FIRC Lesson 06 - Pilot Deviations

Pilot Deviations

Overview of Pilot Deviations

A pilot deviation (PD) is defined as an action of a pilot that results in the violation of a Federal aviation regulation. PDs are broadly classified as either airborne deviations or surface deviations. Within each of these two broad classifications are a number of subclassifications. The principal areas of concern in the airborne classification include altitude deviations, course deviations, and airspace incursions. The principal area of concern within the surface deviation classification involves runway incursions, but surface deviations also include vehicle/pedestrian violations. While the outcomes of most PDs are benign, any deviation has the potential to be catastrophic. Because of this potential for catastrophic outcome, PDs are a major concern in both the aviation industry and within the FAA. For several years, PDs have been on the rise. Of particular concern is that a significant majority of all PDs (69 percent) are occurring during GA operations. Since all PDs involve pilots, and virtually all GA pilots receive training from flight instructors at some point, the flight instructor plays a critical role toward reducing the PD incident rate. This necessitates an intimate understanding of the causes of these incidents. Instructors need to develop tactics that recognize and avoid situations that may result in a PD.

Ground/Surface Deviations

One of the top priorities for instructors and the FAA is to reduce the frequency of runway incursions and the risk of a runway collision. The FAA aims to reduce the severity, number and rate of runway incursions by implementing a combination of technology, infrastructure, procedural and training interventions to decrease the prevalence of human errors and increase the error tolerance of airport surface movement operations.

One of the most critical areas is that of pilot training. That is where the flight instructor comes in. It is critically important that the flight instructor be well versed in the "mechanics" of what leads to a runway incursion, the various types of incursions that can and do take place, and the techniques that can prevent these occurrences. The instructor should be made aware of those areas of operation where pilots are failing to properly place their aircraft and to teach them to be aware of and vigilant for the "traps" that can make a pilot unaware of an unsafe condition before it happens. A well-trained instructor can then transfer that awareness to their flying students each time they get into an airplane with them.

Airport/Runway Familiarization

Any task can be made easier and safer by planning ahead. Teach your students the importance of reviewing current data for any airport they intend to use, even if they intend to only operate from a familiar facility. Information such as communication frequencies, services available, closed runways, airport construction, etc., should be collected.

Make your students familiar with the three common sources of airport information:

- Airport Diagrams
- Airport/Facility Directory (A/FD)
- Notices to Airmen (NOTAMs)

Stress the importance of only using current material. Build this habit right from the beginning by discarding old charts and publications as soon as they become obsolete.

Airport Diagrams

Airport Diagrams are a resource available from NOAA, the FAA's website and several commercial vendors. Although these diagrams are normally used by instrument rated pilots, VFR pilots will also find them useful when performing surface operations. Brief your students on how to obtain and use these handy tools to maintain position and routing awareness while navigating on the airport surface. These diagrams along with a working knowledge of airport markings and signage will help prevent disorientation and blunders while taxiing.

Airport diagrams can be found on Standard Instrument Approach Procedures and the Airport Facility Directory.

Airport/Facility Directory (A/FD)

The Airport/Facility Directory (A/FD) provides the most comprehensive information for any given airport, heliport and seaplane base open to the public. The A/FDs are contained in seven books organized by region and revised every eight weeks. As discussed previously, it is important to use only current books.

For a complete listing of the information provided in an A/FD and how to decode that information a pilot should refer to the "Directory Legend Sample" located in the front of each A/FD.

Since these books are only revised every eight weeks, there is a good chance that even a current A/FD may not contain the latest information. Teach your student that it is vitally important to check the latest NOTAMs for possible changes that may have occurred since the last publication.

Notices to Airmen (NOTAMs)

The FAA has set into place a standardized NOTAM format for the National Notice to Airmen (NOTAM) System. NOTAM information is now classified into two categories: NOTAM (D) or distant and Flight Data Center (FDC) NOTAMs.

NOTAM (D) information is disseminated for all navigational facilities that are part of the NAS, all public use airports, seaplane bases, and heliports listed in the Airport/Facility Directory (A/FD). NOTAM (D) information now includes such data as taxiway closures, personnel and equipment near or crossing runways, and airport lighting aids that do not affect instrument approach criteria such as visual approach slope indicator (VASI).

FDC NOTAMs contain such things as amendments to published Instrument Approach Procedures (IAPs) and other current aeronautical charts. They are also used to advertise temporary flight restrictions caused by such things as natural disasters or large-scale public events that may generate a congestion of air traffic over a site.

NOTAMs are available in printed form through subscription from the Superintendent of Documents. Current NOTAMS are available through FSS and online at The Pilot Website. FSS is also a good source to decipher or decode a NOTAM.

Related Links:

Safe Surface Operations

Runway incursions can result from disorientation, which in turn can result in disaster. The FAA defines a runway incursion as: “Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.” Runway incursions have been increasing. Extra care and vigilance by pilots is one of the keys to reversing this trend. While the hazard exists at towered and non-towered airports alike, runway incursions are only officially recognized at airports with operating control towers.

Detailed investigations of runway incursions have identified three major areas where pilots can help:

- Communications

- Airport knowledge/planning
- Cockpit procedures for maintaining orientation

Communications

Effective pilot/controller communications are key to safe surface operations. Clear understanding of instructions should never be compromised, especially during busy times when the frequency is congested.

- Listen before you transmit. If able, monitor radio communications to establish a "mental picture" of airport activity.
- Think before keying your transmitter. Keep communication with the controller clear and concise.
- Never assume. Ensure you understand all instructions.
- Read back runway hold short instructions verbatim.

Be Familiar with the Airport

It sounds simple: know where you are and where you are going. In reality, ground operations can be the most demanding and complex phase of the flight. As mentioned before, teach your students how to use airport diagrams to maintain positional awareness and compliance with taxi clearances, especially those with hold short instructions.
Be alert to airport vehicle and pedestrian activity.
Review airport diagrams before taxiing or landing.
Use your heading indicator along with the airport/taxi diagram and airport signage to maintain orientation during ground operations.

Follow Proper Cockpit Procedures

Pilots can use proven and effective procedures in the cockpit to help conduct safe operations on the ground and during take-off and landing.
Maintain a sterile cockpit environment. Avoid unnecessary conversation during surface operations, take-off, and landing.
Constantly scan outside the cockpit, especially when approaching, crossing, or while on runways.
If lost, notify Air Traffic Control immediately.
Do not hesitate to request progressive taxi instructions if unfamiliar with the airport or your position on the airport.
Ensure proper radio operation, check audio panel volume control and squelch settings.
Know and follow lost communication procedures and use good judgment should radio failure occur.
Never stop on an active runway to ask for directions after landing; clear the runway first. Once you have passed the hold position markings, stop. When advised by the tower, ask ground control for directions.
Stay Alert When Visibility is Low - Extra vigilance is required when visibility decreases and the ability of pilots and controllers to maintain a desired level of situational awareness becomes significantly more difficult. During periods of reduced visibility, pilots should keep in mind:

- Cockpit workload and distractions tend to increase.
- As cockpit activity increases, attention to communications tends to decrease.
- Fatigue level increases.
- Increased vigilance is needed when snow and other weather conditions obscure surface markings and make signs difficult to see.

Distractions such as performing a checklist, programming a GPS while taxing, looking at interesting aircraft, or picking up items that may have fallen on the floor are examples of distractions that could preoccupy a pilot.

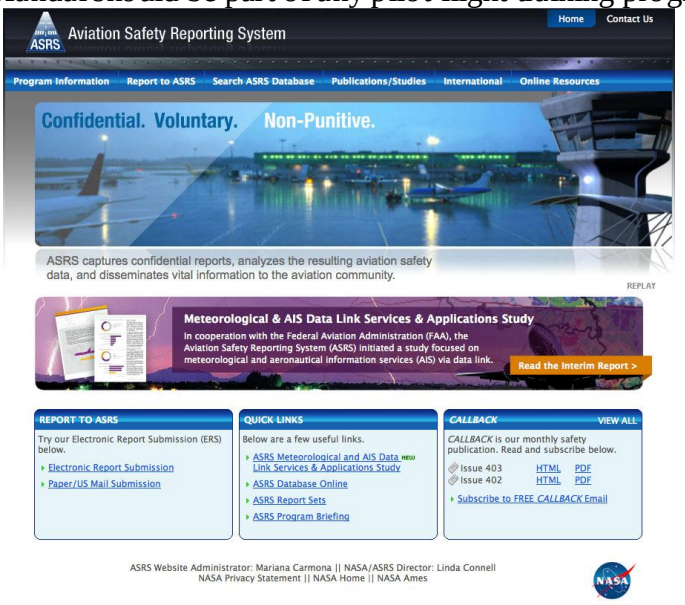
Report Confusing or Deteriorating Surface Markings and Signs

Pilots should report confusing or deteriorating surface markings, signs, and inaccurate airport diagrams to the tower or airport manager. Also, a report to the NASA Aviation Safety Reporting System (ASRS) is strongly recommended. ASRS maintains a database of reported hazards. Alert messages from ASRS are forwarded to appropriate airport authorities for action. Airport authorities are requested to provide responses to ASRS. This serves as an important check on the type of corrective actions being taken and closes the loop in the incident reporting process.

From the Aviation Safety Reporting System website (asrs.arc.nasa.gov), you can either submit a report electronically or download and print a form to send via the US Mail.

An instructor should report deteriorating or confusing surface markings or signage to the air traffic control tower, the NASA Aviation Safety Reporting System, or the FAA Safety Hotline.

If your students do not have a working knowledge of airport markings and signs, even clear and well-maintained indicators will be confusing. Reviewing the airport markings and signs section of the Aeronautical Information Manual should be part of any pilot flight training program.



Aviation Safety Reporting System

Related Links:
Aviation Safety Reporting System Website: http://go.nasa.gov/e1Z4nX
FAA Aviation Safety Hotline: http://1.usa.gov/17wtUPI

Pilot Responsibilities and Basic Procedures

LAHSO is an acronym for "Land and Hold Short Operations." These operations include landing and holding short of an intersecting runway, an intersecting taxiway, or some other designated point on a runway other than an intersecting runway or taxiway.

LAHSO is an air traffic control procedure that requires pilot participation to balance the needs for increased airport capacity and system efficiency consistent with safety. This procedure can be done safely provided pilots and controllers are knowledgeable and understand their responsibilities. The following paragraphs outline specific pilot/operator responsibilities when conducting LAHSO.

At controlled airports, ATC may clear a pilot to land and hold short. Pilots may accept such a clearance provided that the pilot-in-command determines that the aircraft can safely land and stop within the Available Landing Distance (ALD). ALD data are published in the special notices section of the Airport/Facility Directory (A/FD) and in the U.S. Terminal Procedures Publications. Controllers will also

provide ALD data upon request. Student pilots or pilots not familiar with LAHSO should not participate in the program.

The pilot-in-command has the final authority to accept or decline any land and hold short clearance. The safety and operation of the aircraft remain the responsibility of the pilot. Pilots are expected to decline a LAHSO clearance if they determine it will compromise safety.

To conduct LAHSO, pilots should become familiar with all available information concerning LAHSO at their destination airport. Pilots should have, readily available, the published ALD and runway slope information for all LAHSO runway combinations at each airport of intended landing. Additionally, knowledge about landing performance data permits the pilot to readily determine that the ALD for the assigned runway is sufficient for safe LAHSO. As part of preflight planning, pilots should determine if their destination airport has LAHSO. If so, their planning should include an assessment of which LAHSO combinations would work for them given their aircraft's required landing distance. Good pilot decision making is knowing in advance whether one can accept a LAHSO clearance if offered.

If for any reason, such as difficulty in discerning the location of a LAHSO intersection, wind conditions or aircraft condition, the pilot elects to request to land on the full length of the runway, to land on another runway, or to decline LAHSO, a pilot is expected to promptly inform ATC--if possible even before the clearance is issued. Once accepted, a LAHSO clearance must be adhered to, unless an amended clearance is obtained or an emergency occurs. A LAHSO clearance does not preclude a rejected landing.

A pilot who accepts a LAHSO clearance should land and exit the runway at the first convenient taxiway (unless directed otherwise) before reaching the hold short point. Otherwise, the pilot must stop and hold at the hold short point. If a rejected landing becomes necessary after accepting a LAHSO clearance, the pilot should maintain safe separation from other aircraft or vehicles and should promptly notify the controller.

Controllers need a full read back of all LAHSO clearances. Pilots should read back their LAHSO clearance and include the words, "Hold short of (runway, taxiway, etc)," in their acknowledgment of all LAHSO clearances. In order to reduce frequency congestion, pilots are encouraged to read back the LAHSO clearance without prompting. Do not make the controller have to ask for a read back.

Situational awareness is vital to the success of LAHSO. Situational awareness starts with having current airport information in the cockpit readily accessible to the pilot. For example, an airport diagram assists pilots in identifying their location on the airport, thus reducing requests for progressive taxi instructions from controllers. Situational awareness also requires effective pilot/controller radio communication. ATC expects pilots to specifically acknowledge and read back all LAHSO clearances as follows:

ATC: "(Aircraft ID) cleared to land runway six right, hold short of taxiway bravo for crossing traffic (type aircraft)."

Aircraft: "(Aircraft ID), cleared to land runway six right to hold short of taxiway bravo."

ATC: "(Aircraft ID) cross runway six right at taxiway bravo, landing aircraft will hold short."

Aircraft: "(Aircraft ID), copy, cross runway six right at bravo, landing traffic (type aircraft) to hold."

For those airplanes flown with two crewmembers, effective intra-cockpit communication between the cockpit crew is critical. There have been instances where the pilot working the radios accepted a LAHSO clearance but then simply forgot to tell the pilot flying the aircraft.

Situational awareness also includes a thorough understanding of the airport markings, signage and lighting associated with LAHSO. These visual aids consist of a three-part system of yellow hold short markings, red and white signage and in certain cases, in-pavement lighting. Visual aids assist the pilot in determining where to hold short. Pilots are cautioned that not all airports conducting LAHSO have installed any or all of the markings, signage or lighting.

Pilots should only receive a LAHSO clearance when there is a minimum ceiling of 1,000 feet and three statute miles visibility. The intent of having basic VFR weather conditions is to allow pilots to maintain visual contact with other aircraft and ground vehicle operations. Pilots should consider the effects of prevailing in-flight visibility (such as landing into the sun) and how it may affect overall situational awareness. Additionally, surface vehicles and aircraft being taxied by maintenance personnel may also be participating in LAHSO, especially in those operations that involve crossing an active runway.

Making the Aircraft Visible

Pilots need to be taught that whether on the ground or in the air, safety can be greatly enhanced by ensuring their aircraft is visible. Aircraft owners, for example, should avoid the temptation to use camouflage paint schemes. The pattern may look appealing but if the aircraft blends in with ground clutter and cannot be easily seen by aircraft above, the results could be catastrophic. High visibility paint schemes are much more desirable from a safety perspective.

Operation "Lights-On" is an FAA-established voluntary pilot safety program designed to enhance the see-and-be-seen concept. Pilots are encouraged to turn on their landing lights during takeoff, either after takeoff clearance has been received or when beginning takeoff roll. Pilots are further encouraged to turn on their landing lights when operating below 10,000 feet, day or night, especially when within ten miles of any airport or in conditions of reduced visibility, and in areas where flocks of birds may be expected, i.e., coastal areas, lake areas, around refuse dumps, etc. Although turning on aircraft lights does enhance the see-and-avoid concept, pilots should not become complacent about keeping a sharp lookout for other aircraft. Not all aircraft are equipped with lights and some pilots may not have their lights turned on. Maintaining a "Sterile Cockpit" will enhance safety in this area. A "Sterile Cockpit" is maintained by eliminating all unnecessary communication during critical phases of flight such as during ground and low altitude operations. Manufacturer's recommendations for operation of landing lights and electrical systems should be observed.

Situational Awareness

Situational awareness is vital to successful operations both on the ground and in the air. In addition to methods described previously during ground operations, pilots can request progressive taxi instructions at any airport with an operating control tower. Another important aid is listening to radio communications with other aircraft. Did ground control just give the other aircraft a taxi clearance that will conflict with your taxi route? It happens, not often, but often enough. Is the other aircraft taxiing as cleared or is the other pilot confused and interfering with your taxi route?

The same caution is even more important in flight. Has another aircraft given ATC or CTAF a position report that represents the same as your own? Has ATC given someone a clearance that may interfere with your route of flight? These questions should constantly be running through any pilot's mind.

Expect the unexpected: you acknowledge the tower's clearance to enter right downwind for runway six; another pilot acknowledges the tower's clearance to enter left downwind for the same runway. Your first concern is: are you going to meet the other pilot head-on during base leg? That is an obvious question, but what about not so obvious ones?

What if the other pilot is disoriented and mistakes runway 24 for runway six? You hear him call left downwind for six right after you report right downwind for six. No problem for now, unless of course he is actually on a left downwind for 24, in which case he will be on a heading toward you right now! If both of you are looking down at the runway (normal for a pilot on downwind) neither of you will see the other and if a midair is avoided, it will be by accident instead of on purpose. Unlikely scenario? Think again.

We must all exercise continuous, life-sustaining vigilance, and our students must be taught to do no less.

Airborne Deviations

Takeoffs/Landings/Low Altitude Maneuvering

Approximately 65 percent of all general aviation accidents occur during takeoffs, landings or low altitude maneuvering, and virtually all are pilot-related. We can't eliminate the need to maneuver near the ground to takeoff or land, but we can address the skill issues with the pilots performing those maneuvers.

Teaching proper takeoff and landing techniques can be as much an art as a skill, and the instructor needs as much information as he or she can get so that they can better understand the types of difficulties that pilots are having during those phases of flight and what the latest thinking is regarding how to best deal with them.

There are multiple approaches to teaching takeoffs and landings and instructors may need to vary their training technique from one student to another.
Procedures and methods used during these critical phases of flight will have a significant impact on our students' ability to manage risk.
It is important to ensure that students are able to determine the takeoff and landing performance for each departure. This will include knowledge of appropriate V-speeds, performance data, and procedures associated with normal/crosswind, short field, soft field, rejected takeoff, balked landing, and other anticipated emergencies. To allow for student errors, instructors sometimes select airports that have at least twice the runway length required. This minimizes risk but can result in the student developing a habit of complacency. Students must be familiar with the following concepts and computations:

- V-speeds and procedures
- Weight and Balance
- Maximum Structural Take-off Weight
- Maximum Zero Fuel Weight
- Maximum Takeoff weight based on the Maximum Landing Weight
- Maximum Takeoff weight based on runway available
- Maximum Takeoff weight based on climb requirement
- Takeoff / Landing Performance
- Crosswind/Headwind components (to compute takeoff distances and correction for Crosswind)
- Ground Run Distance
- Takeoff Distancet to clear a 50-foot obstacle
- Climb performance (to meet feet per minute or angle of climb requirement)
- Landing Distance from over a 50-foot obstacle
- Landing Roll Distance

As stated earlier, airport familiarization is an important preflight procedure, especially if you have not been to a particular airport recently. A review of airport information references mentioned earlier should be part of any preflight preparation. Besides these published references, local information can be obtained from Local Control Towers, FSS, Flight Standards District Offices, and Fixed Base Operators.

Traffic Pattern Operations

Balanced field length is the runway requirement that needs to be met when operating transport category airplanes. It represents the runway required to accelerate to a minimum takeoff speed and then, in the event of an engine failure, have sufficient runway to decelerate the aircraft before reaching the end of the runway. Once the minimum speed is reached in this type of airplane, continued takeoff and climb is expected after the engine failure.
General aviation airplane pilots are not required to meet this requirement but the concept as it applies to safety is something that instructors should demonstrate to their students. Obviously single-engine airplanes do not have the capability of climbing after an engine failure; however, selecting a runway that gives the pilot sufficient room to reject a takeoff if an engine problem occurs is a procedure that can minimize your risk. Additionally, if the pilot is familiar with the takeoff and landing distance, a decision can be more accurately made in the event an engine fails during the climb out. Selecting the longest runway available will keep you in this "balanced field length" for a longer time, allowing you to gain altitude which may prove to be very valuable in the event one encounters an engine problem.

Position Awareness and Reports

Pilots must maintain constant awareness of their position so that they can keep track of their relationship to other aircraft both on and off the airport, as well as terrain and obstacles. In addition, accurate position

reporting to other pilots and ATC will enhance safety by providing the information they need to provide safe separation and avoid traffic conflicts.
Techniques and procedures that can be used include:

Departure Phase

- Obtain the most current airport information from sources like ATIS/AWOS/ASOS or Airport Advisory.
- Use an Airport Diagram.
- Monitor frequencies prior to use.
- Know and monitor the blind spots of the control tower.
- Know the location of and monitor the windsock.
- Emphasize proper cockpit organization/management and single-pilot resource management.
- Use proper phraseology and communication techniques.
- Use clear and concise communication with ATC or other aircraft.
- Use proper collision avoidance scanning techniques, i.e., clearing area and checking blind spots.
- Comply with the departure and arrival procedures contained in the AIM and look for those that are not.

En route Phase

- Use all available navigation, i.e., pilotage, dead reckoning, radio navigation.
- Prepare and use a route log.
- Use all available FSS/ATC services, flight following, etc.

Arrival Phase

- Familiarization of IFR arrival and departure areas and Visual Reporting Points.
- Know and monitor ATC/CTAF frequencies early for better situational awareness.
- Receive all available arrival information such as ATIS or Landing Advisory (UNICOM).
- Comply with the arrival procedures contained in the AIM.
- Make accurate position reports, referencing navaids or obvious visual references.
- Use effective resource management techniques and maintain control of the situation.

Departure and Arrival Operations

The time to prepare for the high workload phases of flight is not when you are departing or arriving at an airport. Knowing that you are going to operate into or out of an airport situated in Class B airspace means little if you are not familiarized with the procedures associated with Class B or the services available.
Taking the time to research these unfamiliar areas will give pilots the confidence they need to make an uneventful and safe departure or arrival.

Flight Training Devices

The use of modern flight simulation devices with a good instructor can prepare a pilot for operations at seldom-used or new airports. With these flight simulation devices, instructors can create up-to-date and realistic simulations allowing pilots to become "airport and route current" without leaving their home airport.

Maneuvering Altitude

Maneuvering altitude is that altitude where, if an engine fails during takeoff and climb, minimum hazard exists for people and/or property. Minimum maneuvering altitude will be no lower than 500 feet AGL.

The maneuvering altitude concept is used to plan an altitude that pilots can use to assist them in their decision-making process in the event an engine fails during takeoff and climb. If a pilot decides that 800 feet of altitude would be required to be reached before a safe landing could be accomplished with a failed engine, then reaching that altitude as quickly as possible would reduce the risk. Maximum best rate of climb procedures should be maintained until maneuvering altitude is reached. Once reaching maneuvering altitude a transition to a different airspeed or power setting may be considered. Combining the balanced field length concept with maneuvering altitude can assist the pilot in runway selection. Reaching maneuvering altitude before reaching a point where the departing runway is no longer available for a rejected takeoff would be ideal but seldom practical. Selecting a takeoff weight and runway which minimizes the time between losing the departure runway and reaching maneuvering altitude would minimize the risk associated with engine problems during takeoff. Additionally, maneuvering altitude would be a practical altitude for instructors to reach before simulating engine failures during the takeoff and climb phase of flight.

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