# *IFR Emergencies*

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# *IFR Emergencies*

***What is an "emergency" ?***

The AIM identifies an emergency as a condition of distress or urgency.

Pilots in ***DISTRESS*** are threatened by serious and/or immanent danger and requires immediate assistance. Distress conditions may include in-flight fire, mechanical failures, or structural danger.
An ***URGENCY*** situation, which is not immediately dangerous, requires prompt assistance to avoid a potentially catastrophic event. Any condition that may adversely affect your flight, such as low fuel quantity or poor weather my result in an urgent condition which can develop into a distress situation if not handled in a timely manner.

During the course of the emergency, if you are given priority handling by ATC, you may be required to submit a detailed report within 48 yours to the manager of that ATC facility, even though you do not violate any rule.

An emergency can be either a distress or urgency condition as defined in the pilot/controller glossary. Distress is defined as a condition of being threatened by serious and/or imminent danger and requiring immediate assistance. Urgency is defined as a condition of being concerned about safety and requiring timely but not immediate assistance; a potential distress condition.

Pilots do not hesitate to declare an emergency when faced with distress conditions, such as fire, mechanical failure, or structural damage. However, some are reluctant to report an urgency condition when encountering situations that may not be immediately perilous but are potentially catastrophic. An aircraft is in an urgency condition the moment that the pilot becomes doubtful about position, fuel endurance, weather, or any other condition that could adversely affect flight safety. The time for a pilot to request assistance is when an urgent situation may, or has just occurred, not after it has developed into a distress situation.

# Inadvertent Thunderstorm Encounter

A pilot should always avoid intentionally flying through a thunderstorm of any intensity; however, certain conditions may be present that could lead to an inadvertent thunderstorm encounter. For example, flying in areas where thunderstorms are embedded in large cloud masses may make thunderstorm avoidance difficult, even when the aircraft is equipped with thunderstorm detection equipment. Pilots must be prepared to deal with inadvertent thunderstorm penetration. At the very least, a thunderstorm encounter subjects the aircraft to turbulence that could be severe. The pilot, as well as the crew and any passengers, should tighten seat belts and shoulder harnesses and secure any loose items in the cabin or flight deck.

As with any emergency, the first order of business is to fly the aircraft. The pilot workload is high; therefore, increased concentration is necessary to maintain an instrument scan. Once in a thunderstorm, it is better to maintain a course straight through the thunderstorm rather than turning around. A straight course most likely gets the pilot out of the hazard in the least amount of time, and turning maneuvers only increase structural stress on the aircraft.

Reduce power to a setting that maintains a recommended turbulence penetration speed as described in the appropriate aircraft operator's manual, and try to minimize additional power adjustments. Concentrate on keeping the aircraft in a level attitude while allowing airspeed and altitude to fluctuate. Similarly, if using autopilot, disengage altitude and speed hold modes because they only increase the aircraft's maneuvering, which increases structural stress.

During a thunderstorm encounter, the potential for icing also exists. As soon as possible, if the aircraft is so equipped, turn on anti-icing/deicing equipment. Icing can be rapid at any altitude, and may lead to power failure and/or loss of airspeed indication. Lightning is also present in a thunderstorm and can temporarily blind the pilot. To reduce risk, turn up flight deck lights to the highest intensity, concentrate on flight instruments, and resist the urge to look outside.

Inadvertent Icing Encounter

Because icing is unpredictable, pilots may find themselves in icing conditions although they have done everything to avoid the condition. To stay alert to this possibility while operating in visible moisture, pilots should monitor the outside air temperature (OAT).
Anti-icing/deicing equipment is critical to safety of the flight. If anti-icing/deicing equipment is not used before sufficient ice has accumulated, it may not be able to remove all ice accumulation. Use of anti-icing/deicing reduces power availability; therefore, pilots should be familiar with the aircraft operator's manual for use of anti-icing/deicing equipment.

Before entering visible moisture with temperatures at five degrees above freezing or cooler, activate appropriate anti-icing/ deicing equipment in anticipation of ice accumulation; early ice detection is critical. Detecting ice may be particularly difficult during night flight. The pilot may need to use a flashlight to check for ice accumulation on the wings, fuselage, landing gear, and horizontal stabilizer. At the first indication of ice accumulation, the pilot must act to circumvent icing conditions. Options for action once ice has begun to accumulate on the aircraft are the following:

- Move to an altitude with significantly colder temperatures.
- Move to an altitude with temperatures above freezing.
- Fly to an area clear of visible moisture.
- Change the heading, and fly to an area of known non-icing conditions.

If these options are not available, consider an immediate landing at the nearest suitable airport. Anti-icing/deicing equipment does not allow aircraft to operate in icing conditions indefinitely; it only provides more time to evade icing conditions. If icing is encountered, an aircraft controllability check should be considered in the landing configuration. Give careful consideration to configuration changes that might produce unanticipated aircraft flight dynamics.

## Pitot/Static System Failure

A pitot or static system failure can also cause erratic and unreliable instrument indications. When a static system problem occurs, it affects the airspeed indicator, altimeter, and VSI. In the absence of an alternate static source in an unpressurized aircraft, the pilot could break the glass on the VSI because it is not required for instrument flight. Breaking the glass provides both the altimeter and airspeed indicator a source of static pressure, but pilots should be cautious because breaking the glass can cause additional instrument errors. Before considering, pilots should be familiar with their aircraft's specific procedures for static problems.

## Loss of Situational Awareness (SA)

SA is an overall assessment of environmental elements and how they affect flight. SA permits the pilot to make decisions ahead of time and allows evaluation of several different options. Conversely, a pilot who is missing important information about the flight is apt to make reactive decisions. Poor SA means that the pilot lacks vision regarding future events that can force him or her to make decisions quickly often with limited options. During an IFR flight, pilots operate at varying levels of SA. For example, a pilot may be en route to a destination with a high level of SA when ATC issues an unexpected standard terminal arrival route (STAR). Because the STAR is unexpected and the pilot is unfamiliar with the procedure, SA is reduced. However, after becoming familiar with the STAR and resuming normal navigation, the pilot returns to a higher level of SA.

Inadvertent Instrument Meteorological Condition (IIMC)

Some pilots have the misconception that inadvertent instrument meteorological condition (IIMC) does not apply to an IFR flight. The following examples could cause a pilot to inadvertently encounter IMC.

The aircraft has entered visual meteorological conditions (VMC) during an instrument approach procedure (IAP) and while circling to land encounters IMC.

During a non-precision IAP, the aircraft, in VMC, levels at the MDA just below the overcast. Suddenly, the aircraft re-enters the overcast because either the pilot was unable to correctly hold his or her altitude and climbed back into the overcast, or the overcast sloped downward ahead of the aircraft and, while maintaining the correct MDA, the aircraft re-entered the clouds.
After inadvertently re-entering the clouds, the pilot maintains aircraft control, and then maneuvers to the published holding fix, while contacting ATC. If navigational guidance or pilot SA were lost, the pilot would then climb to the published MSA (see AIM 5-4-7c).

In order to survive an encounter with IIMC, a pilot must recognize and accept the seriousness of the situation.

## Maintaining Aircraft Control

Once the crewmembers recognize the situation, they commit to controlling the aircraft by using and trusting flight instruments. Attempting to search outside the flight deck for visual confirmation can result in spatial disorientation and complete loss of control. The crew must rely on instruments and depend on crew coordination to facilitate that transition. The pilot or flight crew must abandon their efforts to establish visual references and fly the aircraft by their flight instruments.

The most important concern, along with maintaining aircraft control, is to initiate a climb immediately. An immediate climb provides a greater separation from natural and manmade obstacles, as well as improve radar reception of the aircraft by ATC. An immediate climb should be appropriate for the current conditions, environment, and known or perceived obstacles. Listed below are procedures that can assist in maintaining aircraft control after encountering IIMC with the most critical action being to immediately announce IIMC and begin a substantial climb while procedures are being performed. These procedures are performed nearly simultaneously:

- Attitude—level wings on the attitude indicator.
- Heading—maintain heading; turn only to avoid known obstacles.
- Power—adjust power as necessary for desired climb rate.
- Airspeed—adjust airspeed as necessary. Complete the IIMC recovery according to local and published regulations and policies.

The pilot must trust the flight instruments concerning the aircraft's attitude regardless of intuition or visual interpretation.

## Precipitation Static

Precipitation static occurs when accumulated static electricity discharges from extremities of the aircraft. This discharge has the potential to create problems with the aircraft's instruments. These problems range from serious, such as complete loss of VHF communications and erroneous magnetic compass readings, to the annoyance of high-pitched audio squealing.

Precipitation static is caused when an aircraft encounters airborne particles during flight (rain or snow) and develops a negative charge. It can also result from atmospheric electric fields in thunderstorm clouds. When a significant negative voltage level is reached, the aircraft discharges it, creating electrical disturbances. To reduce problems associated with precipitation static, the pilot ensures that the aircraft's static wicks are maintained and accounted for. All broken or missing static wicks should be replaced before an instrument flight.

## Aircraft System Malfunction

Preventing aircraft system malfunctions that might lead to an in-flight emergency begins with a thorough preflight inspection. In addition to items normally checked before visual flight rules (VFR) flight, pilots intending to fly instrument flight rules (IFR) should pay particular attention to antennas, static wicks, anti-icing/deicing equipment, pitot tube, and static ports. During taxi, verify operation and accuracy of all flight instruments. The pilots must ensure that all systems are operational before departing into IFR conditions.

## Generator Failure

Depending on aircraft being flown, a generator failure is indicated in different ways. Some aircraft use an ammeter that indicates the state of charge or discharge of the battery. A positive indication on the ammeter indicates a charge condition; a negative indication reveals a discharge condition. Other aircraft use a load meter to indicate the load being carried by the generator. If the generator fails, a zero load indication is shown on the load meter. Review the appropriate aircraft operator's manual for information on the type of systems installed in the aircraft. Once a generator failure is detected, the pilot must reduce electrical load on the battery and land as soon as practical. Depending on electrical load and condition of the battery, sufficient power may be available for an hour or more of flight or for only a matter of minutes. The pilot must be familiar with systems requiring electricity to run and which continue to operate without power. In aircraft with multiple generators, care should be taken to reduce electrical load to avoid overloading the operating generator(s). The pilot can attempt to troubleshoot generator failure by following established procedures published in the appropriate aircraft operator's manual. If the generator cannot be reset, inform ATC of an impending electrical failure.

## Instrument Failure

System or instrument failure is usually identified by a warning indicator or an inconsistency between indications on the attitude indicator, supporting performance instruments, and instruments at the other pilot station, if so equipped. Aircraft control must be maintained while the pilot identifies the failed components and expedite cross-check including all flight instruments. The problem may be individual instrument failure or a system failure affecting several instruments.

One method of identification involves an immediate comparison of the attitude indicator with rate-of-turn indicator and vertical speed indicator (VSI). Along with providing pitch-and-bank information, this technique compares the static system with the pressure system and electrical system. Identify the failed components and use remaining functional instruments to maintain aircraft control. Attempt to restore inoperative components by checking the appropriate power source, changing to a backup or alternate system, and resetting the instrument if possible. Covering failed instruments may enhance the ability to maintain aircraft control and navigate the aircraft. ATC should be notified of the problem and, if necessary, declare an emergency before the situation deteriorates beyond the ability to recover.

# Failures (Fuel, Gyros, Comm)


***MINIMUM FUEL***

If your remaining fuel is such that you can accept little or no delay, you should advise ATC that you have **minimum fuel**. Airline carrier often use the term BINGO fuel.

If your remaining usable fuel supply indicates that you need traffic priority to ensure a safe landing, do not hesitate to declare an emergency. When transmitting such a report, you should state the appropriate number of minutes of flight you can continue with the fuel remaining.

## ***GYROSCOPIC INSTRUMENT FAILURE***

Vacuum or electrical failure can result in a DISTRESS situation. It may develop into an emergence since your ability to immediately and accurately comply with all ATC clearances will be limited. A low vacuum warning indication light or low-voltage warning light failure may provide adequate warning of an impending instrument system malfunction.

If you are in IFR conditions and the gyro has failed, you should IMMEDIATELY transition to partial panel and notify ATC. This is a good reason to maintain your proficiency in partial panel instrument flying!

Detecting the problem early is important in successfully handling the failure. A good instrument cross-check is essential. If you suspect that the gyro has failed, verify the problem with related flight instruments to confirm.

Do not be distracted by the incorrect information the gyro provides (a instrument cover is important). Your priority is to navigate accurately and communicate your situation and intention to ATC. You are likely to need a radar and no-gyro approach to complete the flight.

# *Declaring an IFR Emergency*

DISTRESS situations are announced to ATC with the words "*MAYDAY*"; whereas, URGENT situations are announced to ATC with the words "*PAN-PAN*"

The following information must follow the declaration of either a distress or urgent call.

- Name of station addressed
- Identification and type of aircraft
- Nature or distress or urgency
- Weather
- Your intentions and request
- Present position and heading
- Altitude or flight level
- Fuel remaining in hours and minutes
- Number of persons onboard
- Any other useful information

Example: "Mayday, Mayday, Mayday (or pan-pan, pan-pan, pan-pan), Seattle Center, 114V Piper Arrow, severe icing, IFR, request immediate course reversal and lower altitude, JIMMY intersection, heading 253, 9,000, estimated 2 hours fuel remaining, five aboard, squawking 1146"

Squawk appropriate code 7700 for an emergency.

## ***COMMUNICATION FAILURE***

Unless otherwise authorized by ATC, pilots operating under IFR are expected to comply with this regulation. Expanded procedures are found in the AIM.

***IFR operations: Two-way radio communications failure.***

a) *General.* Unless otherwise authorized by ATC, each pilot who has two-way radio communications failure when operating under IFR shall comply with the rules of this section.

(b) *VFR conditions.* If the failure occurs in VFR conditions, or if VFR conditions are encountered after the failure, each pilot shall continue the flight under VFR and land as soon as practicable.

***(c) IFR conditions. If the failure occurs in IFR conditions, or if paragraph (b) of this section cannot be complied with, each pilot shall continue the flight according to the following:***

***(1) Route.***

***(i) By the route assigned in the last ATC clearance received;***

***(ii) If being radar vectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance;***

***(iii) In the absence of an assigned route, by the route that ATC has advised may be expected in a further clearance; or***

***(iv) In the absence of an assigned route or a route that ATC has advised may be expected in a further clearance, by the route filed in the flight plan.***

***(2) Altitude. At the highest of the following altitudes or flight levels for the route segment being flown:***

***(i) The altitude or flight level assigned in the last ATC clearance received;***

***(ii) The minimum altitude (converted, if appropriate, to minimum flight level as prescribed in Sec. 91.121(c)) for IFR operations; or***

***(iii) The altitude or flight level ATC has advised may be expected in a further clearance.***

***(3) Leave clearance limit.***

***(i) When the clearance limit is a fix from which an approach begins, commence descent or descent and approach as close as possible to the expect-further-clearance time if one has been received, or if one has not been received, as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.***

***(ii) If the clearance limit is not a fix from which an approach begins, leave the clearance limit at the expect-further-clearance time if one has been received, or if none has been received, upon arrival over the clearance limit, and proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or***

# Communications Failure: Alerting ATC

The squawk code for lost communications is ***7600***

If only the transmitter is inoperative, listen for ATC instructions on any operational receiver, including your navigation receivers (ATC may attempt to contact via VOR, VORTAC, NDB, or localizer frequency).

Try a previous ATC frequency to see if you can reestablish communications, or use FSS or Aeronautical Radio/Incorporated (ARINC).

# Communications Failure: Enroute

1. If you must continue after 2-way radio failure, you should fly on of the following routes.
2. The route assigned by ATC in your last clearance received
3. If being radar vectored, the direct route from the point of radio failure to the fix, route, or airway specified in the radar vector clearance.
4. In the absence of an assigned or expected route, the route filed in your flight plan.

# Communications Failure: Altitude

It is important for you to fly a specific altitude should you lose 2-way comm. The altitude you fly after failure is found in FAR 91.185 and must be the highest of the following altitudes for each route segment flown.

- The altitude (or flight level) assigned in your last ATC clearance
- The minimum altitude (or flight level) for IFR operations.
- The altitude (or flight level) ATC has advised you to expect in a further clearance.

In the situation where the MEA rises in the next rout segment you normally begin a climb to the higher MEA when reaching the fix where the MEA rises.

If the fix also has a published minimum crossing altitude (MCA), start your climb so you will be at or above the MCA when reaching the fix.

If the next segment has a lower MEA, descend to the applicable altitude-either the last assigned altitude or the altitude expected in a further clearance-when you reach the fix where the MEA decreases.

# Emergency Approach Procedures

Distress situations such as loss of gyro, radar approach procedures may be available to complete your flight safely. Note: It does not waive the prescribed weather minimums. Three types of radar approaches may be available to: airport surveillance radar (ASR), precision approach radar (PAR), and the no-gyro approach.

***ASR.***

The controller furnishes headings to fly to align your aircraft with the extended centerline of the landing runway-only azimuth information-no vertical guidance. You are advised when to start the descent to the MDA or, if appropriate, to tan intermediate stepdown fix and then to the MDA. You will be advised of the location of the missed approach point end while on final

the published MDA for straight-in ASR approaches is issued to you before you are instructed to begin your descent. If you do not report runway in sight, ATC terminates guidance and instructs you to execute a missed approach.

***PAR***

The controller provides highly accurate navigational guidance in azimuth and elevation. You will be given headings to align the aircraft with the runway centerline and will advise you of glide slope interception 10-30 seconds before it occurs-and you will be told when to start the descent. The controller will also report range to touchdown at least one each mile during the approach. Very cool experience!

# Emergency Approach Procedures

***NO-GYRO VECTOR AND APPROACH.***

ATC will instruct you to make turns by saying, “turn right, stop turn,” and turn left.” You must turn as soon as you receive the instruction and comply with ATC directions by making standard-rate turns until you have been turned onto final. *Once on final, all turns should be made at half standard rate*.

# Malfunction Reports

Malfunctions must be reported in accordance to FAR 91.187 if any navigation or commendation equipment becomes inoperative. It includes:

1. Aircraft identification
2. Equipment affected
3. Degree to which the equipment failure will impair your ability to operate IFR.
4. Type of assistance desired from ATC.

## Emergency Airports

ATC personnel consider how much remaining fuel in relation to the distance to the airport and weather conditions when recommending an emergency airport to aircraft requiring assistance. Depending on the nature of the emergency, certain weather phenomena may deserve weighted consideration. A pilot may elect to fly further to land at an airport with VFR conditions instead of closer airfield with IFR conditions. Other considerations are airport conditions, NAVAID status, aircraft type, pilot's qualifications, and vectoring or homing capability to the emergency airport. In addition, ATC and pilots should determine which guidance can be used to fly to the emergency airport. The following options may be available:

- Radar
- DF
- Following another aircraft
- NAVAIDs
- Pilotage by landmarks
- Compass headings

## Responsibility

ATC, in communication with an aircraft in distress, should handle the emergency and coordinate and direct the activities of assisting facilities. ATC will not transfer this responsibility to another facility unless that facility can better handle the situation. When an ATC facility receives information about an aircraft in distress, they forward detailed data to the center in the area of the emergency. Centers serve as central points for collecting information, coordinating with search and rescue (SAR) and distributing information to appropriate agencies.

Although 121.5 megahertz and 243.0 megahertz are emergency frequencies, the pilot should keep the aircraft on the initial contact frequency. The pilot should change frequencies only when a valid reason exists. When necessary, and if weather and circumstances permit, ATC should recommend that aircraft maintain or increase altitude to improve communications, radar, or DF reception.

# Emergency Summary Checklist

• The AIM defines an emergency as a condition of distress or urgency. A distress threatened by serious and/or imminent danger and requires assistance. An urgent situation requires a timely but not immediate assistance.
• In an emergency you may deviate from any rule in FAR Part 91 to the extent necessary to meet the emergency.
• The emergency frequency of 121.5 MHz may be used to declare an emergency in the event you are unable to contact ATC on other frequencies.
• In a distress situation, begin your initial call with the word “MAYDAY, preferably 3 times. Use “APN-PAN in the same manner in an urgent situation.
• The transponder may be used to declare an emergency situation by squawking code 7700.
• A special emergency is a condition of air piracy and should be indicated by squawking code 7500 on your transponder.
• If your remaining fuel quantity is such that you can accept little or no delay, you should alert ATC with a minimum fuel advisory.
• If the remaining usable fuel supply suggests the need for traffic priority to ensure a safe landing, you should declare an emergency due to low fuel and report fuel remaining in minutes.
• Gyroscopic instruments including the attitude indicator, heading indicator, and turn coordinator. These instruments are subject to vacuum and electrical system failures.
• During an instrument failure your ***first priority*** is to *FLY THE AIRPLANE, NAVIGATE ACCURATELY, then COMMUNICATE WITH ATC*.

# Phase III Exam, Then
# F I N A L  E X A M I N A T I O N

Next time we will have your 3rd of 4 examinations. Phase III will test on all materials covered since the Phase II Examination including:

Weather Factors and Hazards
Analyzing Weather Data
IFR Decision Making
IFR Flight Planning
IFR Emergencies

The last meeting will be the final examination. Make sure to bring: Logbook, Pencil with Eraser, E6B and Nav Plotter.