Instrument Rating Oral Prep – 2013

I. Pilot Qualifications

What are your recency requirements to act as Pilot in Command of a flight under IFR?

The Pilot must have a valid Medical Certificate and a biannual flight review within the last 24 months. In addition to the three takeoffs and landings during the day and to a full stop during night, the pilot must conduct within six calendar months;

- Six instrument approaches
- Holding procedures
- Intercepting/tracking through the use of navigation systems under simulated instrument or actual conditions.

Can you conduct the IFR recency requirements with a simulator?

Yes. The IFR recency requirements can be conducted in an approved flight simulator or flight training device with an authorized instructor.

What happens if a pilot lets his IFR recency requirements expire? What can he/she do in the event?

After six calendar months without completing any of the recency items, the pilot can no longer act as Pilot in Command of a flight under IFR. However, there is a six calendar month grace period after the IFR recency expires that allows the pilot to regain his/her currency with a safety pilot or a flight simulator/flight training device. If 12 calendar months lapse completely, the pilot must undergo an Instrument Proficiency Check from an authorized instructor or flight examiner.

II. Weather & Weather Information

Using tools like www.aviationweather.gov pull up the METAR and TAF for 5 different airports in different regions of the United States (For example: KJFK, KMIA, KDAL, KLAX, KSEA)

Read and understand those reports. In addition, study the following weather products:

- PIREPS
- Prognostic Charts
- Winds Aloft
- AIRMETs and SIGMETs
- Freezing level Charts

What typical weather characteristics can you expect when flying in an area of Low Pressure?

When flying in an area of low pressure you can expect good visibility, showery precipitation, un-stable air more susceptible to convective activity. (Cumulonimbus Formation)

How do winds move around a Low Pressure Area?

Winds will move in a counter-Clockwise direction and will move inwards towards the center of the Low-Pressure area and upwards.

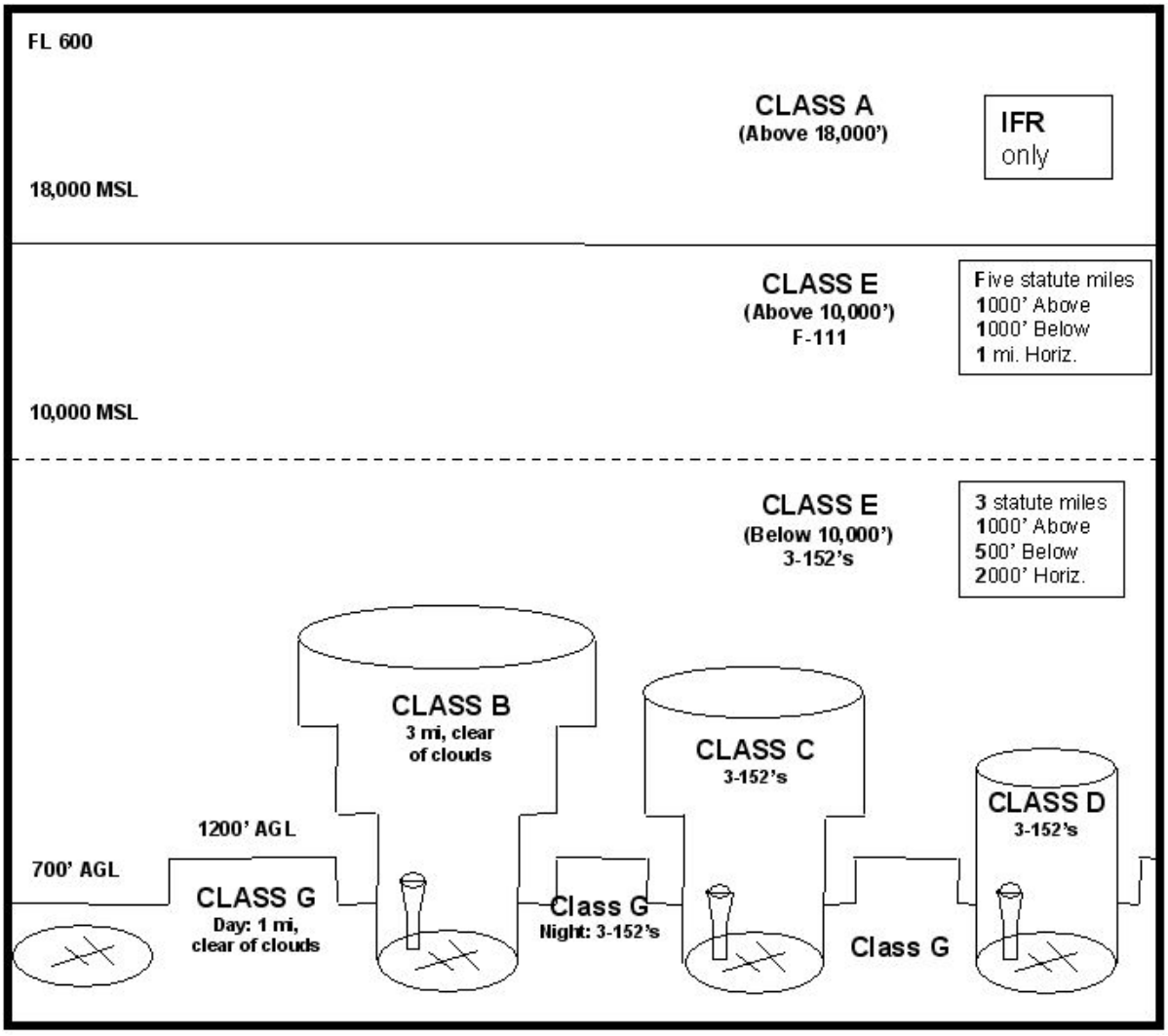
What typical weather characteristics can you expect when flying in an area of High Pressure?

When flying in an area of low pressure you can expect relatively poor visibility, Haze, steady precipitation and stable air that will hinder convective activity.

How do winds move around a High Pressure Area?

Winds will move in a Clockwise direction and will move downwards and outwards from the center of the High-Pressure area .

What are the basic minimum weather conditions for VFR flight?



What kind of weather requires an alternate under an IFR flight?

1 -2 - 3 Rule - If from 1 hour before to 1 hour after your planned ETA at the destination airport, the weather is forecast to be less than a 2,000ft ceiling and 3 mile visibility, an alternate is required. Any higher and an alternate is not required.

What weather minimums must be established at the filed alternate in order for it to be valid?

- Precision approach procedures; ceiling 600 feet and 2 statute mile visibility
- Nonprecision approaches: ceiling 800 feet and 2 statute mile visibility

If there is no Instrument Approach Procedure (IAP) for the alternate, the ceiling and visibility requirements must allow for normal descent from Minimum Enroute Altitude (MEA), approach, and landing under VFR.

Aircraft Systems Related to IFR Operations

Is your aircraft approved for flight in to Icing Conditions?

The Cessna 172 is NOT approved for flight in to known icing conditions.

What kinds of icing could you encounter?

1) **Structural Icing** – This is ice that builds up on the aircrafts surfaces and is broken down in to three categories:
   - **Clear Ice**: Ice that is formed bu large water droplets as they freeze while rolling over the wing. This is the most dangerous form of structural icing as it is difficult to see and difficult to remove from the aircraft.
   - **Rime Ice :** This is ice caused by super-cooled water droplets freezing as they impact the leading edges of the aircraft. As they impact they freeze instantly, trapping air within the ice. This gives the ice a milky white appearance.
   - **Mixed Ice**: This is a combination of Clear and Rime Icing
   - **Vanilla Ice**: “Ice, Ice Baby!”

2) **Induction Icing** – This is ice that builds up within the carburetor. The danger is that enough ice will form causing a blockage of the air/fuel mixture in to the engine, effectively starving the engine from fuel and shutting it down.

What system/s is/are available on the Cessna 172 to prevent / remove Induction Icing?

The Cessna 172 is equipped with Carburetor Heat. This system takes outside air that has been heated by the engine and sends the heated air in to the carburetor to prevent / remove ice build-up within the carburetor.

What systems are available on the Cessna 172 to prevent / remove structural icing?

The Cessna 172 is equipped with Pitot-Heat which warms the Pitot-Tube to prevent ice formation or remove ice build-up. In addition, the in-cabin window defroster will warm a small portion of the windshield to prevent / remove ice build-up from the windshield.

What other systems are available in general to remove ice in flight from the wings and other surfaces?

1. **Boots** – These are rubber strips on the leading edges of airfoils that use bleed air from turbine & turbocharged engines. When the bleed air enters the boot, it inflates causing the ice build-up to crack and allows the airflow to remove the ice from the aircraft surface.
2. **Heated Wing** – This system incorporates a heated strip along the leading edge of airfoils that will prevent ice build-up or melt any existing ice build-up. The "Heated Wing" used either warm bleed air or electronic heating elements.
3. **TKS (weeping wing)** – The TKS system pumps a solution of glycol and alcohol through small holes along the leading edge of airfoils. The solution has a lower freezing point than water (-60 degrees C) and mixes with the moisture on the wings lowing the moistures freezing point preventing ice formation. If ice has already formed, the solution will break the bond between the ice and the aircraft surface allowing the airflow to knock the ice formation off of the aircraft.

Aircraft Flight Instruments and Navigation Equipment

Which Documents need to be on board an aircraft?

A –Airworthiness**, R –** Registration**, R-** Radio Operator Permit**, O –** Operating Limitations**, W –** Weight and Balance **Remember**: **ARROW**

Which aircraft instruments must be on board and operational for VFR day/night flight?

DAY
Airspeed Indicator
Tachometer for each engine
Oil Pressure gauge for each engine
Manifold Pressure gauge for each engine
Altimeter
Temperature Gauge for air cooled engines
Oil Temperature Gauge

Fuel Gauges
Landing Gear Position Indicator
Anti Collision Light
Magnetic Compass
ELT
Seat Belts

NIGHT
Fuses / Circuit Breakers
Landing Light
Anti Collision Lights
Position Lights
Source of electric energy

It is good practice to carry a flashlight.

Remember: A TOMATO FLAMES FLAPS

Which aircraft instruments must be on board and operational for IFR flight?

In addition to the normal instruments required for VFR flight, you also need:

Generator, **R**adio, **A**ltimeter (Sensitive to Pressure), **B**all (Slip Indicator), **C**lock, **A**ttitude indicator, **R**ate of Turn Indicator, **D**irectional Gyro

Remember: GRAB CARD

Which aircraft instruments are components of the Pitot-Static System?

The Airspeed Indicator, Altimeter and Vertical Speed Indicator (VSI)

Which of the Pitot Static Instruments received data from the Pitot-Tube?

Only the Airspeed Indicator receives data from the Pitot-Tube.

Which of the Pitot-Static instruments receive data from the Static Port?

All three of the Pitot-Static instruments receive data from the Static Port.

While in cruise flight, your Pitot-Tubes entry gets blocked however the drain hole remains clear. How will this affect your airspeed indications?

The Airspeed Indicator will show zero airspeed.

While in Cruise flight your Pitot-Tube entry AND drain hole become blocked. How will this affect your airspeed indications?

The airspeed will remain stuck on the same speed as when the blockage occurred. The Airspeed indicator will function in the same way as an Altimeter. As you climb, the airspeed indication will rise. As you descend, the airspeed indication will lessen. This is due to the airspeed indicator being tied in to the static port.

What kind of corrective action can you take to help eliminate ice on the Pitot-Tube and blockage of the Static Port?

<u>Pitot-Tube</u>

- Turn the Pitot Heat on

<u>Static Port</u>

- Turn alternate air on. If alternate air fails, break the face of the static instrument: Altimeter or Vertical Speed Indicator.

What kind of indications will one receive after turning on alternate air?

An alternate static source allows air to be vented inside the cabin thus creating a lower static pressure from outside of the aircraft. The indications are as follows:

Airspeed – Will indicate a greater airspeed.

Altimeter – Will indicate a higher altitude.

Vertical Speed – Will indicate a slight climb while in level flight.

Which instruments contain gyroscopes?

The attitude indicator, heading indicator, and turn-slip coordinator/indicator

Which gyroscopic instruments are vacuum powered and electricity driven?

The attitude indicator and heading indicator are vacuum powered and in most cases, the turn coordinator is electricity based.

How does the vacuum system operate?

A source of vacuum for the gyros draws suction from an engine-driven pump when the engine has sufficient RPM. The amount of pressure required for instrument operation varies between 4.5 to 5.5inHG.

What are the various magnetic compass errors?

Variation error, **D**eviation error, **M**agnetic dip, **O**scillation error, **N**ortherly turning error, **A**cceleration error

Acceleration error – While on east or west headings while accelerating, the magnetic compass shows a turn to the north, and when decelerating, it shows a turn to the south. (In the Northern Hemisphere)

Remember: Accelerate **N**orth; **D**ecelerate **S**outh

Northerly turning error – The compass leads in the south half of a turn, and lags in the north half of a turn.

Remember: Undershoot **N**orth; **O**vershoot **S**outh

Remember: **VDMONA, ANDS, UNOS**

Instrument Cockpit Check and Aircraft Inspections

How do you check your instruments on the ground to make sure they are operational prior to flight?

Magnetic Compass: Filled with Fluid and swings freely indicating known directions

Altimeter: Shows field elevation +/- 75' when set to local altimeter setting

Airspeed: Shows increase in airspeed during take off roll.

Directional Gyro: Spins freely and holds directions

Turn Coordinator: Airplane banks in the direction of taxi turns, ball slides to opposite side of taxi turns.

How often must you test the VORs to be legal for IFR flight? What tests are available?

The VORs must be tested once every 30 days.

VOR Test Facility (VOT): Transmits the 360 Radial in ALL directions. VOR receiver will indicate the 360 radial with a FROM indication. Needle must remain within 4 degrees of center for VOR to pass the test.

Ground Test: Place the aircraft on a pre-determined spot on an airport (indicated in the AF/D). Tune the VOR to the proper radial. VOR receiver must show centered +/- 4 degrees for the VOR to pass the test.

Airborne Test: Overfly a pre-determined spot and tune the VOR to the specified radial (found in the AF/D). The VOR receiver must center +/- 6 degrees for the VOR to pass the test.

Dual System Check: If you have two independent VOR systems on board, you can test one system against the other. Set both VORs to the same radial. You must receive identical indications on both receivers +/- 4 degrees for the VOR to pass the test.

What inspections must your airplane have in order to be airworthy?

Airplanes must go through an Annual Inspection.

If the airplane is used for Commercial Purposes such as Flight Instruction, Rental etc, the aircraft must ALSO go through an inspection every 100 flight hours (TACH time). These inspections must be done by an FAA certified Mechanic and an entry must be made in the aircrafts maintenance records.

If both a 100 hours inspection and an Annual inspection are due at the same time, you can perform the Annual inspection and that will cover the 100 hour inspection as well. The opposite is NOT true.

If you are due for a 100 hour inspection and you are not at the airport that the Inspection will be made at, you may operate the aircraft for an additional 10 hours to get to the location at which the

inspection can be made. When operating an aircraft passed the time due for inspection, the Pilot In Command is the ONLY person allowed to be inside the aircraft. No passengers or property may be carried and the aircraft must go from point of origin to destination with no unneeded stops.

What other equipment inspections are there for an aircraft to be airworthy?

1) **ELT**: Every 12 months
2) **ELT Battery**: Must be replaced after 1 hour of accumulative use or after half of the batteries useful life.
3) **Transponder:** Every 24 calendar months
4) **Altimeter**: Every 24 Calendar Months
5) **Pitot-Static system**: Every 24 calendar months

Flight Operations

What are the minimum fuel requirements for IFR flight?

For IFR flight the aircraft must have enough fuel on board to fly from the point of origin to the destination and from the destination to the planned alternate PLUS a 45 minute reserve at normal cruise settings.

What altitudes must be maintained for IFR flight?

Flying East: Odd Thousands (3000, 5000, 7000 etc)

Flying West: Even Thousands (4000,6000, 8000 etc)

What is a Minimum Enroute Altitude (MEA)?

A Minimum Enroute Altitude is depicted on IFR enroute charts . The MEA provides adequate Obstruction clearance and ensures reception of Navigational Aids along the entire segment of the airway.

What is a Minimum Obstacle Clearance Altitude (MOCA)?

A Minimum Obstacle Clearance Altitude is depicted on IFR enroute charts. The MOCA ensures adequate obstacle clearance but only ensures reception of Navigational Aids within 22NM of the station.

What is an Off Route Obstruction Clearance Altitude (OROCA)?

The Off Route Obstruction Clearance Altitude is depicted on IFR enroute charts. The OROCA provide obstruction clearance with a 1,000’ buffer in non-mountainous terrain and a 2000’ buffer in mountainous terrain. NAVAID reception is NOT guaranteed.

Oxygen Requirments:

From	Up to	Who needs oxygen?
12,500 MSL	14,000 MSL	Crew only if the flight will last longer than 30 min at those altitudes.
14,001 MSL	15,000 MSL	Crew during the entire duration of flight at those altitudes
15,000 MSL	Above	All crew and Passengers must use oxygen above this altitude.

What is a "Hold"?

A hold is a procedure used to help regulate the flow of IFR traffic.

Describe a Hold.

A Hold is an oval shape pattern anchored over a "Fix" consisting of two 180-degree turns with an "Inbound" leg and an "Outbound" Leg. The length of the Outbound leg is timed to one minute **OR** defined by DME. The turns are to be completed at a "Standard-Rate". A normal hold should take four minutes to complete.

What is a "Fix"?

A Fix is the point over which a Hold is executed. A Fix can be either a Navaid (VOR, NDB), an intersection of two radials or it can be a Radial with a DME

Are holds conducted with Left or Right turns?

"Standard" holds are right hand turns. "Non-Standard" holds are left hand turns.

If performing a hold with crosswinds, how shall the pilot apply wind correction?

When on the Inbound leg the pilot will make note of the amount of wind correction needed. The pilot will then apply the same correction in the opposite direction multiplied by three. For example: On the Inbound leg the pilot must keep the nose TEN degrees to the RIGHT to maintain the proper track, on the Outbound leg, the pilot will apply THIRTY degrees correction to the LEFT.

If flying a pattern with a headwind or tailwind, how shall the pilot apply wind correction?

The pilot will lengthen or shorten the Outbound leg to maintain a complete Hold of 4 minutes in length. For example, if flying on the Inbound leg with a tailwind the inbound leg was only forty seconds in length, the outbound leg will be lengthened to one minute and twenty seconds

What is L.A.H.S.O.?

LAHSO is when the controller asks you to land on a runway and hold short of an intersecting runway or taxiway.

In order to perform a LAHSO, you need to know the landing distance required for your aircraft and the available landing distance to you. You must ensure that you have enough runway available to

safely stop the aircraft before the hold short point. It is good practice to add an additional 1000ft to your required landing distance to act as a safety zone.

If you are a student pilot you are prohibited from performing a LAHSO. You should NOT perform LAHSO if it would adversely affect the safety of the flight.

Things that could cause the LAHSO to be unsafe are, but not limited to: Wet runway, poor visibility, landing with tailwinds and landing at night.

When is a Transponder required to be installed on board for flight?

A transponder is required when flying within Class A airspace. It is also required when flying either within or above Class B airspace and Class C airspace. A transponder is also required when flying within 30NM of a Bravo airport and anywhere when flying above 10,000' MSL.

What are the special pre-designated transponder codes? What do they mean?

1200	7500	7600	7700	7777
VFR aircraft	Hi-Jacked	Lost Communications	Emergency Aircraft	Military Aircraft

What kinds of instrument approaches are there?

Instrument approaches can be broken down in to two groups; Precision Approaches and Non-Precision Approaches. A precision approach is an ILS approach. Examples of Non-Precision approaches are VOR, LOC, NDB and GPS approaches.

How can you identify the Final Approach Fix (FAF) on a Non-Precision Approach?

The FAF on a Non-Precision approach can be identified by a Maltese cross on the Profile View of the Approach Plate.

How can you identify the Final Approach Fix (FAF) on a Precision Approach?

The FAF on a Precision Approach can be identified by a small "lightning bolt" symbol on the Profile view on the approach plate. The FAF on a Precision approach may also be identified in flight by crossing the proper altitude while maintaining the glide slope**.**

What is a Decision Height (DH)?

A DH is the lowest altitude you may fly on a Precision Approach. It is named Decision Height because at that altitude you MUST decide if you are landing or going to execute a Missed Approach.

What is a Minimum Descent Altitude (MDA)?

A MDA is the lowest altitude you may descend to on a Non-Precision approach until you have the runway in sight.

What is the difference between an MDA and a DH?

The difference between an MDA and a DH is that the DH is also the Missed Approach Point (MAP) on a Precision Approach where as on a Non-Precision Approach you will reach the MDA prior to arriving at the MAP.

When should a Missed Approach be executed?

A Missed Approach should be executed if:

- The Runway in not in sight at the MAP
- A safe landing cannot be accomplished
- When on a Circle to Land and visual contact is lost with the runway
- When instructed to by ATC

How can you identify the Missed Approach Point (MAP) on an approach?

You can identify the MAP with the following:

- Precision Approach: Arriving to the DH at the correct altitude
- Localizer approach: Upon reaching the time limit from the FAF
- Non Precision Approach: Upon reaching the time limit from the FAF OR if the NAVAID is designated as the MAP, upon reaching the NAVAID
- GPS Approach: Upon reaching the MAP as designated on the GPS

What is a "Procedure Turn"?

A procedure turn is a segment on an instrument approach to allow for a course reversal to intercept the inbound leg to the runway.

When is a Procedure turn not required?

A procedure turn is not required when:

- Receiving radar vectors from ATC or when ATC advises not to do the PT
- A procedure turn is not depicted on the approach plate
- The procedure indicates "No PT"

What is a DME Arc?

A DME Arc is used in instrument approaches and departures to transition an aircraft from a waypoint to the final approach segment of an approach or from runway heading to a waypoint on a departure procedure.

How will you fly a DME Arc? (Right hand 10 mile arc on the 010 radial to the 100 radial outbound)

Fly the 090 radial inbound to the station (190 heading). At 10.5 DME from the station make a 90 degree left turn (heading 100). We make the turn 0.5 miles prior to the desired DME so that by the time the turn is complete, due to momentum, we will be at the desired DME. Set VOR for the outbound radial (100). When the DME shows 10.2 DME from the station, make a 10 degree turn to the right. This will cause the aircraft to get closer to the station returning the aircraft to the desired DME. As the aircraft gets further from the station the DME will return to 10.2 DME. Repeat the above procedure until reaching the desired outbound radial (100). When the CDI starts to show movement, intercept as normal.

NOTAMS:

- NOTAM (D) Notices to airmen regarding distant navigational aid conditions and facilities
- NOTAM (FDC) Notices to airmen regarding flight data, and regulatory information

Lost Communication Procedures:

After troubleshooting possible causes, Squawk 7600 and follow the appropriate procedures under:

VFR Conditions: Continue flight under VFR and land as soon as practicable.

IFR Conditions: Continue flight as follows;

- Route:
  - **A**ssigned: Route in last ATC clearance
  - **V**ectored: Direct to fix, route, airway in vector clearance
  - **E**xpected: If applicable, an expected route ATC has advised previously
  - **F**iled: Route filed from flight plan
- Altitude:
  - **M**inimum: Maintain at least Minimum Enroute Altitude (MEA) along routing
  - **E**xpected: If applicable, maintain altitude ATC has advised to expect
  - **A**ssigned: Maintain altitude ATC has advised

Upon initiating approach procedures at destination, the time to leave a fix/hold is determined by the last ATC clearance, expected, or time filed in the flight plan.

Interception Procedures: Squawk 7700, monitor 121.5 and broadcast – "I am being intercepted"

Rocking wings – Acknowledge

Interceptor's open gear – Land as soon as possible
Interceptor turns gently – Follow
Interceptor turns 90 degrees – Clear
Red-Red-Green Laser – Entered FRZ, exit immediately

Special use airspace areas:

Alert Areas – Areas shown on aeronautical charts to inform you of unusual types of aerial activities, such as parachute jumping, glider towing, or high concentrations of student pilot training are designated as alert areas.

Military Operations Areas –VFR aircraft are not prevented from flying through active MOAs, but it is wise to avoid them when possible.

Warning Areas – A warning area is airspace of defined dimensions, extending from three nautical miles outward from the coast of the United States, that contains activity which may be hazardous to nonparticipating pilots of the potential danger.

Restricted Areas – Restricted areas often have invisible hazards to aircraft, such as artillery firing, aerial gunnery, or guided missiles. Permission to fly through restricted areas must be granted by the controlling areas.

Prohibited Areas – Prohibited areas are established for security or other reasons associated with national welfare and contain airspace within which the flight of aircraft is prohibited. You must obtain permission from the controlling agency to operate within a prohibited area.

National Security Areas – NSAs are established at locations where there is a requirement for increased security and safety of ground facilities. At times, flight through an NSA may be prohibited to provide a greater level of security and safety. A NOTAM is issued to advise you of any changes in an NSA's status.

Temporary Flight Restrictions – When necessary, temporary flight restrictions are imposed by the FAA to protect persons or property on the surface or in the air from a specified hazard or situation. Incidents within Class B, C, or D airspace are handled through existing procedures, and usually do not require issuance of a NOTAM.

Terminal Radar Service Areas – TRSAs do not fit into any of the U.S. airspace classes. Originally part of the terminal radar program at selected airports, TRSAs have never been established as controlled airspace. By contacting approach control, you can receive radar services within a TRSA, but participation is not mandatory.

ADIZ – All aircraft entering domestic U.S. airspace from outside the country must provide identification prior to entry. Air defense identification zones are established to facilitate this identification in the vicinity of U.S. international airspace boundaries.

Human Factors:

Hypoxia: A condition of oxygen deficiency in the bloodstream. Symptoms include headaches, fatigue, euphoria, nausea, and levels of consciousness.

Carbon Monoxide: A colorless, odorless, and tasteless gas. With the increase of altitude, carbon monoxide effects will be greater as oxygen diminishes. A large accumulation of carbon monoxide can cause loss of muscular power if symptoms continue for large periods of time. Symptoms include hazy thinking, uneasiness, dizziness, and headaches.

Hyperventilation: An accelerated rate of breathing caused by stress or anxiety.

Spatial Disorientation: A feeling of imbalance caused by conflicting signals from vision and inner ear fluids. In order to overcome, trust the instruments.

Fatigue: Resulting from sleep loss, exercise, physical work, or stress. Will degrade attention, concentration, coordination, and communication. Requires adequate rest.

ATC light signals, Airport Signs and Markings:

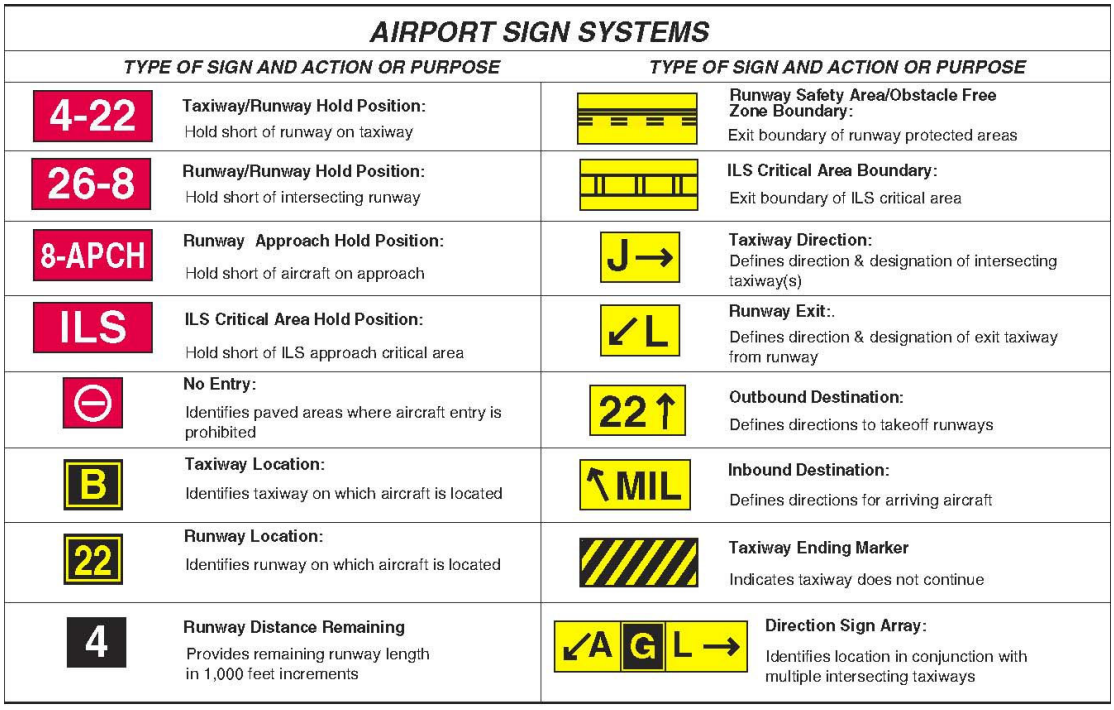
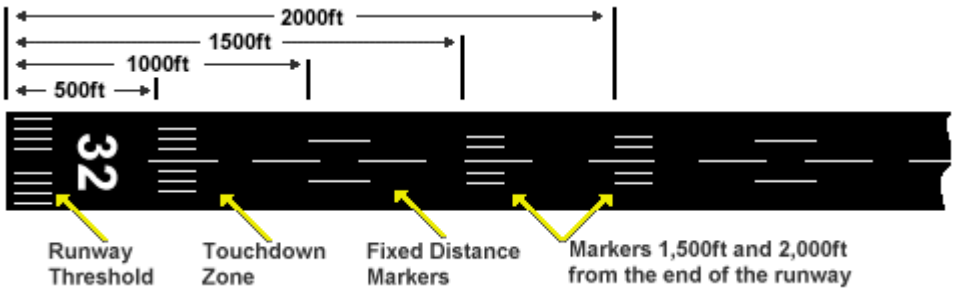
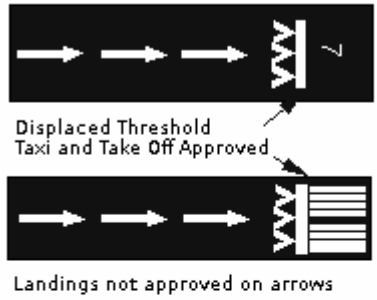


Figure 12-4. Airport signs.



UNUSEABLE RUNWAY AREAS



ATC Light Signals:

Air Traffic Control Light Signals

Color and type of signal	Aircraft on the ground	Aircraft in flight	Movement of vehicles, equipment and personnel
Steady green 	Cleared for takeoff	Cleared to land	Cleared to cross, proceed, or go
Flashing green 	Cleared to taxi	Return for landing (followed by steady green)	Not applicable
Steady red 	Stop	Give way to other aircraft and continue circling	Stop
Flashing red 	Taxi clear of the runway in use	Airport unsafe, do not land	Clear the taxiway/runway
Flashing white 	Return to starting point on airport	Not applicable	Return to starting point on airport
Alternating red and green 	Exercise extreme caution	Exercise extreme caution	Exercise extreme caution