

Technical Subject Areas
Oral Guide
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Task A: Aeromedical Factors

How to obtain Medical

- AME
- FAA Website has the directory.

How to obtain Medical with possible deficiency

- New students- get medical before start spending
- Statement of Demonstrated Ability- SODA, which becomes part of the certificate.

Medical Factors

Hypoxia:

- Hypoxic- Altitude
- Hypemic- Giving Blood
- Histoxic- Alcohol
- Stagnant- G-Force

Hyperventilation:

- Lack of Carbon Dioxide
- Over-breathing
- Slow Rate/ Paper Bag

Middle-Ear/ Sinus:

- Ear Block- difference between the middle ear and cabin altitudes.
- Sinus Block- pressure differentials between the sinuses and the cabin.

Spatial Disorientation:

- Leans
- Elevator
- Coriolis
- Inversion
- Graveyard Spiral
- Somatogravic

Motion Sickness:

- Brain receives conflicting information from the senses.
- Nausea, sweating, vomiting.

Carbon Monoxide Poisoning:

- Colorless, Odorless gas from exhaust fumes.
- Headaches, drowsiness, Fatigue
- From Engine Fumes

Fatigue & Stress:

- Acute Fatigue- daily activity/ workload
- Chronic Fatigue- Insufficient recovery from acute.
- Stress- body's reaction to demands placed upon it. Positive or Negative.

Dehydration:

- Fluid Deficiency in the body. Blood loss, malnutrition, not drinking enough.

The Effects of Drugs/Alcohol

- 8 Hours Bottle to Throttle
- 0.04% BAC or less required
- Prescription/Over-counter can impair pilot judgment/performance.
- Always check meds with AME.
- IMSAFE

Scuba Diving

- Need to release Nitrogen from body or:
 - Bends- joints
 - Creeps- under skin
- Recommended wait time for unpressurized to 8000'
 - 12hrs- did not require decompression stop.
 - 24hrs- did require decompression stop.
- Anything above 8000' requires 24hrs.
SCUBA: Self-Contained Underwater Breathing Apparatus

Task B: Runway Incursion Avoidance

Challenges for Taxi Operations

- Concentration of Traffic
- Navigate while obeying ATC Instructions
- Closures/Construction are common.

Cockpit Activities, briefing hotspots, communicating with ATC.

- Brief Expected route & update as required
- Hotspots- complex intersections
- Request progressive taxi if required.

Procedures for Taxi

- Know airport layout, have taxi diagram.
- Understand/Follow ATC Instructions
- Know Visual aids.

Hold-short lines.

Hold Short Lines:

- Keeps taxiing/ air traffic separate.
- Shows where to stop and where to cross

Do not cross if 100% sure you are cleared. Non-towered, ensure approach is clear.

Eliminating Distractions

- Sterile Cockpit <10'000ft other when required for SOP
- Head-up; Eyes-out while taxiing

Keeping workload minimum during taxi.

- Non-essential tasks should only be completed when stopped.
- Sterile Cockpit
- Use Visual cues to maintain situational awareness.

Taxi Operations/Planning Taxi

- Write down clearance and read back
- Visualize the ATC assigned route on diagram.

Ensuring Instructions are actually received

- Say expected taxi route
- Address amended route and ensure you follow assigned route.

Other Aircraft/Vehicles

- Monitor ATC Instructions
- Heads-up; eyes out
- Follow route step-by-step
- Always know where movement/non-movement areas converge.

Briefing Landing/Taxi-exit

- Brief airport diagram
- Clear runway & follow ATC Instructions
- Observe signs and markings.

Exiting from Parallel runways

- Clear runway & follow ATC Instructions
- Do not cross any runway without ATC clearance
- Be vigilant for other aircraft

ATC Runway crossing instructions

- Issued one at a time
- Hold Short required read-back
- Turn on exterior lights when crossing runway
- Scan runway for traffic before crossing
- Ensure you understand clearance limit

ATC- Take-off/Landing Communications

- Towered:
 - Before Take-off: Read-back and follow taxi; hold short & takeoff instructions.
 - Before Landing: Receive and read back landing clearance.
 - After landing: Taxi clear of runway and follow issued instructions.
- Non-Towered:
 - Before Take-off: Know diagram, self-announce and hold short until ready to depart, self announce departure.
 - Before Landing: Brief diagram, know where you are going on field.
 - After Landing: Clear runway, self announce position and destination.

Night Operations

- Use Edge lights to distinguish between runways/taxi-ways
- Line up just left of centerline to stand out to landing traffic.

Non-Towered Operations

- Use Diagram
- Check AWOS/ASOS for winds/runways
- Self-announce ground/air movements on CTAF
- Be vigilant
- Be aware of traffic landing/departing on intersecting runways.

Use of Aircraft Lighting

Engines Running	Beacon On prior to starting
Taxiing	Nav/Position & Strobes
Crossing Runway	All
Take-off	All

Low Visibility

Extra Vigilance; Prepare to Stop; Head down only when stopped.

Task C: Visual Scanning & Collision Avoidance

Physical Condition vs. Vision

Anything IMSAFE reduces vision.

Environmental conditions that degrade vision

- Dim illumination to read charts etc.
- Dark adaption lost within seconds
- Excessive light causes glare
- Dirty Windscreens
- Smoke, haze etc.

Illusions

Vestibular/Visual (ICEFLAGSRRTAG):

Inversion- *climb to S+L= tumbling backwards*

Coriolis- *moving around different axis*

Elevator- *Updraft= nose up illusion*

False Horizon- *Sloping Cloud*

Leans- *Abrupt bank correction= undetected*

Autokinesis- *stationary light moves*

Graveyard Spiral- *descending turn feels like descending straight*

Somotogravic- *Acceleration nose up*

Runway Width- *narrow= higher; wider= lower*

Runway Slope- *Up= higher; Down= lower*

Terrain- *featureless= higher than normal*

Atmospheric- *fog penetration gives illusion of pitching up*

Ground Lighting- *roads look like RAIL*

See & Avoid

91.113: Pilots must always maintain a vigilant lookout for traffic.

Proper Visual Scanning

- Eyes can focus clearly on one area, fovea.
- Short, regularly spaced eye movements 10deg or less.
- Night- off center viewing

Poor Visual Scanning

- 75% Visual
- 25% Instruments

Clearing Procedure

- Clear the area prior to takeoff and maneuvers.

Blind Spots

Move head to see blind spots & raise wings as required

Speed vs. Collision

Faster the aircraft= faster closure rate= less time to take evasive action

Situations with Greatest Risk

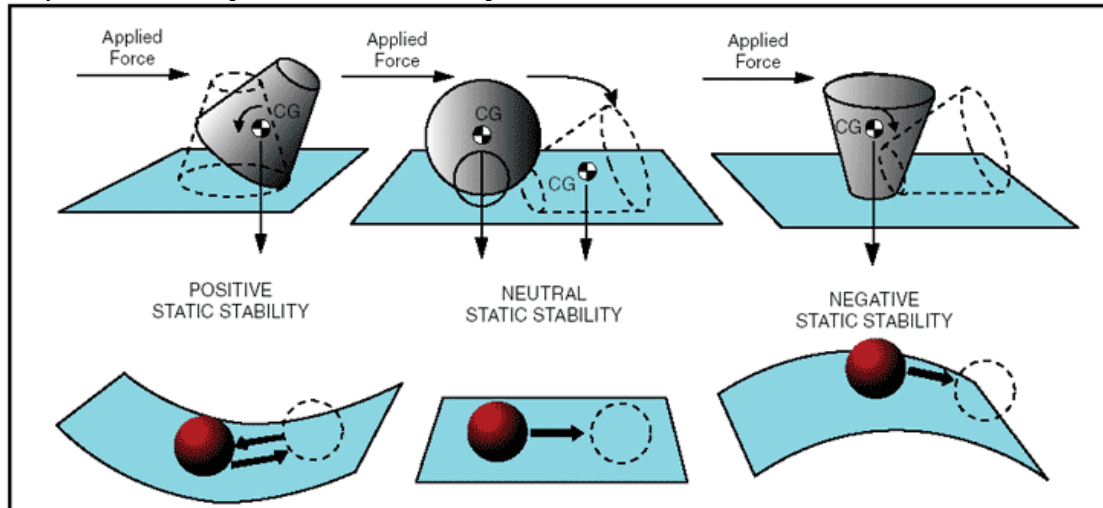
Terminal Area; Cluster Areas; VORs; Airways.

Task D: Principles of Flight

Airfoil Design Characteristics

- Upper camber more pronounced, air further to travel creating low pressure.
- Created to achieve: lift; drag; airspeeds

Airplane Stability and controllability



Center of Pressure vs. CG:

AoA Increase- CoP Fwd- In front of CG- Raises nose further
Hence: airfoil is unstable, which is why we have stabilizer.

Turning Tendencies

- Torque- equal & opposite reaction
- Spiraling Slipstream- Strikes fin pushes right, yaws left
- P-Factor- Descending blade produces more thrust.
- Gyroscopic Precision- Acts 90deg away from rotation.

Load Factors and airplane design

- Weight Supported by Wings by Total Weight
- + When centrifugal force acts in same direction as weight
- - When centrifugal force acts in the opposite direction of weight
- Limits:
 - Normal: +3.8G to -1.52G
 - Utility: +4.4G to -1.76G
 - Acrobatic: +6G to -3G

Wingtip vortices and precautions to be taken

- Higher pressure below seeks lower pressure above; acts outward and upward.
- Strength dependent on weight, speed, configuration & angle of attack.
- Heavy, clean and slow
- Take off before & remain above flight path.
- Stay above flight path & land beyond.

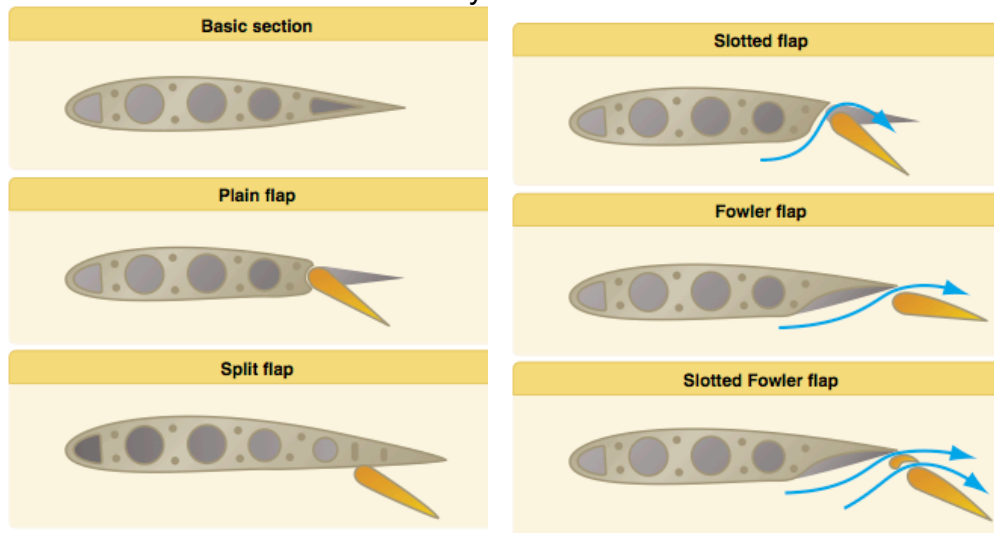
Task E: Airplane Flight Controls

Primary Flight Controls

- Elevator- Lateral
- Ailerons- Longitudinal
- Rudder- Normal

Secondary Flight Controls

- Flaps:
 - Lower Landing Speed/ Distance
 - Manual/ Electric/ Hydraulic



- Leading Edge Devices:
 - High lift- leading edge
 - Delays airflow over wing- delays stalls
 - Slats same as flaps but attached to tracks on leading edge
- Spoilers:
 - High Drag devices deployed on wing
 - Reduce lift, increase drag
 - Used on ground to create friction

Trim Control

- Balances airplane by reducing forces
- Elevator Trim:
 - Balance Tabs
 - Anti-Servo
 - Ground adjustable
 - Adjustable Stabilizer
- Aileron/Rudder Trim

Task F: Airplane Weight & Balance

Terms

- Arm- Distance from CG
- Basic Empty Weight- standard + installed components
- CG- point forces act around
- CG Limits- Distances the CG must be located within
- CG Range- distance between aft/forward limits
- Datum- Imaginary line from which arms are measured
- Delta- symbol that indicates change of movement of CG
- Floor Load Limit- maximum weight floor can take
- Fuel Load- Usable fuel
- Licensed empty weight- Basic Empty + unusable fuel
- Max Landing Weight- greatest weight permitted for landing
- Max ramp weight- greatest weight permitted on ramp
- Max t/o weight- “
- Maximum Weight- “
- Maximum Zero Fuel Weight- “ – Usable fuel
- Mean Aerodynamic Chord- average distance, leading to trailing edge
- Moment- weigh x arm
- Moment index- moment divided by 100
- Payload- occupants, cargo, baggage
- Standard Weights:
 - AVGAS- 6lbs/Gallon
- Station- location by distance
- Useful load- required weight

Effect of Weight & Balance on Performance

Heavier: longer takeoff/landing; shorter range; low service ceiling; reduced maneuverability.

Adverse balance: difficult to raise nose; stability issues; CG limits.

Methods of Weight & Balance Control

- Manufacture Limits
- Compliance with AFM Operating Limitations
- Charts & Graphs in AFM
- PIC responsible for controlling M&B
- Owner responsible for Mx

Determining Values

- PIC Responsible
- Use charts provided

Task G: Navigation & Flight Planning

Terms

- CAS- corrected for Instrument error
- Compass Heading- Magnetic heading corrected for deviation
- Density Altitude- Non standard temperature
- Ground speed- actual speed over ground
- Indicated airspeed- read from ASI
- Magnetic Course- corrected for variation
- Magnetic heading- corrected for wind
- Pressure Altitude- 29.92
- Standard- 29.92/ 15degC
- TAS- corrected for density altitude
- True Course- relative to due north
- True Heading- course corrected for wind
- Variation- true vs magnetic north

Proper Aeronautical Charts

- VFR Sectional- 1:500,000 (1"=6.86NM)
- TAC 1:250,000 (1"=3.43NM)

Course, Fuel, Emergencies

- Plan straight line
- VFR
 - Day: + 30 Minutes
 - Night: + 45 Minutes
- Emergencies; look for landmarks and be mentally prepared for an emergency.
- Stay clear of Restricted/Prohibited Airspace

Pilotage vs. Dead Reckoning

Pilotage: flying from one landmark to another

Dead Reckoning: based on wind, speed distance and time calculations.

Radio Navigation

- Controlling ground track based on Instrument interpretations
- VOR/GPS Navigation

Diversion

- Confirm Position; Select Alternate; Estimate; HAT; Turn

Lost Procedures

Circle

Climb

Call

Confess

Calculate

Flight Log

- Conduct X-C Flight
- Logical Sequence
- Written Record

Go/No Go

- FSS
 - Standard
 - Abbreviated
 - Outlook

VFR Flight Plan

- Recommended
- S+R Begins 30minutes after ETA
- FSS/DUATS

Task H: Night Operations

Factors Related to Night Vision

- Cones- center of vision for day.
- Rods- around cones used for Night Vision
- 30 minutes dark adaption (Rods longer than cones)
- 10seconds to loose adaption

Illusions

- False Horizon
- Autokinesis
- Featureless Terrain
- Runway Slopes
- Ground lighting

Interior Lights

- Bright enough to see instruments
- Dim enough so no glare

Red Flashlight

- White light destroys night vision
- Red wavelength doesn't destroy night vision.

Night Pre-flight

- Required equipment for night
- Normal w/ all lights checked and any taxi obstructions cleared.

Engine Starting

- Extra Caution to ensure propeller area clear
- No Strobes/ Landing lights around other aircraft
- Run-up- extra vigilance to avoid creeping forward
- Fully understand airport markings and position.

Take-off/ Climb out

- Ensure Runway is clear
- 4' left of centerline
- Instruments for rotation
- No turns before safe altitude

In-flight Orientation

- Use Light patterns/beacons to navigate at night
- Avoid weather <VFR
- Have personal weather minimums at night.

Instrument References

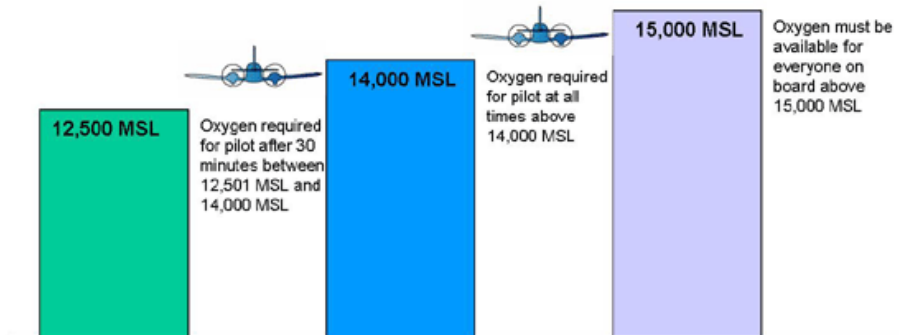
Reference more than during day; cross-ref visual cues.

Night Emergencies

- Greater chance of electrical failure.
- Follow checklist & fly plane. Land near lit area.

Task I: High Altitude Operations

Regulatory



- FL250- 10minutes of O2 required
- FL350- one crew leaves other quick don mask (5 seconds)
- FL410- one crew member wears all time

Physiological

- Hypoxia
 - Hypoxic- High Altitude
 - Histotoxic- Alcohol
 - Hypemic- Giving Blood
 - Stagnant- G-Force
- Vision Deteriorates
- Decompression Sickness
 - Trapped Gas- bends
 - Evolved Gas- creeps

Characteristics of a pressurized airplane & types of O2 masks

- Compressed Air into Cabin and regulated by outflow valve
- Oxygen Systems:
 - Continuous Flow
 - Diluter-Demand
 - Pressure-Demand

Aviators Breathing Oxygen

- 99.5% Pure Oxygen
- < 0.05mg water per liter
- Medical/Scuba has too much water.

Storage

- Fixed installations
- POH

Rapid Decompression

- Noise; Cabin Fog; dust; debris.
- Explosive (<0.5 seconds)
- Donning Masks/ Emergency Descent

Task J: 14 CFR & Publications

Document Revisions

- FSDO
- Website

General Information

- Part 1- Definitions & Abbreviations
- Part 61- Certifications
- Part 91- General Operating & Flight Rules
- NTSB 830- Notification of Accidents

Availability of Information

- AFD
- AIM
- AC
- NOTAM
 - Distance- runway, Nav aids, en-route
 - FDC- changes in IAPs; TFR;
 - Pointer- points out other NOTAM
 - Military
- PTS
- POH

Task K: National Airspace System

VFR Weather Minimums

A IFR
B 3COC
C 3512
D 3512
E> 3512
E< 5111
G> 5111
G<>D 1512
N 3512
G<D 1COC
N 3512

SVFR? B, C, D, E REQUIRES 1SM FLIGHT VIS.

Operating Rules

Class A	IFR
Class B	Clearance & Mode C
Class C	Two-way & Mode C
Class D	Two Way
Class E	None
	Surface
	Extension
	Terminal
	Victor Airway
	Offshore
	Domestic
	Above FL600
Class G	None

SUA

- Prohibited- No flight
- Restricted- Hazardous to non-participating. Fly through when cold.
- Warning- 3NM offshore, can fly through with caution
- Military- separates military from IFR traffic
- Alert- concentrated Ariel activity
- Controlled firing- Activates suspended if traffic is approaching

TFR

- Used to protect persons or property on the ground or in the air from imminent hazard.

Task L: Navigation System & Radar Services

Ground-based Navigational Systems

- VOR/VORTAC:
 - VHF Omni-Directional
 - 30 pulses per-second/ revolutions per second
 - Referenced to Magnetic North
 - Bearings TO; Radials FROM
- NDB:
 - Ground-based emits radio signal
 - ADF points to station
 - $MH+RB=MB$
- DME:
 - VORTAC/ VORDME provides slant distance
- LORAN:
 - Long-Range Navigation
 - 27 transmitters LF range.
 - Navigation/Non-Precision Approaches
- Satellite-based navigation system:
 - GPS; WAAS; LAAS
 - WAAS within 25' 95% of the time
 - LAAS like WAAS but relies on ground stations.
- Radar Service and procedures:
 - ATC Radar Service for VFR Traffic
 - Two-Way/ Identifiable required
 - Flight Following/ Lost Assistance
 - Hierarchy: Ground, Clearance, Tower, Approach, Center
- GPS:
 - 24 active satellites; 5 Usable at all times
 - 4 required for 3D
 - GPS Computes distance, bearing, groundspeed and altitude.
 - RAIM: Receiver Autonomous Integrity Monitoring

Task M: Logbook Entries & Endorsements

Required Logbook Entries for Instruction Given

- Record of the date, make & model, N-Number, Flight Time, To/From, Training Type and Conditions.

Specialty Endorsements: Complex, High-Performance, Tailwheel and High Altitude.

Student Pilot Endorsements

- Pre-Solo/Solo (4)
 - Pre-Solo Knowledge Exam- Corrected to 100%
 - Pre-Solo Flight Training
 - 90 Day- Required 90 days after initial solo
 - Pre-Solo Night- To fly solo at Night
 - Cross-Country (4)
 - 25NM- T/Os and Landings at an airport within 25NM. (Required for each airport.
 - Initial- For initial cross-country.
 - Cross-Country- Each Solo X-C Flight
 - Repeated- Repeated X-C <50NM, after dual instruction given for entire route.
 - Class B (2)
 - Solo Flight in Particular Class B Airspace
 - Endorsement for each airport in Class B Airspace
- NOTE: CFI can include limitations on Student Endorsements.*

Practical Test

- Initial Pilot Certification
 - Instructor complete 8710, and endorse it.
 - New form required for each re-test.
- Additional Certification
 - Complex/ Knowledge/ Practical required.
 - Practical Test Preparation: within 2 preceding months.
- Additional aircraft Qualifications
 - Specialty Endorsement
 - Instructor must have appropriate endorsement in their logbook before endorsing student.
 - Applicant must have logged required flight training and ground instruction.

Flight Review

- Endorse logbook of successful applicant
- Log instruction given, even if unsatisfactory.

Required Records

- Name of each person endorsed for solo flight, the type and date of the endorsement.
- Name of each person for knowledge/ practical test including the kind of test, date and result.
- Retain for 3 years.