by hazardous attitudes and they must be familiar with positive alternatives to counteract the hazardous attitudes. These substitute attitudes are referred to as antidotes. During a flight operation, it is important to be able to recognize a hazardous attitude, correctly label the thought, and then recall its antidote.

Students can be asked to identify hazardous attitudes and the corresponding antidotes when presented with flight scenarios.

HAZARDOUS ATTITUDES	**ANTIDOTES**
Anti-Authority - Although he knows that flying so low to the ground is prohibited by the regulations, he feels that the regulations are too restrictive in some circumstances.	**Follow the rules. They are usually right**
Impulsivity - As he is buzzing the park, the airplane does not climb as well as Steve had anticipated and without thinking, Steve pulls back hard on the yoke. The airspeed drops and the airplane is close to a stalling attitude as the wing brushes a power line.	**Not so fast. Think first.**

Invulnerability - Steve is not worried about an accident since he has flown this low many times before and he has not had any problems.	**It could happen to me.**
Macho - Steve often brags to his friends about his skills as a pilot and how close to the ground he flies. During a local pleasure flight in his single-engine airplane, he decides to buzz some friends barbecuing at a nearby park.	**Taking chances is foolish.**
Resignation - Although Steve manages to recover, the wing sustains minor damage. Steve thinks to himself, "It's dangerous for the power company to put those lines so close to a park. If somebody finds out about this I'm going to be in trouble, but it seems like no matter what I do, somebody's always going to criticize."	**I'm not helpless. I can make a difference.**

STRESS MANAGEMENT

Everyone is stressed to some degree all the time. A certain amount of stress is good since it keeps a person alert and prevents complacency. However, effects of stress are cumulative and, if not coped with adequately, they eventually add up to an intolerable burden. Performance generally increases with the onset of stress, peaks, and then begins to fall off rapidly as stress levels exceed a person's ability to cope. The ability to make effective decisions during flight can be impaired by stress. Factors, referred to as stressors, can increase a pilot's risk of error in the cockpit.

The three types of stressors can affect a pilot's performance

Physical Stress - Conditions associated with the environment, such as temperature and humidity extremes, noise, vibration, and lack of oxygen.
Physiological Stress - Physical conditions, such as fatigue, lack of physical fitness, sleep loss, missed meals (leading to low blood sugar levels), and illness.
Psychological Stress - Social or emotional factors, such as death in the family, a divorce, a sick child, or a demotion at work. This type of stress may also be related to mental workload, such as analyzing a problem, navigating an aircraft, or making decisions.

One way of exploring the subject of stress with a student is to recognize when stress is affecting performance. If a student seems distracted, or has a particularly difficult time accomplishing the tasks of the lesson, the instructor can query the student. Was the

student uncomfortable or tired during the flight? Is there some stress in another aspect of the student's life that may be causing a distraction? This may prompt the student to evaluate how these factors affect performance and judgment. The instructor should also try to determine if there are aspects of pilot training that are causing excessive amounts of stress for the student. For example, if the student consistently makes a decision not to fly, even though weather briefings indicate favorable conditions, it may be due to apprehension regarding the lesson content. Stalls, landings, or an impending solo flight may cause concern for the student. By explaining a specific maneuver in greater detail or offering some additional encouragement, the instructor may be able to alleviate some of the student's stress.

To help students manage the accumulation of life stresses and prevent stress overload, instructors can recommend several techniques. For example, including relaxation time in a busy schedule and maintaining a program of physical fitness can help reduce stress levels. Learning to manage time more effectively can help pilots avoid heavy pressures imposed by getting behind schedule and not meeting deadlines. While these pressures may exist in the workplace, students may also experience the same type of stress regarding their flight training schedule. Instructors can advise students to take assessments of themselves to determine their capabilities and limitations and then set realistic goals. In addition, avoiding stressful situations and encounters can help pilots cope with stress.

USE OF RESOURCES

To make informed decisions during flight operations, students must be made aware of the resources found both inside and outside the cockpit. Since useful tools and sources of information may not always be readily apparent, learning to recognize these resources is an essential part of ADM training. Resources must not only be identified, but students must develop the skills to evaluate whether they have the time to use a particular resource and the impact that its use will have upon the safety of flight. For example, the assistance of ATC may be very useful if a pilot is lost. However, in an emergency situation when action needs be taken quickly, time may not be available to contact ATC immediately. During training, instructors can routinely point out resources to students.

INTERNAL RESOURCES

Internal resources are found in the cockpit during flight. Since some of the most valuable internal resources are ingenuity, knowledge, and skill, pilots can expand cockpit resources immensely by improving their capabilities. This can be accomplished by frequently reviewing flight information publications, such as the CFRs and the AIM, as well as by pursuing additional training.

A thorough understanding of all the equipment and systems in the aircraft is necessary to fully utilize all resources. For example, advanced navigation and autopilot systems are valuable resources. However, if pilots do not fully understand how to use this equipment, or they rely on it so much that they become complacent, it can become a detriment to safe flight. To ensure that students understand the operation of various equipment, instructors must first be familiar with the components of each aircraft in which they instruct.

Checklists are essential cockpit resources for verifying that the aircraft instruments and systems are checked, set, and operating properly, as well as ensuring that the proper procedures are performed if there is a system malfunction or in-flight emergency. Students reluctant to use checklists can be reminded that pilots at all levels of experience refer to checklists, and that the more advanced the aircraft is, the more crucial checklists become. In addition, the POH, which is required to be carried on board the aircraft, is essential for accurate flight planning and for resolving in-flight equipment malfunctions. Other valuable cockpit resources include current aeronautical charts, and publications, such as the Airport/Facility Directory.

It should be pointed out to students that passengers can also be a valuable resource. Passengers can help watch for traffic and may be able to provide information in an irregular situation, especially if they are familiar with flying. A strange smell or sound may alert a passenger to a potential problem. The pilot in command should brief passengers before the flight to make sure that they are comfortable voicing any concerns.

EXTERNAL RESOURCES

Possibly the greatest external resources during flight are air traffic controllers and flight service specialists. ATC can help decrease pilot workload by providing traffic advisories, radar vectors, and assistance in emergency situations. Flight service stations can provide updates on weather, answer questions about airport conditions, and may offer direction-finding assistance. The services provided by ATC can be invaluable in enabling pilots to make informed in-flight decisions. Instructors can help students feel comfortable with ATC by encouraging them to take advantage of services, such as flight following and Flight Watch. If students are exposed to ATC as much as possible during training, they will feel confident asking controllers to clarify instructions and be better equipped to use ATC as a resource for assistance in unusual circumstances or emergencies.

Throughout training, students can be asked to identify internal and external resources which can be used in a variety of flight situations. For example, if a discrepancy is found during preflight, what resources can be used to determine its significance? In this case, the student's knowledge of the airplane, the POH, an instructor or another experienced pilot, or an aviation maintenance technician are resources which may help define the problem.

During cross-country training, students may be asked to consider the following situation. On a cross-country flight, you become disoriented. Although you are familiar with the area, you do not recognize any landmarks, and fuel is running low. What resources do you have to assist you? Students should be able to identify their own skills and knowledge, aeronautical charts, ATC, flight service, and navigation equipment as some of the resources that can be used in this situation.

WORKLOAD MANAGEMENT

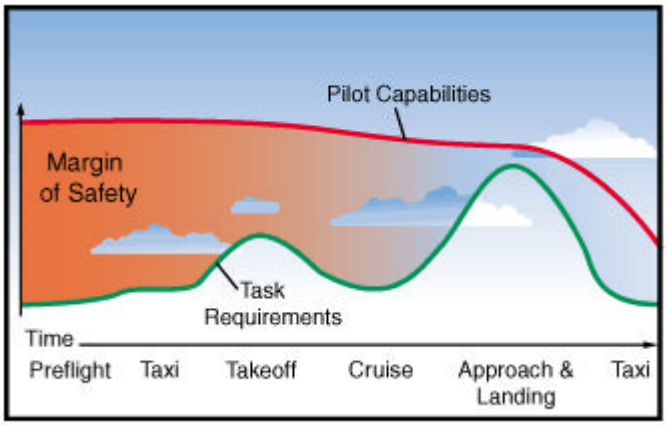
Effective workload management ensures that essential operations are accomplished by planning, prioritizing, and sequencing tasks to avoid work overload. As experience is gained, a pilot learns to recognize future workload requirements and can prepare for high workload periods during times of low workload. Instructors can teach this skill by

prompting their students to prepare for a high workload. For example, when en route, the student can be asked to explain the actions that will need to be taken during the approach to the airport. The student should be able to describe the procedures for traffic pattern entry and landing preparation. Reviewing the appropriate chart and setting radio frequencies well in advance of when they will be needed helps reduce workload as the flight nears the airport. In addition, the student should listen to ATIS, ASOS, or AWOS, if available, and then monitor the tower frequency or CTAF to get a good idea of what traffic conditions to expect. Checklists should be performed well in advance so there is time to focus on traffic and ATC instructions. These procedures are especially important prior to entering a high-density traffic area, such as Class B airspace.

To manage workload, items should be prioritized. This concept should be emphasized to students and reinforced when training procedures are performed. For example, during a go-around, adding power, gaining airspeed, and properly configuring the airplane are priorities. Informing the tower of the balked landing should be accomplished only after these tasks are completed. Students must understand that priorities change as the situation changes. If fuel quantity is lower than expected on a cross-country flight, the priority can shift from making a scheduled arrival time at the destination, to locating a nearby airport to refuel. In an emergency situation, the first priority is to fly the aircraft and maintain a safe airspeed.

Another important part of managing workload is recognizing a work overload situation. The first effect of high workload is that the pilot begins to work faster. As workload increases, attention cannot be devoted to several tasks at one time, and the pilot may begin to focus on one item. When the pilot becomes task saturated, there is no awareness of inputs from various sources so decisions may be made on incomplete information, and the possibility of error increases.

Accidents often occur when flying task requirements exceed pilot capabilities.



The difference between these two factors is called the margin of safety. Note that in this idealized example, the margin of safety is minimal during the approach and landing. At this point, an emergency or distraction could overtax pilot capabilities, causing an accident.

During a lesson, workload can be gradually increased as the instructor monitors the student's management of tasks. The instructor should ensure that the student has the

ability to recognize a work overload situation. When becoming overloaded, the student should stop, think, slow down, and prioritize. It is important that the student understand options that may be available to decrease workload. For example, tasks, such as locating an item on a chart or setting a radio frequency, may be delegated to another pilot or passenger, an autopilot (if available) may be used, or ATC may be enlisted to provide assistance.

SITUATIONAL AWARENESS

Situational awareness is the accurate perception of the operational and environmental factors that affect the aircraft, pilot, and passengers during a specific period of time. Maintaining situational awareness requires an understanding of the relative significance of these factors and their future impact on the flight. When situationally aware, the pilot has an overview of the total operation and is not fixated on one perceived significant factor. Some of the elements inside the aircraft to be considered are the status of aircraft systems, pilot, and passengers. In addition, an awareness of the environmental conditions of the flight, such as spatial orientation of the aircraft, and its relationship to terrain, traffic, weather, and airspace must be maintained.

To maintain situational awareness, all of the skills involved in aeronautical decision making are used. For example, an accurate perception of the pilot's fitness can be achieved through self-assessment and recognition of hazardous attitudes. A clear assessment of the status of navigation equipment can be obtained through workload management, and establishing a productive relationship with ATC can be accomplished by effective resource use.

OBSTACLES TO MAINTAINING SITUATIONAL AWARENESS

Fatigue, stress, and work overload can cause the pilot to fixate on a single perceived important item rather than maintaining an overall awareness of the flight situation. A contributing factor in many accidents is a distraction which diverts the pilot's attention from monitoring the instruments or scanning outside the aircraft. Many cockpit distractions begin as a minor problem, such as a gauge that is not reading correctly, but result in accidents as the pilot diverts attention to the perceived problem and neglects to properly control the aircraft.

Complacency presents another obstacle to maintaining situational awareness. When activities become routine, the pilot may have a tendency to relax and not put as much effort into performance. Like fatigue, complacency reduces the pilot's effectiveness in the cockpit. However, complacency is harder to recognize than fatigue, since everything is perceived to be progressing smoothly. For example, cockpit automation can lead to complacency if the pilot assumes that the autopilot is doing its job, and does not crosscheck the instruments or the aircraft's position frequently. If the autopilot fails, the pilot may not be mentally prepared to fly the aircraft manually. Instructors should be especially alert to complacency in students with significant flight experience. For example, a pilot receiving a flight review in a familiar aircraft may be prone to complacency.

By asking about positions of other aircraft in the traffic pattern, engine instrument indications, and the aircraft's location in relationship to references on a chart, the instructor can determine if the student is maintaining situational awareness. The

instructor can also attempt to focus the student's attention on an imaginary problem with the communication or navigation equipment. The instructor should point out that situational awareness is not being maintained if the student diverts too much attention away from other tasks, such as controlling the aircraft or scanning for traffic. These are simple exercises that can be done throughout flight training which will help emphasize the importance of maintaining situational awareness.

OPERATIONAL PITFALLS

There are a number of classic behavioral traps into which pilots have been known to fall. Pilots, particularly those with considerable experience, as a rule always try to complete a flight as planned, please passengers, meet schedules, and generally demonstrate that they have the right stuff. The basic drive to demonstrate the right stuff can have an adverse effect on safety, and can impose an unrealistic assessment of piloting skills under stressful conditions. These tendencies ultimately may bring about practices that are dangerous and often illegal, and may lead to a mishap. Students will develop awareness and learn to avoid many of these operational pitfalls through effective ADM training. The scenarios and examples provided by instructors during ADM instruction should involve these pitfalls.

All experienced pilots have fallen prey to, or have been tempted by, one or more of these tendencies in their flying careers.

Peer Pressure - Poor decision making may be based upon an emotional response to peers, rather than evaluating a situation objectively.

Mind Set - A pilot displays mind set through an inability to recognize and cope with changes in a given situation.

Get-There-Itis - This disposition impairs pilot judgment through a fixation on the original goal or destination, combined with a disregard for any alternate course of action.

Duck-Under Syndrome - A pilot may be tempted to make it into an airport by descending below minimums during an approach. There may be a belief that there is a built-in margin of error in every approach procedure, or a pilot may not want to admit that the landing cannot be completed and a missed approach must be initiated.

Scud Running - This occurs when a pilot tries to maintain visual contact with the terrain at low altitudes while instrument conditions exist.
Continuing Visual Flight Rules (VFR) into Instrument Conditions - Spatial disorientation or collision with ground/obstacles may occur when a pilot continues VFR into instrument conditions. This can be even more dangerous if the pilot is not instrument-rated or current.
Getting Behind the Aircraft - This pitfall can be caused by allowing events or the situation to control pilot actions. A constant state of surprise at what happens next may be exhibited when the pilot is getting behind the aircraft.

Loss of Positional or Situational Awareness - In extreme cases, when a pilot gets behind the aircraft, a loss of positional or situational awareness may result. The pilot may know the aircraft's geographical location, or may be unable to recognize deteriorating circumstances.

Operating Without Adequate Fuel Reserves - Ignoring minimum fuel reserve requirements is generally the result of overconfidence, lack of flight planning, or disregarding applicable regulations.

Descent Below the Minimum En Route Altitude - The duck-under syndrome, as mentioned above, can also occur during the en route portion of an IFR flight.

Flying Outside the Envelope - The assumed high performance capability of a particular aircraft may cause a mistaken belief that it can meet the demands imposed by a pilot's overestimated flying skills.

Neglect of Flight Planning, Preflight Inspections, and Checklists - A pilot may rely on short- and long-term memory, regular flying skills, and familiar routes instead of established procedures and published checklists. This can be particularly true of experienced pilots.

EVALUATING STUDENT DECISION MAKING

A student's performance is often evaluated only on a technical level. The instructor determines whether maneuvers are technically accurate and that procedures are performed in the right order. Instructors must learn to evaluate students on a different level. How did the student arrive at a particular decision? What resources were used? Was risk assessed accurately when a go/no-go decision was made? Did the student maintain situational awareness in the traffic pattern? Was workload managed effectively during a cross-country? How does the student handle stress and fatigue? Instructors should continually evaluate student decision-making ability and offer suggestions for improvement. It is not always necessary to present complex situations which require detailed analysis. By allowing students to make decisions about typical issues that arise throughout the course of training, such as their fitness to fly, weather conditions, and equipment problems, instructors can address effective decision making and allow students to develop judgment skills. For example, when a discrepancy is found during preflight inspection, the student should be allowed to initially determine the action to be taken. Then the effectiveness of the student's choice and other options that may be available can be discussed. Opportunities for improving decision-making abilities occur often during training. If the tower offers the student a runway that requires landing with a tailwind in order to expedite traffic, the student can be directed to assess the risks involved and asked to present alternative actions to be taken. Perhaps the most frequent choice that has to be made during flight training is the go/no-go decision based on weather. While the final choice to fly lies with the

instructor, students can be required to assess the weather prior to each flight and make a go/no-go determination.
In addition, instructors can create lessons that are specifically designed to test whether students are applying ADM skills. Planning a flight lesson in which the student is presented with simulated emergencies, a heavy workload, or other operational problems can be valuable in assessing the student's judgment and decision-making skills. During the flight, performance can be evaluated on how effectively the student managed workload, or handled stress. While debriefing the student after the flight, the instructor can suggest ways that problems may have been solved more effectively, how tasks might have been prioritized differently, or other resources that could have been used to improve the situation.