Private Pilot Study Guide

Pilot Documents

Pilot Certificate
Government Issued photo ID
Medical Certificate
Logbook with endorsement – solo students

Airmen Certification

Category – Airplane, Rotorcraft, Glider, Power-lift, Lighter-than-air
Class – Single, Multi, Land, Sea
Type – B-747, SR-20, C-172

Aircraft Certification

Category – Normal, Utility, Acrobatic, Restricted, Experimental
Class – Airplane, Rotorcraft, Glider, Power-lift, Lighter-than-air
Type – Large(12,500+), Turbine, Jet, or Specified by FAA

Duration of Medical

Under 40				
First	ATP, Comm	12	PP,FI,RP,SP	60
Second	Comm	12	PP,FI,RP,SP	60
Third	PP,FI,RP,SP			60

*No medical certificate required for piloting glider and ballon

At or Over 40						
First	ATP	6	Comm	12	PP,FI,RP,SP	24
Second	Comm			12	PP,FI,RP,SP	24
Third	PP,FI,RP,SP					24

Aircraft Documents §91.203 - ARROWS

A Airworthiness Certificate
R Registration Certificate
R Radio License – if outside US
O Operators Handbook (limitation)
W Weight & Balance
S Supplement

Registration Expires When–on the back of registration –30ft DUC

30 30days after death
F Foreign registration
T Transfer ownership
D Destroyed
U US citizenship revoked
C Cancelled by request (every 3 years)

Special Flight Permit §21.197

1.Fly to a repair station, 2.Deliver or export aircraft, 3.Flight test, 4.Customer demo, 5.Remove aircraft from area of impending danger, 6.Overweight flight over land or waters that refueling is not allowed

Passenger Carrying Requirement §61.57(a)&(b)

Day – 3 Takeoffs and 3 Landings in the same category, class & type if required within preceding 90 days.
Night, Tailwheel – Like day, but each landing to a full stop

IFR Currency §61.57(c) – 66HIT

6 Within past 6 months
6 Ac/Sim IFR, 6 approaches including
H Holding procedures
I Intercepting courses
T Tracking courses
Next 6 months may be accomplished with an appropriately rated safety pilot

When out of IFR Currency §61.57(d)

12 months after currency ends
Instrument proficiency Check

Preflight Actions – §91.103 – AW KRAFT

A All available info for that flight to include
W Weather (1-800-WX-BRIEF)
K Known ATC Delay
R Runway Length
A Alternatives
F Fuel Requirement
T Takeoff and Landing Distance

Inspection - AVIATES

A Airworthiness Directives §39
V VOR Check (IFR-30 days) §91.171
I Inspection (Annual, 100h or Progressive) §91.409
A Altimeter (24 Mo) §91.411
T Transponder (24 Mo) §91.413
E ELT (12 Mo, 1 hr. use or 1/2 bat life) §91.207
S Static Source – (24 Mo) §91.411

Required Equipment – VFR Day §91.205

ATOM FLAMES A TOE

A Altimeter
T Tachometer
O Oil Pressure Gauge
M Manifold Pressure Gauge (alt eng)
A Airspeed
T Temperature
O Oil Temperature
E ELT
F Fuel Gauge (each tank)
L Landing Gear Indicator Lights
A Anti-Collision Lights (after 3/11/96)
M Magnetic Compass
E Emergency Equipment (hire and over water, §91.506)
S Seat Belts

Required Equipment – VFR Night – FLAPS

F Fuses – a set or 3 for each
L Landing Light (if for hire)
A Anti-Collision Light(s)
P Position Lights (Nav Lights)
S Source of Electrical Power

Required Equipment – IFR – GRAB CARDD

G Generator or Alternator
R Radio/Nav appropriate for flight
A Attitude Indicator
B Ball (Inclinometer)
C Clock (Second hand or digital)
A Altimeter (Pressure Sensitive)
R Rate of Turn Indicator
D Directional Gyro
D DME

Types of Airspeed – ICE TG

I Indicated (Read off from Instrument)
C Calibrated (IAS corrected pos. & instru. error)
E Equivalent (CAS corrected Compressibility)
T True (EAS corrected non-std P & T)
G Ground (TAS corrected wind)

Types of Altitude – iPad T

I Indicated (Read off Instrument)
P Pressure (Alt. above std/29.92 plane)
D Density (PA corrected non-std T)
A Absolute (AGL)
T True (MSL)

Airspace – AIM CH8

- **A** 18,000 MSL – FL600, Require IFR, Clearance, Mode C Transponder, Two-way Radios, No VFR, Speed - up to Mach 1
- **B** SFC–10,000 MSL, Requires Clearance, Two-way Radios, Mode C Transponder, (VOR or GPS, if IFR), Speed – 250 in below 10,000 MSL, 200 below B
- **C** SFC–4,000 AGL, Two-way Radios, Mode C Transponder, Speed – 200 with 4nm from SFC–2500 AGL
- **D** SFC–2,500 AGL, Two-way Radios, Speed – 200
- **E** Below 17,999 MSL is charted on Sectional, Terminal and En route Low Altitude Chart – **SEGA DOT**
  - S Surface
  - E Extension (SFC extension to B,C,D)
  - G General (above G & FL600)
  - A Airway (1200 to 17,999 AGL)
  - D Domestic En Route (lacks airway, requires IFR control)
  - O Offshore (12 nm from Coast to 17,999 MSL)
  - T Transition (700 or 1200 AGL)
- **G** Uncontrolled Airspace (excluded A, B, C, D)

Special Airspace – AIM CH3-4 – WARM PC N

- W Warning Area (offshore)
- A Alert Area (high volume of training area)
- R Restricted Area (need permission)
- M MOA (Military Operation Area)
- P Prohibited Area (can't go into)
- C Controlled Firing Area (not charted)
- N National Security Area

Other Airspace – AIM CH3-5 – MTV PAT

- M Military Training Route
- T Temporary Flight Restriction
- V VFR flyway (under B), transition and corridor (through B)
- P Parachute Area
- A Airport Advisory
- T TRSA (terminal radar service area)

ADIZ – Air Defense Identification Zone

Requires 2-way Radios, Mode C Transponder, DVFR or IFR

MTR

3 digit number – include one or more segment > 1500' AGL
4 digit number – no segment above 1500' AGL

SVFR §91.157

In B ,C , D, E with ATC clearance, requires GVIS 1 SM or FVIS 1 SM and COC. At night, the pilot & aircraft must be IFR rated

Cloud Clearance, Basic VFR weather minimums – §91.155

http://www.law.cornell.edu/cfr/text/14/§91.155
**SEE APPENDIX 1*

Supplemental Oxygen – §91.211

General, Non-Pressurize Cabin

12500-14000	Crew > 30 min
>14000	Crew must use supplemental oxygen
>15000	Each Occupant must be provided with oxygen

Pressurized Cabin

>FL250	10 min oxygen for a descent due to loss of cabin pressurization
>FL350	1 pilot always use oxygen mask 2 pilots, quick-donning type of oxygen mask can be placed on face within 5 seconds
>FL410	Always use oxygen mask

VFR Fuel Requirement – §91.151

Day – fuel to first point to land + 30 min fuel reserve
Night – fuel to first point to land + 45 min fuel reserve

Minimum Altitude – §91.119

Anywhere – Safe Alt. should the engine fail to emergency landing not cause a hazard to persons or property on the SFC
Congested – 1000' above the highest obstacle within 2000' horizontal radius to the aircraft
Non-congested – 500' above any person or structure, not closer than 500' to any person or structure

Right of Way Rule – §91.113, §91.103

Aircraft in distress have the right of way over all other aircraft
Aircraft towing/refueling another aircraft have the right of way over all engine driven aircraft
Landing – aircraft at lower Alt. has right of way, but shall not take advantage of rule to cut in front of another aircraft
Head-On – both shall alter course to the right
Converging – aircraft on the right has the right of way
Overtaking – overtaking aircraft shall pass on the right aircraft being overtaken has the right of way
Right of way order – Balloon > Glider > Airship > Airplane > Rotorcraft (**BGAAR – "big R"**)

Light Gun Signals – §91.125

Light	On Ground	In Flight
Steady Green	Cleared for T/O	Cleared to land
Flashing Green	Cleared to taxi	Return for landing
Steady Red	Stop	Continue circling
Flashing Red	Taxi off runway	Airport unsafe
Flashing White	Return to standing point	N/A
Red/Green	Use extreme caution	Use extreme caution

Transponder Requirements – §91.125 – ABC 10 30

- A In A airspace and crossing ADIZ
- B In B airspace
- C In C and above airspace
- 10 Above 10,000MSL (except < 2,500' AGL)
- 30 Within 30 nm of B

7700 – Emergency
7600 – Lost Communications
7500 – Hijacking
1200 – VFR operations

CG (Central Gravity) Effects in Flight (PHAK)

Forward CG – high stall speed, slow cruise speed, more stable, longer take-off roll, similar to heavy aircraft.
Aft CG – lower stall speed, faster cruise speed, less stable, poor spin recovery, similar to lighter aircraft

Engine SR20 – IO-360-ES – Hand C4 6FT

- H Horizontally Opposed
- A Air Cooled
- N Normal Aspirated (use ambient air P)
- D Direct Drive

- C Constant Speed
- 4 4-Stroke (intake, compression, power, exhaust)

- 6 6 Cylinders
- F Fuel Injected
- T Teledyne-Continental

Aviation Weather

	Weather Report	Issued	Valid	Information
Text	METAR – Air Routine Wx Report	Hourly @ 55 min	When issued	Wind, Vis., Clouds, Temp/Dew, etc
	TAF – Terminal Aerodrome Forecast	4X / day	24/30 hrs	Similar to METAR
	FA – Area Forecast	3X / day	depends	Header, Precautionary, 18 Synopsis, 12 Clouds/Wx & +6 Outlook
	FD – Winds and Temp. Aloft	4X / day	24 hrs	Level < 1500 AGL, No wind issued Level < 2500 AGL, No temp issued
	WA – AIRMET (Airmen Met. Info)	4X / day	6 hrs	Moderate conditions
	WS – SIGMENT (Sig. Met. Info)	As needed	4 hrs	Severe Weather (TB, Icing CAT)
	WST – Convective SIGMET	Hourly @ 55min	2 hrs	Way bad stuff (worse than WS)
	SD – Radar Wx Report	Hourly @ 35 min	When issued	Precipitation, Intensity, trend
	CWA – Center Wx Advisory	As needed	up to 2 hrs	WA, WS, WST
T/G	AC – Convective Outlook	see AWS AC 00-45F, page 6-32		
G	Surface Analysis Chart	Every 3 hours	When issued	Pressure systems, Fronts, Isobars, etc
	Weather Depiction Chart	Every 3 hours	When issued	VFR, MVFR, IFR, LIFR

Flight Service Station – AIM 7-1-3 - SAIO
- S Standard (complete)
- A Abbreviated (update previous info)
- I In-flight
- O Outlook (>6 hrs, in future)

Weather sources
- ATIS – Automatic Terminal Info Service
- AWOS –Automated Weather Observing Station
- ASOS – Automated Surface Observing System.
- DUATS – Direct User Access System
- EFAS – En route Flight Advisory System
- FSS – Flight Service Station – 1-800-WX-BRIEF
- HIWAS – Hazardous In-flight Wx Advisory Service
- TIBS – Telephone Info Briefing Service
- TWEB – Transcribed Weather Broadcast

(Both are self-contained weather station designed to make observations without human involvement.)

Requirements for a Thunderstorm
- Warm – Lifting Force
- Wet – Moist air
- Wiggle – Unstable air

3 Phrases of Thunderstorm
- Cumulus – Updrafts
- Mature – Rain at the surface
- Dissipating – Downdrafts

Convective Sigments – 40 WHITE Lt & LLWS
- 40 40% of 3000 square mile area
- W Wind > 50 Knots at surface
- H Hail 3/4" or greater
- I Icing (Severe)
- T Turbulence (Severe or greater)
- E Embedded Thunderstorms
- L Line of Thunderstorms
- T Tornados
- LLWS Low Level Wind Shear

Sigmets – Severe Wx without Conv. Activity – SSDV
- Severe Icing
- Severe or greater TB, Clear Air TB (CAT)
- Dust/Sand storms lowering sfc. vis. to < 3sm
- Volcanic ash
- * conditions associate with hurricanes valid for 6 hours

Airmet – mod, conditions hazardous to all aircraft – STZ
- S (Sierra) - Mountain obscuration, IFR condition
- T (Tango) – Mod, Turbulence, sfc. Wind > 30 kts
- Z (Zulu) – Mod, Icing, Freezing level

Types of Fog – USA RIP
- U Upslope (air cools as it rises)
- S Steam (over warm water)
- A Advection (costal area requires wind) (adding moisture)
- R Radiation
- I Ice fog
- P Precipitation Induced

Types of Icing - CRIMF
- Clear/Glaze – Most hazardous , water freezes slowly
- Rime – Jagged conglomerate, Freezes quickly
- Induction – Ice that stops airflow to engine (carburetor icing is the most common or filter gets wet)
- Mixed – Combination of Clear & Rime
- Frost – Water sublimates

Definition of In-Flight Icing Terms – AIM 7-1-22
- Intercycle – Ice accumulates on a protected surface between actuation cycles of a deicing system
- Residual – Ice remains on a protected surface after actuation of a deicing system
- Runback – Ice forms from the freezing or refreezing of water leaving protected surface and running back to unprotected surfaces

PIREP
- UA Routine
- UUA Urgent

Aeromedical Factors

Personal Checklist – AIM CH8 – I'm SAFE

I Illness
M Medication
S Stress
A Alcohol(§91.17, no alcohol with 8 hrs before flight and concentration < 0.04 in a blood or breath)
F Fatiguue
E Emotion

Aeronautical Decision Making (ADM) - DECIDE

Detect, Estimate, Choose, Identify, Do, Evaluate

Risk Elements – PAVE

Pilot, Airplane, enVironment, External pressure (Operation)

Sensation of Movement

Vestibular System – Organs in ear
Somatosensory System – Nerves in the skin, Muscles, Joints, Sense position base on gravity, Feeling, and Sound
Visual System – Eyes, Sense position based on what is seen, 70%

Organs of Sensation

Eye cornea, Lens, Iris, Pupil, Retina, Rods, Cones, Fovea (all cones), Optic nerve, Rhodopsin (a purplish-red light-sensitive pigment)
Ear semicircular tubes, Otolith organ, Cupola, Hair cells, Vestibular nerve, Andolymph fluid
Eustachian tube – The connection tube between middle ear and throat. Used to balance the pressure of inner ear

Illusion in Flight – FLAG SLICE & Black hole

F False Horizon – Cloud, Terrain
L Landing Illusion – See below
A Autokinesis – Stationary light moves
G Graveyard Spin/Spiral – Due to leans, in a prolong coordinated turn, applied back pressure tightens the spiral
S Somatographic – Acceleration/Deceleration
L Leans – When slowly enter a banked attitude, an abrupt correction to level will create an illusion of a banked attitude to the opposite side
I Inversion – Sudden level off
C Coriolis – Head move in turn
E Elevator – Up/Down drafts
Black-hole pilot sees nothing (or bcuz of rwy lighting)
What's the different btwn Leans and Inversion??

Landing Illusion - FRRAG

F Featureless Terrain – Pilot thinks he's high
R Runway Slope – Upslope, pilot thinks he's high
R Runway Width – Wide, pilot thinks he's low
A Atmospheric – See below
G Ground Lighting – Bright, Pilot thinks he's low

Atmosphere Illusion

Rain – Pilot thinks he's high
Haze – Pilot thinks he's farther away
Fog – Pilot thinks he's pitch up

Physical Conditions – MDH CHOSENS

Motion Sickness – Symptoms include nausea, Dizziness, Paleness, Sweating, Vomiting, caused by the brain receiving conflicting signals from the eye and inner ear.
Drug (§91.17) – No person may act as a crewmember while using any drug that affects the person's faculties in any way contrary to safety
Hypoxia – Lack of Oxygen in the Body
Hypoxic – Altitude/Low pressure prevents oxygen from passing to the lungs
Hypemic – Blood/Hemogiobin doesn't carry the oxygen (ex: due to the CO poisoning)
Stagnant – Circulatory system doesn't carry blood properly (G-force, Clogged, Age)
Hystotoxic – Drugs/Alcohol prevent the cells from property using oxygen
CO poisoning – Colorless, Odorless, Tasteless gas that is a byproduct of combustion. It can enter the cabin with heated air. Symptoms include well-being, short breath, blurred vision, slow speech, and confusion. Visual cues of CO poisoning: finger tips, lips turn blue/cyanosis
Hyperventilation – Caused by stress when the body exhales too much carbon dioxide. Symptoms are similar to hypoxia bag/short. Always treat hypoxia first.
Oxygen Requirements – See §91.211
Sinus Block – During ascent/descent, pressure in sinuses should be equalized with cabin pressure. Pain is felt when it is not equalized. Avoid flying with upper respiratory problems
Ear Block – During descent, one must periodically open Eustachian tube to equalize pressure between the inner ear and outside pressure by swallowing, yawning.
Night Vision – Dark adaptation requires 30 min for the rods to adjust to low light and can be lost immediately after contact with bright light. Red cockpit lighting is used to aid night vision; however, it causes colors to be washed out which can cause difficulty reading charts. AIM recommends supply O, above 5000 MSL
Scuba Diving – Nitrogen, absorbed in the body during diving can be released and form bubbles in the blood (the Bends). Always 24 hrs, unless flying below 8000 ft and no controlled ascent required than 12 hrs.

Symptom of Hypoxia – CHIVENT DDD

C Cyanosis
H Headache
I Impaired judgment
V Visual impairment
E Euphoria
N Numbness
T Tingling in fingers and toes
D Decreased reaction time
D Drowsiness
D Dizzy sensation or lightheaded

Symptom of Hyperventilation – DV MUTH

D Dizzy sensation
V Visual impairment
M Muscle spasms (muscular contraction or convulsive movement)
U Unconsciousness
T Tingling sensation
H Hot or cold sensation

Special Emphasis Area – PTS –SLOW CRAP PC C – WATSS

- S Stall/Spin Awareness
- L Land and Hold Short Operations
- O Other areas deemed appropriate to any phase of the practical test
- W Wake Turbulence Avoidance
- C Collision Avoidance
- R Runway Incursion Avoidance
- A Aeronautical Decision Making (ADM)
- P Positive Aircraft Control

- P Positive Exchange of the Flight Control
- C Controlled Flight into Terrain
- C Checklist Usage

For CPL plus following items

- W Wire Strike Avoidance
- A Aviation Security
- T Temporary Flight Restrictions (TFRs)
- S Special Use Airspace
- S Single-Crew Resources Management (SRM)

NTSB (National Transportation Board) Reports – FIAT COP

- F Flight Control Malfunction
- I In-flight fire
- A Aircraft Collision in Flight
- T Turbine Engine Failure
- C Crew Member Incapacitation
- O Overdue Aircraft
- P Property Damage (> 25,000 beside aircraft)

Instrument Study Guide

Required Equipment – VFR Day – ATOM FLAMES A TOE

- A Altimeter
- T Tachometer
- O Oil Pressure Gauge
- M Manifold Pressure Gauge (alt eng)
- F Fuel Gauge (each tank)
- L Landing Gear Indicator Lights
- A Anti-Collision Lights (after 3/11/96)
- M Magnetic Compass
- E Emergency Equipment (hire and over water, §91.506)
- S Seat Belts
- A Airspeed
- T Temperature
- O Oil Temperature
- E ELT

IFR: VFR & Night (if flight is at night) – GRAB CARDD

- G Generator or Alternator
- R Radio/Nav appropriate for flight
- A Attitude Indicator
- B Ball (Inclinometer)
- C Clock (Second hand or digital)
- A Altimeter (Pressure Sensitive)
- R Rate of Turn Indicator
- D Directional Gyro
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Preflight Actions – §91.103 – AW KRAFT

- A All available info for the flight to include
- W Weather (1-800-WX-BRIEF)
- K Known ATC Delay
- R Runway Length
- A Alternatives
- F Fuel Requirement
- T Takeoff and Landing Distance

Instrument Rating Required – §61.3, §91.157

1. Under IFR
2. In weather conditions are in IMC
3. In Class A requirements
4. Special VFR in Class A, B, C, E between sunset and sunrise

Personal Checklist Before Flight – AIM CH8 – I'm SAFE

- I Illness
- M Medication
- S Stress
- A Alcohol(§91.17, no alcohol with 8 hrs before flight and concentration < 0.04 in a blood or breath)
- F Fatiguue
- E Emotion

VFR Night Required Equipment – FLAPS

- F Fuses – a set or 3 for each
- L Landing Light (if for hire)
- A Anti-Collision Light(s)
- P Position Lights (Nav Lights)
- S Source of Electrical Power

Inspection – §91.409, §91.411, §91.143, §91.207– AVIATES

- A Airworthiness Directives Part. 39
- V VOR Check (IFR-30 days) §91.171
- I Inspection (ANN 100h or Progressive) §91.409
- A Altimeter (24 Mo) §91.413
- T Transponder (24 Mo) §91.413
- E ELT (12 Mo, 1 hr. use or 1/2 bat life) §91.207
- S Static Source – (24 Mo) §91.411

3 fundamentals of an Instrument Scan – CIA

- C Crosscheck
- I Interpretation
- A Aircraft Control

Common Error – FOE

- F Fixation
- O Omission
- E Emphasis

IFR Currency – §61.57(c) – 66 HIT

- 6 Within past 6 months
- 6 Ac/Sim IFR, 6 approaches including
- H Holding procedures
- I Intercepting courses
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- I Indicated (Read off from Instrument)
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- D Density (PA corrected non-std T)
- A Absolute (AGL)
- T True (MSL)

NTSB Reports – FIAT COP

- F Flight Control Malfunction
- I In-flight fire
- A Aircraft Collision in Flight
- T Turbine Engine Failure
- C Crew Member Incapacitation
- O Overdue Aircraft
- P Property Damage (> 25,000 beside aircraft)

Registration Expires When–on the back of registration –30ft DUC

- 30 30days after death
- F Foreign registration
- T Transfer ownership
- D Destroyed
- U US citizenship revoked
- C Cancelled by request (every 3 years)

Aeronautical Decision Making (ADM) - DECIDE
Detect, Estimate, Choose, Identify, Do, Evaluate

Risk Elements – PAVE
Pilot, Airplane, enVironment, External pressure (operation)

5 Cs
Climb, Circle, Confess, Communicate, Comply

Must Have Before Decent to Approach
I In range
C Clearance

ADF/NDB Bearing Formula
MH + RB = MB

Airspeed Indicator (pitot & static)
Pitot ram & drain blocked / Static open = altimeter
Pitot ram blocked = 0 indication
Pitot drain blocked / Ram open = operational airspeed indicator
Pitot open / Static blocked = faster decending / slower acending
Pitot & Static blocked = airspeed will remain the same (frozen)

Altimeter
Static blocked = altimeter will remain the same at any altitude

Vertical Speed Indicator
Static blocked = pressure will equalize and indicate 0

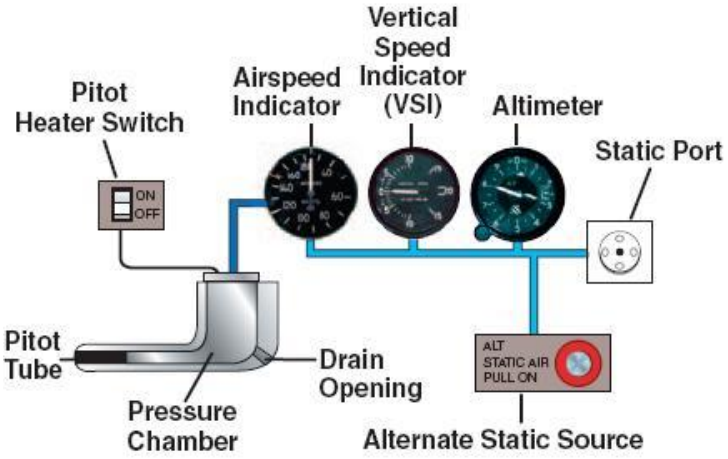
Alternate Static Source
Airspeed will indicate higher
Altimeter will indicate higher then level out
VSI will operate at a slower rate

Types of Class E – SET VODA
S Surface Area
E Extension Area
T Transition Area
V Victor Airways
O Offshore
D Domestic En Route
A Above FL 600

My Hairy Red Balls Make Babies

Clearance Order – CRAFT V
C Clearance
R Route
A Altitude
F Frequency
T Transponder
V Void time

Magnetic compass errors – VDMONA
V Variation,
D Deviation,
M Magnetic dip,
O Oscillation
N Northerly turning errors,
A Acceleration / deceleration errors



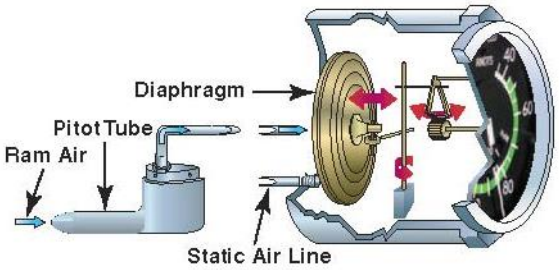
	 Indicated Airspeed	 Indicated Altitude	 Indicated Vertical Speed
Pitot Ram Air Source and Drain Hole Blocked	Increases with altitude gain; decreases with altitude loss	Unaffected	Unaffected
Pitot Ram Air Source Blocked and Drain Hole Open	Displays zero knots	Unaffected	Unaffected
Static Source Blocked	Decreases with altitude gain; increases with altitude loss	Does not change with altitude gain or loss	Does not change with vertical speed changes
Both Static and Pitot Sources Blocked	All indications remain constant, regardless of changes in airspeed, altitude, and vertical speed.		

PIMPLE = P-principle, I-indication, M-marks on instrument, P-power, L-limitation, E-Errors

∗PITOT-STATIC SYSTEM

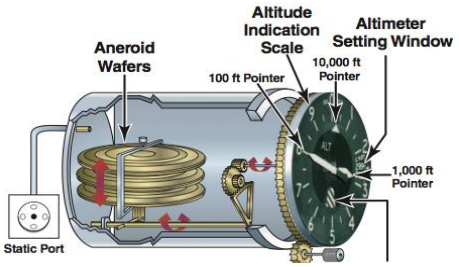
Airspeed Indicator

- P Comparing ram and static pressure
- I Indicated knots in 5 knot increments or mph
- M White, green, yellow arcs, red line, airspeed
- P Ram and static pressure
- L Max airspeed number, shows IAS
- E Position, density, compressibility and mech. Error



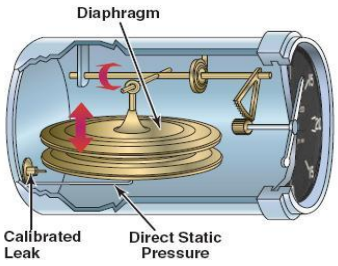
Altimeter

- P Compares static with calibrated aneroid wafer
- I Ft above selected pressure level
- M 1,000 100 20 foot marks
- P Static pressure
- L Kollsman window must be adjusted, type of altitude 28.00" – 31.00"
- E Pressure, temperature and mechanical error



Vertical Speed Indicator

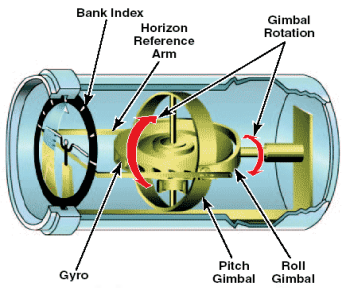
- P Measures increase and decrease in static pressure
- I Rate and trend
- M 100, 500, 1000, 1500, 2000 ft
- P Static pressure
- L 6-9 second lag, will not function if static port is blocked
- E Calibration and mechanical error



∗GYROSCOPE SYSTEM

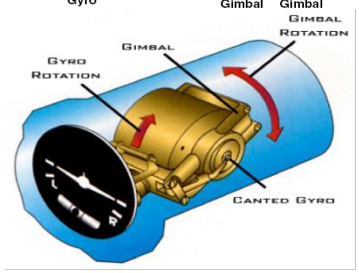
Attitude Indicator

- P Rigidity in space
- I Pitch and bank
- M Bank – 10° 20° 30° 60° 90° ;Pitch – 5° and 10°
- P Vacuum
- L 60 degrees pitch, 100 degree roll
- E 180 degree rollout, acceleration/deceleration error, tumbles if limitation exceeded



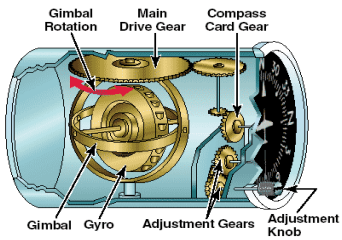
Turn Coordinator

- P Precession
- I Rate of turn, rate of roll, quality of turn
- M Standard rate, and coordinated turn
- P Electric
- L Standard rate indications and no pitch information
- E Calibration and mechanical error



Heading Indicator

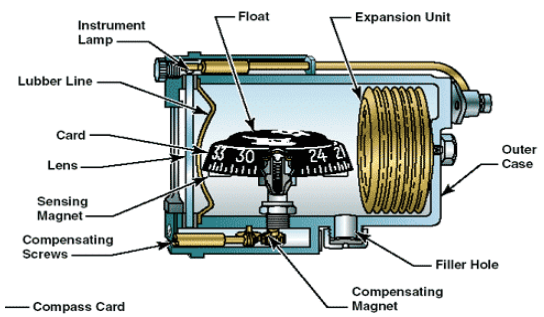
- P Rigidity in space
- I Heading
- M Compass heading
- P Vacuum
- L Must be aligned with compass
- E Precession and mechanical error



∗MAGNET SYSTEM

Magnetic Compass

- P Magnetic fields attract and repel
- I Magnetic headings
- M Cardinal heading, 5 and 10 degree increments
- P Magnetic fields
- L 10 degrees of bank
- E Magnetic compass errors "**VDMONA**"



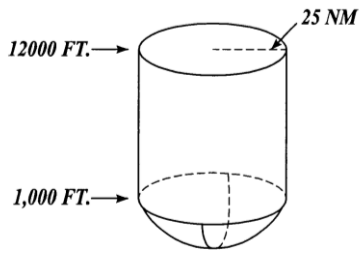
VOR/NDB Service Volumes

VOR Frequency Range: 108.00 – 117.95 MHz

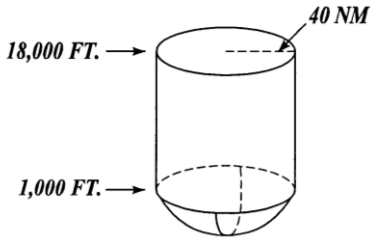
Note: Heights are AGL, not MSL

Deflection is 2 degrees per dot: full scale is 10 degrees per side

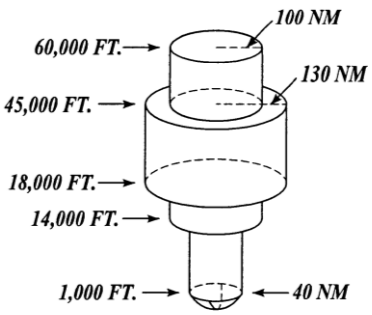
Terminal VOR



Low VOR



High VOR



VOR Tests – §91.171 – Very Good Airmen Always Do Bench Test

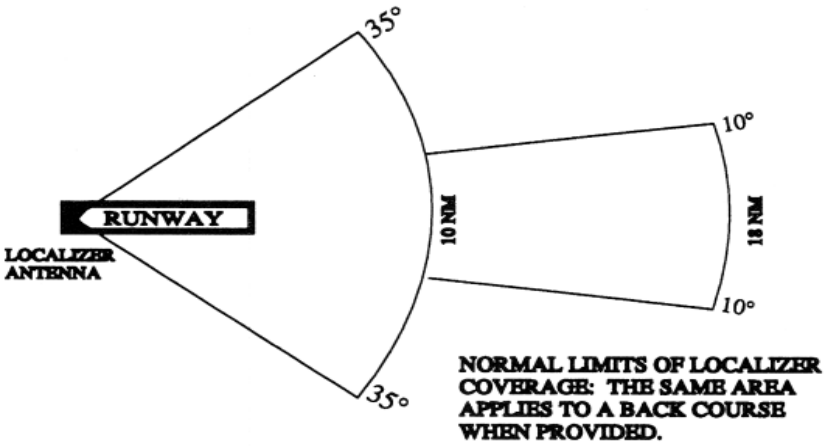
VOT	+/- 4 degrees (Find locations in AFD. 360 from/ 180 to; tune & ID)
Ground Check	+/- 4 degrees (Find locations in AFD. Specific point on airport surface. Tune & ID)
Airborne Check	+/- 6 degrees (Find locations in AFD. Specific point at specified altitude)
Airway Check	+/- 6 degrees (Self-made, centerline of airway marked by visual reference point more than 20 nm from VOR as low as practical)
Dual Check	+/- 4 degrees <maximum> (Units independent of each other except for the antenna. Turn both to same VOR, center needles, note variation)
Bench Test	Can be done anytime at avionics shop, should be corrected to zero error

Required Information on VOR Checks – §91.171 – Dog Poops, Bear Shits

1. Date 2. Place 3. Bearing 4. Signature

NDB Frequency Range: 190 – 535 MHz

NDB Facility	Usable Range
Compass Locator	15 NM
MH (Medium Homing)	25 NM
H (Homing)	50 NM
HH (High Homing)	75 NM



Components of an ILS §91.175

Guidance	Localizer and Glide Slope
Range	Marker Beacons, DME
Visual	Approach Lights, Touchdown and Centerline Lights, Runway Lights

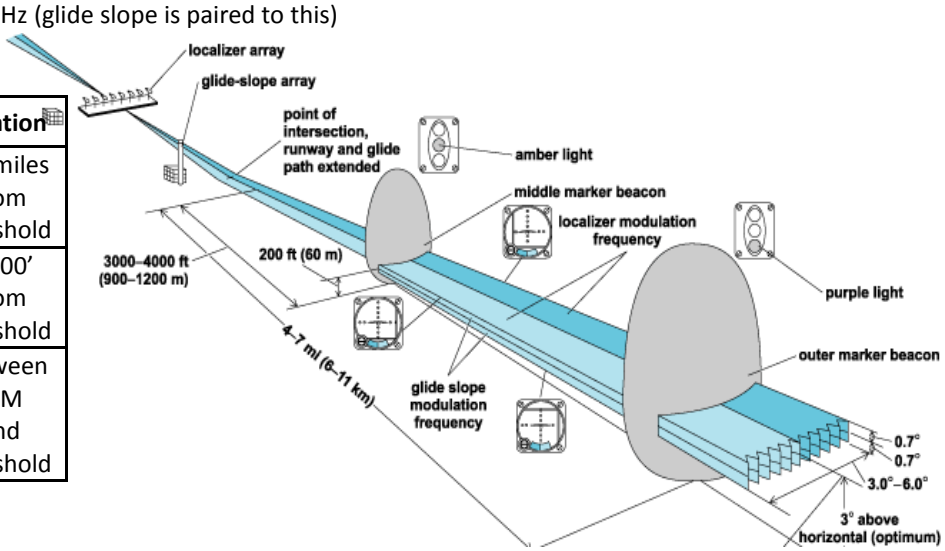
Glide slope is 3 degrees with a depth of 1.4 degrees. The transmitter is located 750’ and 1250’ from the approach end of the runway and is offset 250’ to 650’. Range is normally 10 NM

Localizer antenna and transmitter located at the far end of approach runway. Range is 18 NM from antenna. Angular width of localizer adjusted between 3 and 6 degrees to provide linear width of 700’ at threshold. Full scale deflection occurs at approximately 2.5 degrees from the course centerline (5 % per dot)

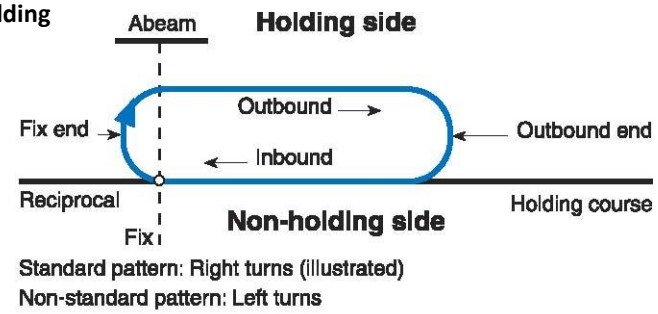
Localizer frequency is 108.10 MHz to 111.95 MHz (glide slope is paired to this)

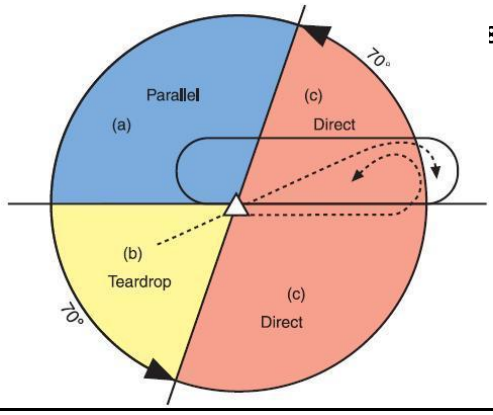
Marker Beacons

Marker	Light	Tone	Speed	Location
Outer	Blue	Dull	Slow	4-7 miles from threshold
Middle	Amber	Medium	Medium	3,500’ from threshold
Inner	White	High	High	Between MM and threshold



Holding





Maximum Airspeeds in a Hold		Hold Leg Lenghts	
MHA – 6,000 ft	200 KIAS	14,000 ft and below	1 minute (60s) inbound
6,001 ft – 14,000 ft	230 KIAS	14,000 ft and above	1.5 minute (90s) inbound
14,001 ft and above	265 KIAS		

5T's for Holding	DME Arc
Turn	Lead turn to the arc by 1/2 mile
Time	Center CDI
Twist	Tune OBS to next 10 degree radial
Throttle	Turn to the 90 degree position on the OBS
Talk	Each time the needle centers, turn 10 degree geading, twist OBS 10 degrees

Alternate

Need for an Alternate – §91.167, §91.169

Always unless:

The intended airport has a published SIAP (Standard Instrument Approach Procedure) and

1. 1 hour before to 1 hour after your ETA at your destination, there is forecasted to be
2. 2000 foot ceilings
3. 3 SM visibility

Requirements for Alternate – §91.169

1. Alternate must be approved for use
2. At the ETA, alternate the Wx minimums must be:
   a.) As required by the specific SIAP or
   b.) Standard minimums:
      I. 600 foot ceiling, 2 SM visibility for precision approach
      II. 800 foot ceiling, 2 SM visibility for non-precision approach
   c.) If there is not a standard instrument approach procedure, then you must be able to descent from MEA to land under basic VFR minimums

Approach Plates

Header (briefing strip)
Plan View (drawn to scale)
Profile (not to scale)
Minimums (Altitude, visibility, etc.)

No Procedure Turn Allowed – §91.175

S Straight in
H Hold in lieu of
A Arc (DME)
R Radar Vectored
P no PT on Chart
T Teardrop Entry T Timed Entry

Approach Brief

A Approach Brief
M Marker beacons tested and on low
I Identify Navaids/ Approach Charts
C Course
E Entry type – full/vectored
A Altitudes
T Time
M Missed Approach Procedure
S Stack check
A ATIS
P Pre-landing checklist

ATC Clearance and Flight Plan Required – §91.173

No person may operate an aircraft in controlled airspace under IFR unless that person has:

1. Filed and IFR flight plan
2. Received an appropriate ATC clearance

Clearance Void Time

1. A way for a pilot at an uncontrolled field to receive a clearance when IFR conditions exist
2. All other IFR traffic To/From airport will be suspended until air craft has contacted ATC or 30 minutes after void time
3. Call FSS to request void time
4. Cleared into controlled airspace and after 30 minutes if ATC has not been contacted, the aircraft is considered overdue

Position Report

- I Identification
- P Position
- T Time
- A Altitude or flight level
- T Type of flight plan
- E ETA and name of next reporting point
- N Name of next succeeding reporting point along route of flight
- R Remarks

Mandatory Reports to ATC - DRUMS

- D Deviation from clearance
- R Requested
- U Un-forecasted weather
- M Malfunctions
- S Safety of flight

Other Reports to ATC – A MARVELOUS DVFR 500

- A Assigned, requested or required by chart
- M Missed approach
- A Airspeed changes of 10 KIAS or 5 % (whichever is greater)
- R Reaching a clearance limits
- V Vacating an altitude
- E ETA changes of 3 minutes or more
- L Leaving a clearance limit
- O outer Marker Inbound
- U Un-forecasted weather
- S Safety of flight
- D Deviations
- V VFR – on top altitude changes
- F Final approach fix inbound
- R Radio/ Nav failures
- 500 Unable to maintain 500 ft/min descent

Lost communications – §91.185

TROUBLESHOOT!

If VFR or encounter VFR, remain VFR and land as soon as possible

Course (in order):

- A Assigned
- V Vectored
- E Expected
- F Filed

Altitude (the highest of):

- M Minimum IFR Altitude
- E Expected
- A Assigned

Malfunctions Reports – §91.187 – DEAN

Report any malfunction of navigational, approach, or communication equipment, including:

- D Degree to which the capability to operate under IFR is impaired
- E Equipment Affected
- A Aircraft Identification
- N Nature and extent of assistance desired from ATC

Aircraft Approach Categories and Circling Approach Areas for Each Category (CAT)

CAT (category)	Airspeed	Max distance from airport for circling to land
A	0 – 90 kts	1.3 miles
B	91 – 120 kts	1.5 miles
C	121 – 140 kts	1.7 miles
D	141 – 165 kts	2.3 miles
E	> 165 kts	4.5 miles

Minimum Safe Altitude (MSA)

Used during lost communications or disorientation

Provides 1000’ obstacle clearance – does not ensure navigation signal coverage

Decent to MDA (Minimum Decent Altitude)

Cleared for the approach

Within the prescribed distance

Positive course guidance

Decent Below MDA/DH – §91.175

Aircraft must continuously be in a position from which a landing on the intended runway can be made at a normal rate of descent using normal maneuvers.

The flight visibility cannot be less than that prescribed for the standard instrument approach being used

One of the following visual references for the intended runway is distinctly visible:

The approach light system – may descend to 100’ above TDZE, unless the red termination bars or the red side row bars are distinctly visible

Threshold

Threshold markings

Threshold lights

Runway end identifier lights (REIL)

Visual approach slope indicator (VASI)

Runway

Runway markings

Runway lights

Touchdown zone

Touchdown zone markings

Touchdown zone lights

Approach Segments

Initial	Commences at IAF and includes outbound leg and procedure turn outbound
Intermediate	Procedure turn inbound to FAF
Final	FAF to MAP
Missed	MAP to MAF at prescribed

Special VFR – §91.157

1 SM – clear of clouds
Pilot is responsible for obstacle clearance
Only effective within class B, C, D, E surface areas
Sunset-Sunrise must be IFR rated and the aircraft IFR equipped

* COC = Clear of Cloud

Visual Approach

3 SM – COC – 1000' ceiling – IFR flight plan
Authorizes pilot to proceed visually and clear of clouds to the airport
Must have either the preceding aircraft or the airport in sight
VFR cloud clearances not applicable

Contact Approach

1 SM – COC IFR flight plan
Must reasonably expect to continue to the destination in these conditions
Must have instrument approach procedure at airport
Must be requested by the pilot and authorized by ATC (pilot must contact ATC for this approach)
Must be familiar with area and current weather

Report	Valid	Issued	Contains
Airmet (WA)	6 Hours	Every 6 hours	5 things (Moderate turb, Icing, Winds < 30, Ceiling 1000', Mtn obscure; Z = mod, icing; T = mod, turb and winds; S = mountain/IFR)
Sigmet (WS)	4 Hours	As needed	3 things (Severe icing, Severe to extreme tub, Volcanic eruption)
Conv. Sigmet (WST)	2 Hours	H+55	1 thing (Convection activity) – TS, LN TS, EMB TS, VIP4, 40% of area
METAR	Time issued	H+50 to 55	Winds, Temp, Dew point, Cloud layers, Visibility
TAF	24 Hours	0, 6, 12, 18Z	Same as METAR
FA	18 Hours	0, 8, 16Z	Product header, precautionary statement, Synopsis, VF clouds and WX
Radar Rep.	1 Hour	H+35	Precipitation, Echo tops
Winds Aloft		4 times daily	Specifies in header times
HIWAS		As needed	Hazardous inflight WX advisory service. Broadcast over select VORs
TWEBS	15 Hours	3 times daily	Similar info as an FA just enroute format. Broadcast over select VORs
Control WX Advisory	2 Hours	Unscheduled	Nowcast, supplement to FA, when condition affect safe flow of traffic
Chart	**Valid**	**Issued**	**Contains**
Surface Analysis	Time issued	Every 3 hours	Front pressure systems isobars, Station data
WX Depict	Till next one	1, 4, 7, 10Z…	Sky condition, Cloud height, VFR/MVFR/IFR
Radar Summary	Time issued	H+35	Intensity, Echo tops, Echo types
LL WX prog.	24 Hours	0, 6, 12, 18Z	4 panel – 12-24 hour forecasts – surface and upper air
36 & 48 Prog.		0, 12Z	Same as 12-24 hour prog., just further into the future
Constant Press	12 Hours	0, 12Z	850, 700, 500, 300, 250, 200 millibar levels
Composite Moisture	12 Hours	0, 12Z	Lifted index, Precipitable water, Freezing level, Relative humidity

Stable air – high pressure, wide spread steady precipitation, bad visibility, stratus-type clouds
Unstable air – low pressure, showery precipitation, good visibility, cumulus clouds

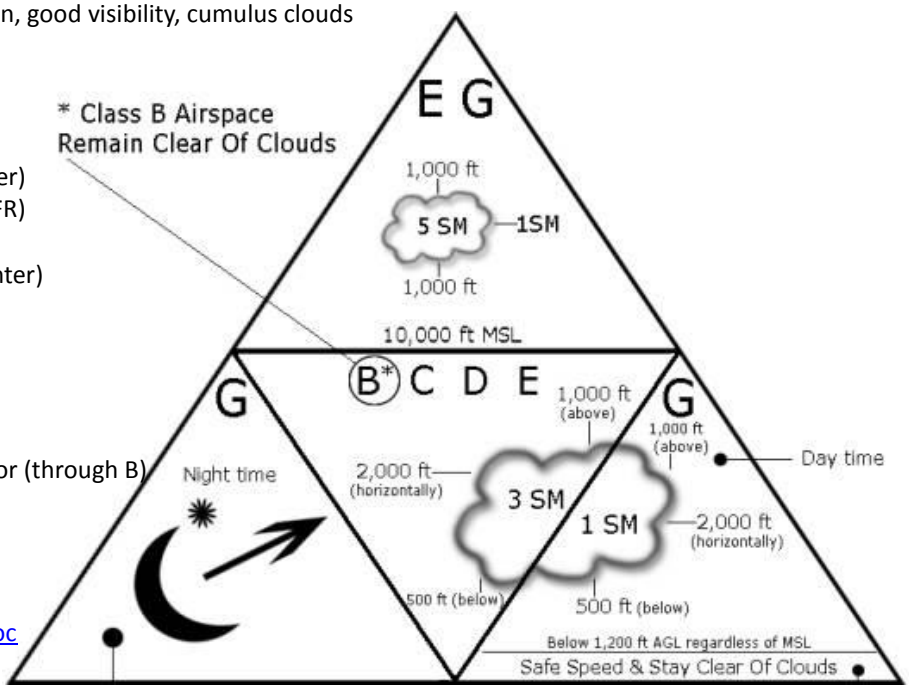
Special Airspace – AIM CH3-4 – WARM PC N

W Warning Area (restricted but int'l)
A Alert Area (look out for training aircraft)
R Restricted Area (need permission, may enter)
M MOA (Military Operation Area, separates IFR)
P Prohibited Area (do not enter)
C Controlled Firing Area (not charted, may enter)
N National Security Area

Other Airspace – AIM CH3-5 – MTV PAT

M MTR (Military Training Route)
T TFR (Temporary Flight Restriction)
V VFR flyway (under B), transition and corridor (through B)
P Parachute Area
A Airport Advisory
T TRSA (terminal radar service area)

https://www.youtube.com/watch?v=q5ZZlgLeWoc
Wx minimums flow chart



Class B requires 3 SM COC

Cirrus SR20 Systems

Fuselage

Monocoque, composite materials

Gear

Main gear: composite Nose gear: Steel, 216 degrees (108 degrees each side), free castering

Trim System (electric motor)

Elevator: 28 VDC thru the 2-amp PITCH circuit breaker on Main Bus 1
Aileron: 28 VDC thru the 2-amp ROLL TRIM circuit breaker on Main Bus 1
Yaw: Ground adjustable only

Flaps

Electrically controlled, single-slotted, aluminum, powered by 28 VDC thru 15-amp FLAPS circuit breaker on Non-Essential Bus
UP(green), 50% (16° ,yellow), 100% (32° , yellow)

Engine SR20 – I0-360-ES – Hand C4 6ft – 200 hp @ 2700 RPM

H	Horizontally Opposed	C	Constant Speed
A	Air Cooled	4	4-Stroke (intake, compression, power, exhaust)
N	Normal Aspirated (use ambient air P)	6	6 Cylinders
D	Direct Drive	F	Fuel Injected
		T	Teledyne Continental IO-360-ES

Engine Oil System

Wet-sump, high-pressure for lubrication and cooling, 8-quart capacity *do not operate below 6 quarts, 7 is recommended
Oil is also directed to the propeller governor

Propeller

Constant speed, aluminum, 2 blade (76" diameter), 3 blade (74" diameter)
Blade pitch is automatically adjusted by governor which senses engine speed and throttle setting

Fuel system

Total capacity: 60.5, Usable fuel: 56 gal/ Tabs 26
Low Fuel Light – total fuel in both tanks below 8.5 gal
Collector – 0.67 gal
* do not operate more than 30 seconds when 1/4 fuel or less which would cause the tank suck in air to damage the system

Brake System

Hydraulically operated, single-disc type brakes, individually activated, master cylinder for each rudder pedal
Brake failure indication: 1. Noisy or spongy pedals, 2. excessive travel, 3.weak braking action

Electrical System

28 VDC Dual alternator systems
ALT 1 – Belt driven, 75 amp, 28v
ALT 2 – Gear driven, 20 amp, 28.75v
BAT 1 – 12 cell, 24v, 10 amp
BAT 2 – 2-12v, 7 amp connected in series making 24v
Diode – prevents ALT 2 to charge ALT 1

2 Main Buses:

1) Main bus: non-essential
2) Essential bus: Essential, powered by ALT2 & BAT2 (also powered by ALT1 & BAT1, thru an isolation diode)

Weights

Ramp/Takeoff: 3000 lbs
Landing: 2900 lbs
Baggage: 130 lbs

Airspeed Indicator Markings

Red radial line	200 kts
Yellow arc	165-200 kts
Green arc	65-165 kts
White arc	56-100 kts

Maximum Altitude 17500ft, 10,000 for T/O

Max Cylinder Head Temperature

~~200F 460F~~
240-420F maximum 460F

Appendix I – Cloud Clearance, Basic VFR weather minimums – §91.155

Airspace	Flight visibility	Distance from clouds
Class A	Not Applicable	Not Applicable.
Class B	3 SM	Clear of Clouds.
Class C	3 SM	500 ft below. 1,000 ft above. 2,000 ft horizontal.
Class D	3 SM	500 ft below. 1,000 ft above. 2,000 ft horizontal.
Class E		
Less than 10,000 ft MSL	3 SM	500 ft below. 1,000 ft above. 2,000 ft horizontal
At or above 10,000 ft MSL	5 SM	1,000 ft below. 1,000 ft above. 1 statute mile horizontal.
Class G		
Less than 1,200 ft AGL		
Day, except as provided in § §91.155(b)	1 SM	Clear of clouds.
Night, except as provided in § §91.155(b)	3 SM	500 ft below. 1,000 ft above. 2,000 ft horizontal.
More than 1,200 ft AGL but less than 10,000 ft MSL		
Day	1 SM	500 ft below. 1,000 ft above. 2,000 ft horizontal.
Night	3 SM	
More than 1,200 ft above the surface and at or above 10,000 ft MSL	5 SM	1,000 ft below. 1,000 ft above. 1 statute mile horizontal.

Airspace – 4-Types
1) Controlled => Class A, B, C, D, E
2) Uncontrolled => Class G
3) Special Use => WARM PC N
4) Other Airspace Area => MTV PAT

APPENDIX II – Code for METAR Remarks

Part 4 Remarks and Coded Data: This can be lots of things (snow depth, amount of precipitation, pressure tendency, etc.) with most in code. It is preceeded by "RMK".

A01/A02	This is from an automated station. A01 does not have the capability to detect precipitation. A02 has a "precipitation discriminator".
P0000	The total precipitation received during the last hour. P0000 indicates 0/100's of an inch and P0017 would indicate 17/100's of an inch.
T11171150	The hourly air and dew point temperatures to the nearest 1/10 C degree. 1117 is -11.7 C (coded M12 above) and 1150 is -15.0 (coded M15 above). A positive number is preceeded by a 0 instead of a 1 (0117 would be +11.7 C).
SLP236	The sea level pressure (SLP) is 1023.6 mb (millibars or 102.36 pascals). This is another measure of atmospheric pressure. A low number (like 236 [23.6]) must be added to 1000 millibars (indicating 1023.6 mb) while a high number must be added to 900 mb (so 978 [97.8] indicates 997.8 mb).
11106	The 6 hour maximum temperature (the highest air temperature recorded during the previous six hours) is -10.6 C. The first 1 is the group identifier, the second is the sign (0 for + or 1 for -), and the final three digits are the temperature (106 is 10.6).
21131	The 6 hour minimum temperature (-13.1 C) coded as above. Here, the 2 is the group identifier.
4/001	The total snow depth on the ground in inches. Usually found in the 06 and 18Z observations.
4110§61131	A nine digit group beginning with a 4 as the group identifier would contain the 24 hour maximum and minimum temperatures, in that order, coded as in the "T" group above. Usually found in the 08Z observation.
51016	The "5" group is the 3 hour pressure tendency and amount of change. The second digit is the tendency (coded, where 0-3 are going up, 4 is steady, and 5-8 are going down) and the last three digits are the change (016 is 1.6 mb).
60000	3 and 6 hour precipitation amounts encoded as above. 60217 would indicate 2.17 inches. The 3 hourly precip is reported in the
70025	The 24 hour total precipitation (this will be liquid equivalent for frozen precip) in 1/100s of an inch. 70025 would be 0.25 inch. This is usually found in the 12Z observation.
8/546	This identifies the low, middle, and high cloud types using WMO code. (See table 2 below.)
933125	Liquid water equivalent of the snow on the ground in 1/10s of an inch. 933125 says the SWE is 12.5 inches. Usually in the 18Z obs.
98096	Duration of sunshine in minutes. 98096 means there were 96 minutes of sunshine during the day. Usually in the 08Z observation.

Plus a lot of other information that can be encoded or given in plain language (ex: volcanic eruptions, wind shifts, precipitation beginning or ending, lightning type and direction, etc.).

http://www.met.tamu.edu/class/wflm/metar_decode.htm

http://www.met.tamu.edu/class/metar2/quick-metar.html

APPENDIX III – Abbreviation Used in Aviation

ABV - above
AC - Advisory Circular
ACFT - Aircraft
AD - Airworthiness Directive
ADI - attitude direction indicator
ADF - automatic direction finder
ADIZ - air defense identification zone
A/FD - Airport/Facility Directory
AFM - Airplane Flight Manual
AFSS - Automated Flight Service Station
AGI - Advanced Ground Instructor
AGL - above ground level
AIM - Aeronautical Information Manual
AIRMET - Airman's Meteorological Info
ALS - approach light system
ALSF-1 - standard 2400' high-intensity approach lighting system with sequenced flashers (Category I configuration)
ALSF-2 - standard 2400' high-intensity approach lighting system with sequenced flashers (Category II configuration)
AME - aviation medical examiner
AMEL/S - airplane multi-engine land/sea
AOA - angle of attack
AOE - airport of entry
A&P - Airframe & Powerplant
APCH - approach
APU - auxiliary power unit
ARTC - air route traffic control
ARTCC - Air Route Traffic Control Center
ASL - above sea level (Canada)
ASOS - Automated Surface Observing System
ASR - airport surveillance radar
ASRS - Aviation Safety Reporting System
A/T - auto throttle
ATA - actual time of arrival
ATC - air traffic control
ATE - actual time enroute
ATIS - Automatic Terminal Info Service
ATP - Airline Transport Pilot
AWOS - Automatic Weather Observing System
BFR - Biennial Flight Review
BHP - Brake Horsepower
C - Celcius
CAS - calibrated airspeed
CAT II - Category II
CAVU - Ceiling and visibility unlimited
CDI - Course Deviation Indicator
CFI - Certificated Flight Instructor
CFIT - controlled flight into terrain
CFR - Code of Federal Regulations
CG - center of gravity
CHT - cylinder head temperature
CO - carbon monoxide CO2 carbon dioxide
CONSOL or CONSOLAN - a low or medium frequency long range navigational aid
CONUS - Continental U.S.
COP - change over point
CRM - crew resource management
CTAF - common traffic advisory frequency
CVR - cockpit voice recorder
CWA - center weather advisory
DA - density altitude
DALR - dry adiabatic lapse rate
DF/Steer - direction finding/steering
DG - directional gyro, heading indicator
DH - decision height
DME - distance measuring equipment compatible with TACAN
DOT - Department of Transportation
DUAT(S) - Direct User Access Terminal (System)
DVFR - defense VFR
EAS - equivalent airspeed
EFAS - enroute flight advisory service
EFIS - electronic flight instrument system
EFC - expect further clearance
EGT - exhaust gas temperature
ELT - emergency locator transmitter
ETA - estimated time of arrival
ETE - estimated time enroute
F - Farenheit
FA - area forecast report
FAA - Federal Aviation Administration
FAF - final approach fix
FAR - Federal Aviation Regulation
FBO - fixed base operator
FCC - Federal Communications Commission
FD - winds aloft report
FDC - Flight Data Center (FAA)
FDR - flight data recorder
FE - flight engineer
FL - flight level
FM - fan marker
FMS - flight management system
FO - first officer
FOD - foreign object debris
FPM - feet per minute
FSDO - Flight Standards District Office (FAA)
FSS - flight service station
FYI - For your information
G - gravitational force
GA - general aviation
GMT - Greenwich Mean Time
GP - glide path/ GS slope
GPH - gallons per hour
GPS - global positioning system
GPU - ground power unit
GPWS - ground proximity warning system
HAA - height above airport
HAT - height above threshold
HF - high frequency
HIRL - high-intensity runway light system
HIWAS - Hazardous In-Flight Weather Advisory Service
HP - horsepower
HSI - horizontal situation indicator
HUD - heads-up display
IAF - initial approach fix
IAP - instrument approach procedure
IAS - indicated airspeed
ICAO - International Civil Aviation Organization.
IFR - instrument flight rules
IGI - Instrument Ground Instructor
ILS - instrument landing system
IM - ILS inner marker
IMC - instrument meterological conditions
INOP - inoperative
INS - intertial navigation system
INT - intersection
ISA - International Standard Atmosphere
IR - military training route - instrument
KIAS - Knots, Indicated Airspeed
KHZ - kilohertz
LAA - local airport advisory
LAAS - local area augmentation system (GPS)
LAHSO - land & hold short operations
LAT - latitude
LBS - pounds
LDA - localizer-type directional aid
LF - low frequency
LFR - low-frequency radio range
LLWS - low level wind shear
LLWAS - low level windshear alert system
LLZ - localizer
LMM - compass locator at middle marker
LNAV - lateral navigation
LOC - localizer
LOM - compass locator at outer marker
LONG - longitude
LOP - line of position
LORAN - long range radio aid to navigation
M - mach number
MAA - maximum authorized IFR altitude.
MALS - medium intensity approach light system.
MALSR - medium intensity approach light system with runway alignment indicator lights
MAP - missed approach point
MB - magnetic bearing
MCA - minimum crossing altitude
MDA - minimum descent altitude
MEA - minimum en route IFR altitude
MFD - multi-function display
MEI - multi engine instructor
MEL - minimum equipment list (§91.213)
METAR - meteorological aerodrome report
MH - magnetic heading
MHZ - megahertz
MIRL - medium intensity runway lights
MM - ILS middle marker
MOA - military operations area
MOCA - minimum obstruction clearance altitude
MP - manifold pressure
MPH - miles per hour
MRA - minimum reception altitude
MSA - minimum safe altitude
MSL - mean sea level
MTR - military training route (see IR, VR)
MVA - minimum vectoring altitude
NA - not authorized
NACO - National Aeronautical Charting Office (FAA)
NAVAID - navigational aid, NDB, VOR, etc
NDB(ADF) - nondirectional beacon (automatic direction finder)
NDH - no damage history
NCFT - non federal control tower
NM - nautical mile
NOAA - National Oceanic and Atmospheric Administration
NOPT - no procedure turn required or authorized
NORDO - no radio

NOTAM - notice to airman
NPRM - notice of proposed rulemaking
NTSB - National Transportation Safety Board
NWS - National Weather Service
OAT - outside air temperature
OBS - omni-bearing selector
OEI - one engine inoperative
OM - ILS outer marker
OROCA - off route obstruction clearance altitude
OTS - out of service
PAR - precision approach radar
PCL - pilot controlled lighting
PF - pilot flying
PFD - primary flight display
PIC - pilot in command
PIREP - Pilot weather report
PM - pilot monitoring
PNF - pilot not flying
POH - pilot's operating handbook
PSI - pounds per square inch
PT - procedure turn
PTS - practical test standards
RAIL - runway alignment indicator light system
RAIM - receiver autonomous integrity monitoring (GPS)
RB - relative bearing
RBN - radio beacon
RCLM - runway centerline marking
RCLS - runway centerline light system
RCO - remote communications outlet
REIL - runway end identification lights
RMK - remark
RMI - radio magnetic indicator
RNP - required navigational performance
RPM - rotations per minute
RR - low or medium frequency radio range station
RV - radar vector
RVR - runway visual range as measured in the touchdown zone area
RVSM - reduced vertical separation minimum
SALR - saturated adiabatic lapse rate
SALS - short approach light system
SALSF - SALS with sequenced flashing lights
SAR - search and rescue
SDF - simplified directional facility
SIC - second in command
SIGMET - significant meteorological information
SLP - sea level pressure
SM - statute mile
SMOH - since major overhaul
SODA - statement of demonstrated ability
SOP - Standard operating procedure
SPOH - since prop overhaul
SSALS - simplified short approach light system.
SSALSR - simplified short approach light system with runway alignment indicator lights
STAR - standard terminal arrival route
STOL - short take off & landing
SUA - special use airspace
SVFR - special VFR
TACAN - tactical air navigational aid, a UHF military nav aid
TAF - terminal aerodrome forecast
TAS - true airspeed
TBO - time between overhaul
TC - true course
TCAS - traffic alert & collision avoidance system
TCH - threshold crossing height
TDZE - touchdown zone elevation
TDZL - touchdown zone lights
TFR - temporary flight restriction
TH - true heading
TPA - traffic pattern altitude
TRACON - terminal radar approach control
TRSA - terminal radar service area
TSO - technical standard order
TTSN - total time since new
TVOR - terminal VHF omnirange station
TX - transmit or transponder
UHF - ultra-high frequency
UTC - universal coordinated time
V Speeds see r-vspeed.htm
VASI - visual approach slope indicator
VDP - visual descent point
VFR - visual flight rules
VHF - very high frequency
VMC - Visual meteorological conditions
VNAV - vertical navigation
VOR - VHF omnirange station.
VORTAC - co-located VOR and TACAN
VR - military training route - VFR
VSI - vertical speed indicator
VV - vertical visibility
WA - airmet
WAAS - wide area augmentation system (GPS)
WAC - world aeronautical chart
WH - hurricane advisory
WPT - waypoint
WS - sigmet
WST - convective sigmet
WW - Severe Weather Watch
Z - zulu time

Colors:

A - Amber
Be - Beige
Bk - Black
B - Blue
Br - Brown
Gd - Gold
Gy - Gray
G - Green
O - Orange
P - Purple
R - Red
S - Silver
T - Tan
V - Violet
W - White
Y - Yellow

Definition:

i) "Shall" is used in an imperative sense;

ii) "May" is used in a permissive sense to state authority or permission to do the act prescribed, and the words

iii) "no person may * * *" or "a person may not * * *" mean that no person is required, authorized, or permitted to do the act prescribed

iv) "Includes" - "includes but is not limited to"