Instrument Rating

Airplane

Revision 8-Mar-16

Steve McCroskey: *"Gunderson, check the Radar Range. Anything yet?"*
Gunderson: *"About two more minutes, chief."*
Steve McCroskey: *"Two more minutes? They could be miles off course!"*
Rex Kramer: *"That's impossible. They're on instruments!"*

-- Airplane!

Instrument flying is an unnatural act probably punishable by God.

-- Gordon Baxter

Pilots don't need much school. They just have to learn to read numbers so they can read their instruments.

-- Essay on Growing Up to be a Pilot Allegedly Written by a Fifth Grader

Believe your instruments.

-- Unattributed Words of Wisdom

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Training Materials

- Syllabus
- FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A)
- FAA Airplane Flying Handbook (FAA-H-8083-3A)
- FAA Instrument Flying Handbook (FAA-H-8083-15B)
- FAA Instrument Procedures Handbook (FAA-H-8083-16A)
- FAA Aeronautical Chart User's Guide
- Current Federal Aviation Regulations (FAR)
- Current Aeronautical Information Manual (AIM)
- Instrument Airplane Practical Test Standards (FAA-S-8081-4E)
- Instrument Rating Knowledge Exam Guide
- Instrument Rating Oral Exam Guide
- Checklists
- Current Low En Route Chart and Terminal Procedure Publication
- Current Airport / Facility Directory (AFD)
- Plotter
- E6-B
- Hold Calculator
- IFR Kneeboard
- Flight bag
- Headset
- Foggles or hood

Useful Webpages

FAA Aircraft Handbooks
https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/

FAA Aviation Handbooks
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/

FAA Aeronautical Information Manual
http://www.faa.gov/air_traffic/publications/

FAA Practical Test Standards
https://www.faa.gov/training_testing/testing/test_standards/

FAA Notices to Airmen Publication
https://www.faa.gov/air_traffic/publications/notices/

FAA Terminal Procedures
https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/

FAA Service Availability Prediction Tool
http://sapt.faa.gov/default.php

The GPO's Code of Federal Regulations Download Site
http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR

Gleim Publications (FAR / AIM, textbooks, knowledge exam guides, etc.)
http://www.gleim.com/aviation/

Aviation Supplies and Academics (FAR / AIM, oral and knowledge exam guides, etc.)
http://www.asa2fly.com

StudentPilot.com Forums
http://www.studentpilot.com

National Weather Service Aviation Weather Center
http://www.aviationweather.gov/adds/

NOAA Hazard Mapping System Fire and Smoke Product
http://www.ospo.noaa.gov/Products/land/hms.html

CSC DUATS (Weather and flight planning service)
http://www.duats.com

DTC DUAT (Weather and flight planning service)
http://www.duat.com

Lockheed Martin Flight Service
http://www.1800wxbrief.com/

FltPlan.com (Flight planning)
http://www.fltplan.com

National Flight Data Center Preferred Routes Database
https://www.fly.faa.gov/rmt/nfdc_preferred_routes_database.jsp

Aircraft Owners and Pilots Association
http://www.aopa.org

AOPA Airports
http://www.aopa.org/airports/

AOPA Flight Planner
http://www.aopa.org/flightplanning/flyq/

AOPA Air Safety Institute
http://www.aopa.org/asf

AOPA Medication Database
http://www.aopa.org/members/databases/medical/search_faa_meds.cfm

FAA Safety
http://www.faasafety.gov/

Aviation Safety Reporting System
http://asrs.arc.nasa.gov/

Special Emphasis Areas

- Positive airplane control
- Positive exchange of flight controls
- Stall / spin awareness
- Collision avoidance
- Wake turbulence avoidance
- Land and Hold Short Operations (LAHSO)
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Wire-strike avoidance
- Checklist usage
- Single-pilot Resource Management (SRM)
- Icing condition operational hazards, anti-icing and deicing equipment, differences, and approved uses and operations

IFR Checklists

Refer to FAR §91.185

IFR LOST COMMUNICATIONS

Freq / Vol / Sq / Headset ..... Check
Last Freq / FSS ..... Check
Transponder..... 7600

Transmitter Failure:

Listen for instructions on any operable receiver *including nearby NAV facilities*.

Upon Encountering VMC:

Land under VFR as soon as PRACTICAL.

Continuing IFR:

Route:
1. Last assigned route clearance.
2. Vectoring, con't to assigned fix or route.
3. Route expected in further clearance.
4. Filed route.

Altitude, HIGHEST of:
1. Last assigned altitude.
2. Minimum en route altitude.
3. Altitude expected in further clearance.

Clearance limit is fix where approach begins:

WITH EFC TIME: leave fix as close as possible to the expect further clearance time, thence…

WITHOUT EFC TIME: leave fix as close as possible to the estimated time of arrival, thence…

…commence descent and approach.

Clearance limit is NOT fix where approach begins:

WITH EFC TIME: leave fix as close as possible to the expect further clearance time, thence…

WITHOUT EFC TIME: leave fix upon reaching it, thence…

…proceed to a fix from which an approach begins. Commence descent and approach as close as possible to estimated time of arrival.

Refer to FAR §91.183 and AIM 5-3-3

IFR REPORTING PROCEDURES

With Radar Contact:

- **Loss of nav / comms ability.**
- **Safety of flight / unforecasted weather.**
- Reporting points requested by ATC.
- Leaving assigned alt or FL for another.
- Report VFR-on-top change in altitude.
- Unable to climb / descend at > 500 FPM.
- Report missed approaches.
- TAS variation greatest of 5% or 10 knots.
- Time and alt / FL reaching a holding fix or clearance limit.
- Leaving any assigned holding fix or point.

Without Radar Contact:

- Report leaving final approach fix or outer marker in bound on final approach.
- Report revised estimated time of arrival of more than three minutes.
- Report at compulsory position reporting points.

Position Report

- Identification
- Altitude
- Time
- Position
- ETA and name of next reporting point
- Name of next successive reporting point
- Remarks

HOLDING

Teardrop / Parallel	Direct
TIME	Turn
Turn	Twist
Twist	TIME
Throttle	Throttle
Talk	Talk
Track	Track

FOR REFERENCE ONLY

Refer to POH and Approved Checklists

INSTRUMENT CHECKLIST

With Master Switch OFF

Compass ..... Full of fluid
Inclinometer ..... Full of fluid
Turn Coordinator ..... Flag visible

With Master Switch ON

Turn Coordinator ..... No flag
Electric Gyros ..... Spinning up
Pitot Heat ..... Check
Lights ..... Check

Visually Check

Pitot Tube(s) and Drain(s) ..... Clear
Static Port(s) ..... Clear

Run-up

Suction ..... Normal
Refer to POH for normal suction.
Ammeter ..... Charging

Taxi Check

Compass Movement ..... Free
Compass Heading ..... Correct
Attitude Indicator ..... < 5° of bank
Heading Indicator ..... Align; Verify
Turn Coordinator ..... Correct turn
Inclinometer ..... Outside turn

Before Takeoff

Airspeed ..... Zero
Attitude Indicator ..... Align
Altimeter ..... Set
Turn Coordinator ..... Flag cleared
Heading Indicator ..... Align; Verify
Vertical Speed Indicator ..... Check
Use VSI indication as "zero".
Clearance ..... Obtain
Radios ..... Set
GPS ..... Set
Transponder ..... Set
Departure ..... Review
Departure Emergencies ..... Review

Refer to FAR §91.205 and POH / MEL

REQUIRED EQUIPMENT – VFR (DAY)

Required Navigation, Operations, and Type Certification Equipment +
Tachometer(s)
Oil Pressure Gauge(s)
Manifold Pressure Gauge(s)
Altimeter
Temperature Gauge(s) (liquid-cooled)
Oil Temperature Gauge(s) (air-cooled)
Fuel Gauge(s)
Landing Gear Position Indicator
Airspeed Indicator
Magnetic Compass
ELT
Seatbelts

REQUIRED EQUIPMENT – VFR (NIGHT)

VFR Day +
Fuses (Spare) or Circuit Breakers
Landing Light (Commercial only)
Anti-Collision Lights
Position Lights
Source of Electricity (Alternator or Generator)

REQUIRED EQUIPMENT – IFR

VFR Night +
Generator or Alternator
Radios / Equipment required by flight plan
Attitude Indicator
Ball (slip / skid indicator)
Clock (with seconds indicator)
Altimeter (sensitive and adjustable)
Rate of Turn Indicator
Directional Gyro

Ground Lessons

You, Your Goals, and the Training Ahead

Objectives

The student and instructor should become familiar with each other, and the student should become familiar with the training process, training materials, and certification.

References

- FAR Part 61
  - §§ 51, 57, 65
- AC 61-98B (Currency Requirements and Guidance for the Flight Review and Instrument Proficiency Check)

Materials

- FAR / AIM

Schedule

30 minutes

Instructor Actions

Learn about the student, the student's previous aviation experience, and the student's aviation goals.

Discuss:

- ❑ Aeronautical knowledge, flight proficiency, and experience requirements.
- ❑ Training materials.
- ❑ Using aviation training devices.
- ❑ Logging instrument experience.
- ❑ Recent experience requirements and the instrument proficiency check.

Student Actions

Engage in a discussion with the instructor about his or her own expectations for the flight training process. The student should discuss his or her interests, any previous aviation experience, and any future aviation goals.

Completion Standards

The student should have a good, broad understanding of how the training will proceed, his or her own expectations for training, and what materials will be required for training.

The student should be comfortable with the instructor, be confident that the instructor understands his or her aviation goals, and be confident that the instructor is capable of helping the student achieve those goals.

Human Factors

Objectives

In this lesson, the student will revisit human sensory systems, spatial and optical illusions, spatial disorientation, medical and psychological factors, as well as Single-Pilot Resource Management and Crew Resource Management.

References

- Instrument Flying Handbook
  - Chapter 3 (Human Factors)

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Sensory systems.
- ❑ Spatial disorientation.
- ❑ Vestibular and visual illusions.
- ❑ Optical illusions and preventing landing errors.
- ❑ Psychological and medical factors.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss human sensory systems, spatial disorientation, vestibular and visual illusions, optical illusions, and psychological and medical factors.

Aeronautical Decision Making Review

Objectives

In this lesson the student will review strategies for identifying, analyzing, mitigating, and supervising aviation hazards, managing risk, maintaining situational awareness, and managing workload.

References

- Pilot's Handbook of Aeronautical Knowledge
  - Chapter 17 (Aeronautical Decision Making)
- Instrument Flying Handbook
  - Chapter 3 (Human Factors)
- AC 60-22 (Aeronautical Decision Making)

Schedule

1 hour

Instructor Actions

The instructor will present the student with some common scenarios he or she is likely to encounter as an instrument pilot. While discussing the scenarios with the student, the instructor will discuss the following topics with the student:

- ❑ Hazardous attitudes and how to mitigate them.
- ❑ Situational Awareness.
- ❑ The PAVE checklist.
- ❑ The IMSAFE checklist.
- ❑ Aircraft hazards.
- ❑ Environmental hazards.
- ❑ External pressures.
- ❑ Assessing risk with the CARE process.
- ❑ Analyzing risk with the TEAM process.
- ❑ The 5P checklist and the OODA loop process.
- ❑ Automatic decision making.
- ❑ Common pitfalls.
- ❑ Workload management.

Student Actions

The student will discuss the instructor's scenarios and apply Aeronautical Decision Making principles.

Completion Standards

The student will demonstrate ability to use the Aeronautical Decision Making process to analyze common scenarios and make reasonable decisions on how to handle the scenarios. The student will also demonstrate a deeper understanding of situational awareness and workload management through planning.

Aerodynamics

Objectives

In this lesson, the student will revisit aerodynamics and learn more about the effect of icing on the aerodynamics of an airplane. By exploring these topics in depth, the student will develop a solid foundation for the development of precise airplane control skills.

References

- Instrument Flying Handbook
  - Chapter 4 (Aerodynamic Factors)
- AC 91-51A (Effect of Icing on Aircraft Control and Airplane Deice and Anti-Icing Systems)

Materials

- Whiteboard and markers
- Miniature airplane

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ The four forces of flight and Newton's laws of motion.
- ❑ Pressure and density altitude.
- ❑ Pitch and power relationship with lift.
- ❑ Drag, region of reversed command, and slow flight.
- ❑ Climbs, turns, and load factor.
- ❑ Types of icing.
- ❑ Effects of icing on airfoils, roll upset, and tailplane stalls.
- ❑ Other icing hazards.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss these aerodynamics concepts and explain how understanding them is the first step to developing more precise control of an airplane.

Flight Instruments

Objectives

In this lesson, the student will gain a deeper understanding of how pitot-static, gyroscopic, and solid-state flight instruments operate. Additionally, the student will gain a deeper understanding of the limitations, errors, and failure modes of each instrument.

References

- Instrument Flying Handbook
  - Chapter 5 (Flight Instruments)
- FAR Part 91
  - §§ 205, 207, 213, 215, 217, 411, 413

Materials

- FAR / AIM
- Whiteboard and markers
- Demonstration gyroscope
- Airplane or flight deck poster

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ The pitot-static system, indications of blockage, and alternate static sources.
- ❑ Sensitive altimeter principles, operation, errors, and required accuracy.
- ❑ Vertical speed indicator principles and operation.
- ❑ Airspeed indicator principles, operation, and errors.
- ❑ Types of airspeed.
- ❑ Magnetic compass principles, operation, and errors.
- ❑ Gyroscope principles, pneumatic and electric gyroscope systems.
- ❑ Attitude indicator principles and operation.
- ❑ Heading indicator principles, operation, and errors.
- ❑ Turn-and-slip indicators, turn coordinators.
- ❑ Solid-state instruments and advanced avionics.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss these flight instrument concepts and explain why it is important to understand the operating principles, limitations, and error modes of the various types of flight instruments.

Attitude Instrument Flying – Control / Performance Method

Objectives

In this lesson, the student will learn about the Control / Performance Method of Attitude Instrument Flying. The Control / Performance Method will serve the student well in the training airplane and as the student progresses on to higher performance and more technologically advanced airplanes.

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)
  - Chapter 7 (Airplane Basic Flight Maneuvers, Part I or Part II as appropriate)

Materials

- Flight deck poster with appropriate instruments

Schedule

30 minutes

Instructor Actions

Discuss the following topics with the student:

- ❑ Fundamental instrument flight skills.
- ❑ Control instruments.
- ❑ Performance instruments.
- ❑ Control and performance procedures.
- ❑ Pitch and bank control with the attitude indicator.
- ❑ Power control.
- ❑ Importance of proper trim technique.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the Control / Performance Method of Attitude Instrument Flying and how to accomplish the fundamental instrument flight skills using it.

Attitude Instrument Flying – Primary / Supporting Method

Objectives

In this lesson, the student will learn about the Primary / Supporting Method of Attitude Instrument Flying. The Primary / Supporting Method is a versatile method that serves well under both normal and emergency situations that result in the loss of one or more instruments.

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)
  - Chapter 7 (Airplane Basic Flight Maneuvers, Part I or Part II as appropriate)

Materials

- Flight deck poster with appropriate instruments

Schedule

30 minutes

Instructor Actions

Discuss the following topics with the student:

- ❑ Fundamental instrument flight skills.
- ❑ Pitch instruments.
- ❑ Bank instruments.
- ❑ Power instruments.
- ❑ Trim instruments.
- ❑ Primary and supporting arrangements for flight maneuvers.
- ❑ Importance of proper trim technique.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the Primary / Supporting Method of Attitude Instrument Flying and how to accomplish the fundamental instrument flight skills using it.

Attitude Instrument Flying – Coping with an Instrument Failure

Objectives

While mechanical instruments are fairly reliable, and solid-state instruments are even more reliable, an instrument failure is always a possibility. In this lesson, the student will learn methods for identifying and coping with instrument failures.

References

- Instrument Flying Handbook
  - Chapter 5 (Flight Instruments)
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)
  - Chapter 7 (Airplane Basic Flight Maneuvers, Part I or Part II as appropriate)

Materials

- Flight deck poster with appropriate instruments

Schedule

30 minutes

Instructor Actions

Discuss the following topics with the student:

- ❑ Fundamental instrument flight skills.
- ❑ Identifying failures of gyroscopic instruments.
- ❑ Identifying failures of pitot-static instruments.
- ❑ Standard rate turns.
- ❑ Timed turns.
- ❑ Compass turns and compass errors.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss applying the fundamental instrument flight skills to identify possibly subtle instrument failures and compensate for them to maintain control of the airplane.

Attitude Instrument Flying – Unusual Attitudes

Objectives

Despite a pilot's best efforts, spatial disorientation, distraction or an instrument failure may lead to the airplane entering an unusual nose-high or nose-low attitude. In this lesson, the student will learn techniques for identifying and recovering from unusual attitudes.

References

- Instrument Flying Handbook
  - Chapter 7 (Airplane Basic Flight Maneuvers, Part I or Part II as appropriate)

Materials

- Flight deck poster with appropriate instruments

Schedule

30 minutes

Instructor Actions

Discuss the following topics with the student:

- ❑ Situations that can lead to an unusual attitude.
- ❑ Recognizing and recovering from a nose-high attitude.
- ❑ Recognizing and recovering from a nose-low attitude.
- ❑ Recovering with a partial panel.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the situations that can lead to an unusual attitude, how to recognize unusual attitudes, and how to recover with a full or partial panel.

Navigation Systems

Objectives

In this lesson, the student will gain a deeper understanding of the various radio navigation instruments available for instrument flight.

References

- Instrument Flying Handbook
  - Chapter 9 (Navigation Systems)
- Aeronautical Information Manual
  - Chapter 1 (Air Navigation)
  - Chapter 2, Section 1 (Airport Lighting Aids)
- FAR Part 91; § 171

Materials

- FAR / AIM
- White board and markers
- Flight deck poster with appropriate instruments

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Radio characteristics.
- ❑ ADF principles, tracking / homing, and common operational errors.
- ❑ VOR principles, tracking, common operational errors, and accuracy checks.
- ❑ DME principles and errors.
- ❑ RNAV types.
- ❑ GPS principles and RAIM.
- ❑ GPS IFR operation requirements, WAAS, and operational errors.
- ❑ ILS principles, marker beacons, and common operational errors.
- ❑ Approach lighting systems.
- ❑ Visual glide slope indicators.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the principles and common operational errors of the various radio navigation systems.

The National Airspace System and Airport Operations Review

Objectives

In this lesson, the student will review the basics of the National Airspace System and receive an introduction to the procedures are charts used for Instrument Flight Rules.

References

- Pilot's Handbook of Aeronautical Knowledge
  - Chapter 13 (Airport Operations)
- Instrument Flying Handbook
  - Chapter 1 (The National Airspace System)
- Aeronautical Information Manual
  - Chapter 2, Section 3 (Airport Marking Aids and Signs)
  - Chapter 3 (Airspace)
- Aeronautical Chart User's Guide
  - §§ 2 (IFR En Route Charts), 3 (Terminal Procedures Publication)

Materials

- VFR Sectional Chart
- IFR En Route Chart
- Terminal Procedures Publication

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Runway and taxiway markings.
- ❑ Airport signs.
- ❑ Runway incursion avoidance.
- ❑ Land and Hold Short Operations (LAHSO).
- ❑ Sources of airport information.
- ❑ Airspace classifications and requirements.
- ❑ Special use airspace types.
- ❑ Federal airways.
- ❑ Preferred routes.

After reviewing airspace, the instructor will introduce the student to the IFR En Route and Terminal Procedure charts noting the differences and similarities to VFR Sectional charts. Topics to discuss include:

- ❑ IFR En Route chart legend.
- ❑ Airspace designations and airport information blocks.
- ❑ MEA, MOCA, MRA, MCA, MAA, OROCA, COPs.
- ❑ NAVAID symbols.
- ❑ Weather and communication blocks.
- ❑ Obstacle Departure Procedures and Standard Instrument Departures.
- ❑ Standard Terminal Arrival Routes.
- ❑ Instrument Approach Procedures.

Student Actions

Answer questions related to the lesson topics and discuss the IFR En Route and Terminal Procedure charts with the instructor.

Completion Standards

The student will be able to answer questions about and discuss the National Airspace System, and the student will show a basic, introductory, understanding of the IFR En Route and Terminal Procedure charts.

The Air Traffic Control System

Objectives

In this lesson, the student will review the facilities of the Air Traffic Control System and learn the basics of working with them under Instrument Flight Rules.

References

- Instrument Flying Handbook
  - Chapter 2 (The Air Traffic Control System)
- Aeronautical Information Manual
  - Chapter 4 (Air Traffic Control)

Materials

- FAR / AIM

Schedule

30 minutes

Instructor Actions

Discuss the following topics with the student services provided by:

- ❑ Automated Flight Service Stations.
- ❑ Air Traffic Control Towers.
- ❑ Terminal Radar Approach Control.
- ❑ Tower En Route Control.
- ❑ Air Route Traffic Control Centers.
- ❑ General control sequence.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the facilities of the Air Traffic Control System and the general sequence an aircraft on an instrument flight plan follows.

Weather Theory Review

Objectives

In this lesson, the student will review the basics of how weather works.

References

- Pilot's Handbook of Aeronautical Knowledge
  - Chapter 11 (Weather Theory)
- AC 00-6A (Aviation Weather for Pilots and Flight Operations Personnel)
- AC 00-24C (Thunderstorms)
- AC 00-54 (Pilot Windshear Guide)

Materials

- Whiteboard and markers

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ The atmosphere, circulation, the Coriolis Force, and surface friction.
- ❑ Atmospheric pressure.
- ❑ High pressure, low pressure, wind, convection, and turbulence.
- ❑ Isobars.
- ❑ Atmospheric stability, inversions, humidity, temperature / dew point.
- ❑ Methods and results of air saturation.
- ❑ Cloud types, and ceiling.
- ❑ Air masses and fronts.
- ❑ Wind shear.
- ❑ Thunderstorms, squall lines, tornadoes, icing, SLD, and hail.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss weather theory.

Weather Information Sources Review

Objectives

In this lesson, the student will review how to use Internet-, telephone-, and radio-based weather information sources.

References

- Pilot's Handbook of Aeronautical Knowledge
  - Chapter 12 (Aviation Weather Services)
- AC 00-45G (Aviation Weather Services)
- Aeronautical Information Manual; Chapter 7 (Safety of Flight)

Materials

- Internet connection or printed briefing

Schedule

1 hour

Instructor Actions

The instructor will setup a typical cross-country scenario and guide the student through a standard briefing. While reading through the briefing with the student, the instructor will discuss the following topics with the student:

- ❑ ASOS, AWOS, ATIS.
- ❑ FSS, TIBS, DUATS, EFAS, HIWAS.
- ❑ Standard and abbreviated weather briefings.
- ❑ METAR's.
- ❑ PIREP's.
- ❑ TAF's.
- ❑ Area Forecasts (FA's).
- ❑ AIRMET's, SIGMET's, and Convective SIGMET's.
- ❑ Temperature and Winds Aloft Forecasts (FD's).
- ❑ Surface Analysis and Weather Depiction Charts.
- ❑ Radar Summary Charts.
- ❑ Significant Weather Prognostic Charts.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss how to use aviation weather information sources.

IFR Flight – Preflight, Clearances, Takeoffs and Departures

Objectives

In this lesson, the student will dig deeper into the Air Traffic Control System to learn about required preflight actions, filing IFR flight plans, obtaining IFR clearances, and using departure procedures.

References

- Instrument Procedures Handbook
  - Chapter 1 (Departure Procedures)
- Instrument Flying Handbook
  - Chapter 10 (IFR Flight)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Aeronautical Information Manual
  - Chapter 5 (Air Traffic Procedures); §§ 1 (Air Traffic Procedures), 2 (Departure Procedures)
- FAR Part 91
  - §§ 103, 167, 169, 173, 175(f)

Materials

- Terminal Procedures Publication

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Required preflight actions and sources of flight planning information.
- ❑ Filing IFR flight plans.
- ❑ Obtaining IFR clearances and CRAFT.
- ❑ Runway incursion avoidance.
- ❑ Standardized taxi routes.
- ❑ Alternate takeoff minimums.
- ❑ Obstacle Departure Procedures, Standard Instrument Departures.
- ❑ Departure procedure design criteria.
- ❑ Departing with and without an operating control tower.
- ❑ Climb gradients and see-and-avoid.
- ❑ CFIT.
- ❑ VFR departures.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss required preflight actions, filing IFR flight plans, obtaining IFR clearances, using departure procedures, the differences between ODPs and SIDs, departure procedure design criteria, and operating from a towered versus an un-towered airport.

IFR Flight – En Route

Objectives

In this lesson, the student will continue digging into about the Air Traffic Control System to learn about en route navigation, minimum altitudes, and required Air Traffic Control communication.

References

- Instrument Procedures Handbook
  - Chapter 2 (En Route Operations)
- Instrument Flying Handbook
  - Chapter 10 (IFR Flight)
- Aeronautical Chart User's Guide; § 2 (IFR En Route Charts)
- Aeronautical Information Manual
  - Chapter 5 (Air Traffic Procedures); § 3 (En Route Procedures)
- FAR Part 91
  - §§ 177, 179, 181, 183, 185, 187

Materials

- FAR / AIM
- IFR En Route Chart

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Air Route Traffic Control Centers.
- ❑ Preferred IFR routes.
- ❑ VHF airways, obstacle clearances, service volumes, and changeover points.
- ❑ MEA, MOCA, MVA, MRA, MCA
- ❑ IFR cruising altitude.
- ❑ Reporting procedures.
- ❑ RNAV routing, minimum altitudes, OROCA.
- ❑ IFR transition routes.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss IFR en route procedures.

IFR Flight – Holding

Objectives

In this lesson, the student will learn about IFR holding procedures.

References

- Instrument Flying Handbook
  - Chapter 10 (IFR Flight)
- Aeronautical Information Manual
  - Chapter 5 (Air Traffic Procedures); § 3 (En Route Procedures)

Materials

- FAR / AIM
- Terminal Procedures Publication and IFR En Route Chart
- Whiteboard and markers
- Hold calculator

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ What holding patterns are and when they are necessary.
- ❑ Standard and non-standard holding patterns, and obstacle clearance.
- ❑ ATC holding instructions.
- ❑ Holding at a clearance limit fix.
- ❑ Maximum airspeeds.
- ❑ Standard entries.
- ❑ Reporting procedures.
- ❑ Determining and using wind drift correction.
- ❑ Maintaining situational awareness during the hold.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss why holding patterns exist, standard and non-standard patterns, expected ATC instructions, standard holding pattern entries, how to correct for wind, and the importance of maintaining situational awareness during the hold.

IFR Flight – Arrival

Objectives

In this lesson, the student will learn about the Air Traffic Control procedures for transitioning from the en route environment to the terminal environment.

References

- Instrument Procedures Handbook
  - Chapter 3 (Arrivals)
- Instrument Flying Handbook
  - Chapter 10 (IFR Flight)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Aeronautical Information Manual
  - Chapter 5 (Air Traffic Procedures); § 4 (Arrival Procedures)
- FAR Part 91; § 117

Materials

- FAR / AIM
- Terminal Procedures Publication

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Importance of descent planning, workload management, and CFIT awareness.
- ❑ Importance of precise navigation.
- ❑ Types of descent clearances.
- ❑ Cruise clearances.
- ❑ Types of transitions and clearances from en route to approach.
- ❑ Standard Terminal Arrival Routes.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss IFR arrival procedures with emphasis on workload management, CFIT awareness, and STAR usage to simplify arrivals.

IFR Flight – Approach

Objectives

In this lesson, the student will learn about the various types of instrument approach procedures, their purpose, requirements, and charts.

References

- Instrument Procedures Handbook
  - Chapter 4 (Approaches)
- Instrument Flying Handbook
  - Chapter 10 (IFR Flight)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Aeronautical Information Manual
  - Chapter 1 (Navigation Aids)
  - Chapter 5 (Air Traffic Procedures); § 4 (Arrival Procedures)
- FAR Part 91; § 175

Materials

- FAR / AIM
- Terminal Procedures Publication

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Planning for approach during preflight and en route.
- ❑ Approach categories, airspeeds, and circling radii.
- ❑ General structure of an approach chart and approach naming conventions.
- ❑ Instrument approach procedure segments, procedure turns, and hold-in-lieu of procedure turns.
- ❑ Minimum Safe Altitude, Final Approach Fix altitude, Minimum Descent Altitude, Decision Altitude Decision Height, and factors that affect them.
- ❑ Flying a stabilized approach.
- ❑ Missed approach procedures.
- ❑ Visual approaches.
- ❑ Types of RNAV approaches and approach design.
- ❑ ILS approaches, simultaneous approaches.
- ❑ Localizer, back course, and Localizer-type Directional Aid approaches.
- ❑ VOR and NDB approaches.
- ❑ Radar approaches.
- ❑ Circling and side-stepping.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions about and discuss the importance of planning ahead for approaches, the structure, important altitudes, and various types of approaches, missed approach procedures, and the importance of flying a stabilized approach.

Emergency Procedures

Objectives

In this lesson the student will examine the common emergencies that an IFR pilot may face and discuss general strategies for dealing with them.

References

- Instrument Flying Handbook
  - Chapter 11 (Emergency Operations)
- AC 00-24C (Thunderstorms)
- AC 00-54 (Pilot Windshear Guide)
- AC 91-74B (Pilot Guide: Flight in Icing Conditions)
- FAR Part 91, § 185

Materials

- Whiteboard and markers

Schedule

1 hour

Instructor Actions

Discuss the following topics with the student:

- ❑ Inadvertent thunderstorm encounter.
- ❑ Inadvertent icing encounter.
- ❑ Alternator / Generator failure.
- ❑ Pneumatic system failure.
- ❑ Pitot / Static system failure.
- ❑ Communications failure.
- ❑ Loss of situational awareness.

Student Actions

Answer questions related to the lesson topics.

Completion Standards

The student will be able to answer questions and discuss strategies for deal with common emergencies that an IFR pilot may encounter.

Flight Lessons

Full-Panel Instrument Flight

Scenario

The ceiling is overcast at 800' feet, visibility is 2 statute miles in light rain, and you want to go flying? Hold on second… Instrument flight is an entirely new world of challenges and fun, but we need to start with the fundamentals. Let's start with the familiar scenario of inadvertently flying into a cloud bank. Instead of simply performing a level 180° turn to exit the clouds, let's stay in it and learn about attitude instrument flying.

Objectives

- Introduce attitude instrument flying using the Control Performance Method.
- Perform the fundamental maneuvers precisely solely by reference to the airplane's instruments.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)

Special Emphasis Areas

- Positive airplane control
- Stall / spin awareness
- Controlled Flight into Terrain (CFIT)

Pre-flight (15 minutes)

The student will discuss the principles of attitude instrument flying using the Control Performance Method.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 hour)

After takeoff and upon reaching a safe altitude, the student will put on a view limiting device. The instructor will guide the student to the practice area allowing the student to practice the fundamental maneuvers solely by reference to the airplane's instruments.

Upon reaching the practice area, the instructor will clear the area and have the student perform the fundamental maneuvers, slow flight, stalls, and unusual attitude recovery.

On the way back to the training airport, the student will have the opportunity to continue practicing the fundamental maneuvers.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss the principles of attitude instrument flying using the Control Performance Method.

Demonstrate ability to perform:

- ❑ Straight-and-level flight.
- ❑ Constant airspeed climbs and descents.
- ❑ Constant rate climb and descents and learn required power settings.
- ❑ Standard rate turns.
- ❑ Climbing and descending turns.
- ❑ Slow flight.
- ❑ Power-off and power-on stalls.
- ❑ Recover from unusual attitudes.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°.

Common Errors

- Fixating on trend indicators rather than using proper instrument scan.
- Omitting instruments from the instrument scan.
- Emphasizing a single instrument rather than using proper instrument cross-check.

Partial-Panel Instrument Flight

Scenario

The Control Performance Method of attitude instrument flight relies heavily on the attitude indicator. So, what happens if you lose your vacuum pump? Now is a great time to learn about the Primary Support Method of attitude instrument flying before you encounter a real failure.

Objectives

- Review full panel instrument flight using the Control Performance Method.
- Introduce attitude instrument flying using the Primary Supporting Method.
- Perform the fundamental maneuvers precisely solely by reference to the airplane's instruments.
- Introduce partial-panel instrument flight.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)

Special Emphasis Areas

- Positive airplane control
- Stall / spin awareness
- Controlled Flight into Terrain (CFIT)

Pre-flight (15 minutes)

The student will discuss the principles of attitude instrument flying using the Primary Supporting Method, coping with instrument failures, and magnetic compass concepts.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 hour)

After takeoff and upon reaching a safe altitude, the student will put on a view limiting device. The instructor will guide the student to the practice area allowing the student to practice the fundamental maneuvers solely by reference to the airplane's instruments.

Upon reaching the practice area, the instructor will simulate a vacuum failure and introduce partial-panel attitude instrument flying.

On the way back to the training airport, the student will have the opportunity to continue practicing the fundamental maneuvers.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss the principles of attitude instrument flying using the Primary Supporting Method.

Demonstrate ability to perform:

- ❑ Straight-and-level flight.
- ❑ Constant airspeed climbs and descents.
- ❑ Constant rate climb and descents using known power settings.
- ❑ Standard rate turns.
- ❑ Timed turns to magnetic headings.
- ❑ Magnetic compass turns.
- ❑ Climbing and descending turns.
- ❑ Slow flight.
- ❑ Power-off and power-on stalls.
- ❑ Recover from unusual attitudes.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°.

Common Errors

- Fixating on trend indicators rather than using proper instrument scan.
- Omitting instruments from the instrument scan.
- Emphasizing a single instrument rather than using proper instrument cross-check.
- Not compensating for magnetic compass errors during turns.

VOR Navigation

Scenario

VORs are still the current backbone of the Federal Airway System. In time, GPS will probably take the place of VORs. For now, however, you are still going to find yourself using VORs in a variety of situations from basic navigation to DME arcs to holds.

Objectives

- Review the basics of VORs, DME arcs, and accuracy checks.
- Introduce identifying a station, determining the airplane's position relative to a VOR, intercepting radials, and tracking courses.
- Introduce flying DME arcs using either DME or simulating DME with a GPS.
- Expand attitude instrument flying skills by dividing attention between airplane control, situational awareness, and navigating the airplane solely by reference to the airplane's instruments.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 9 (Navigation Systems)

Special Emphasis Areas

- Positive Airplane Control
- Controlled Flight into Terrain (CFIT)
- Single-pilot Resource Management (SRM)

Pre-flight (15 minutes)

The student will discuss the principles of VOR operation and DME arc concepts.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, the PIC role, and the VOR to be used.

In Flight (1 hour)

After takeoff and upon reaching a safe altitude, the student will put on a view limiting device. The student will practice navigating to a VOR, determining the airplane's current radial, flying to specific radials, identifying whether the CDI is normal or reverse sensing, identifying station passage, and flying DME arcs.

The student will maintain situational awareness, positive airplane control, and divide his or her attention between airplane control, navigation, and maintaining altitude.

On the way back to the training airport, the student will have the opportunity to continue practicing the fundamental maneuvers and unusual attitude recovery using both full-panel and partial-panel attitude instrument flying.

Post-flight (15 minutes)

The student and instructor will review and asses the flight.

Completion Standards

The student will:

- ❑ Discuss the principles and operation of VORs, DME arcs, and accuracy checks.

Demonstrate ability to:

- ❑ Tune and identify a VOR station.
- ❑ Determine the airplane's current radial.
- ❑ Navigate to the station by tracking a radial.
- ❑ Fly to a specific radial and track it away from the station.
- ❑ Properly identify station passage.
- ❑ Identify whether the CDI is normal or reverse sensing.
- ❑ Intercept and accurately fly a DME arc.
- ❑ Effectively divide attention between airplane control and navigation.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, DME arc within ± ____ nm, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, DME arc ±1 nm, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Errors

- Not identifying the VOR station after selecting the station's frequency.
- Incorrectly selecting the desired radial on the OBS.
- Mistaking reverse sensing for normal sensing.
- Approaching a radial with too large or too small of an intercept angle.
- Homing by re-centering the CDI rather than tracking.
- Fixating on the CDI rather than scanning.
- Misinterpreting station passage.
- Not choosing an appropriate wind correction.
- Over-controlling during corrections.
- Fixating on navigation rather than effectively dividing attention.

Localizer Front and Back Course

Scenario

VORs allow us to track any of 360 radials to or from the station and form the backbone of the Federal Airway System. What might be possible if we started thinking of radials as runways and made the technology more precise?

Objectives

- Review the basics of localizer operation, both normal and reverse sensing.
- Expand attitude instrument flying skills by dividing attention between airplane control, situational awareness, and precisely navigating the airplane solely by reference to the airplane's instruments.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 9 (Navigation Systems)

Special Emphasis Areas

- Positive Airplane Control
- Controlled Flight into Terrain (CFIT)
- Single-pilot Resource Management (SRM)

Pre-flight (15 minutes)

The student will discuss the principles of localizer operation using both normal sensing for a front course and reverse sensing for a back course.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, the PIC role, and the localizer to be used.

In Flight (1 hour)

After takeoff and upon reaching a safe altitude, the student will put on a view limiting device. The student will have the opportunity to continue practicing attitude instrument flying as the instructor guides the student to a quiet airport with a localizer.

The instructor will provide guidance to the localizer and give the student the opportunity to practice tracking the localizer front and back course at a safe altitude well above the airport's traffic pattern.

The student will maintain situational awareness, positive airplane control, and divide his or her attention between airplane control, tracking the localizer, and maintaining altitude.

On the way back to the training airport, the student will have the opportunity to continue practicing VOR navigation, the fundamental maneuvers, and unusual attitude recovery using both full-panel and partial-panel attitude instrument flying.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss the principles of localizer operation using both normal sensing for a front course and reverse sensing for a back course.

Demonstrate ability to:

- ❑ Tune and identify a localizer station.
- ❑ Setup the CDI correctly for the localizer.
- ❑ Determine the airplane's general position relative to the localizer.
- ❑ Choose an appropriate intercept heading.
- ❑ Recognize the CDI's increased sensitivity and react appropriately.
- ❑ Correctly track both front courses and back courses.
- ❑ Effectively divide attention between airplane control and navigation.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Errors

- Not identifying the localizer station after selecting the station's frequency.
- Fixating on the CDI rather than scanning.
- Reacting too slowly to movement of the CDI.
- Chasing the CDI due overcorrection and using headings not appropriate for the wind conditions.
- Using inappropriate corrections on the back course.
- Disorientation and inability to determine the airplane's position relative to the localizer.

Holding

Scenario

There are a variety of situations under which an instrument pilot may be required to perform a holding pattern. For example, weather conditions or traffic may necessitate putting en route aircraft into holding patterns. So, what will you do when ATC issues a holding clearance? How will you prepare on the ground for possible holds during your flight?

Objectives

- Review holding pattern concepts and procedures including clearances, entry procedures, and wind correction.
- Expand attitude instrument flying skills by dividing attention between maintaining situational awareness, airplane control, visualizing and planning holding pattern entries, and determining wind correction.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 10 (Instrument Flight)
- Aeronautical Information Manual
  - 5-3-8 (Holding)

Special Emphasis Areas

- Positive Airplane Control
- Controlled Flight into Terrain (CFIT)
- Single-pilot Resource Management (SRM)

Pre-flight (15 minutes)

The student will discuss holding pattern concepts, procedures, standard entries, and what it means to maintain situational awareness.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, the PIC role, and the holding patterns to expect.

In Flight (1 hour)

After takeoff and upon reaching a safe altitude, the student will put on a view limiting device. The student will have the opportunity to continue practicing attitude instrument flying as the instructor guides the student to a fix.

The instructor will provide the student with a simulated holding clearances at the fix. The student will maintain situational awareness, positive airplane control, and divide his or her attention between airplane control, planning hold entries, and adjusting for wind.

On the way back to the training airport, the student will have the opportunity to continue practicing the fundamental maneuvers and unusual attitude recovery using both full-panel and partial-panel attitude instrument flying.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss holding pattern concepts, procedures, and standard entries.

Demonstrate ability to:

- ❑ Visual the holding pattern and plan the correct entry for standard and non-standard holding patterns.
- ❑ Navigate to and identify the holding fix.
- ❑ Configure the airplane, reduce speed if necessary, and perform the correct entry.
- ❑ Make the required reports.
- ❑ Adjust for wind using timed legs.
- ❑ Adjust for wind using distance legs.
- ❑ Request Expect Further Clearance time if none received.
- ❑ Effectively maintain situational awareness while flying the pattern.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Errors

- Incorrectly configuring the navigation equipment to identify the fix.
- Inability to determine the airplane's position relative to the fix and plan the appropriate entry.
- Entering the pattern above maximum airspeed.
- Not making the required reports or not requesting an Expect Further Clearance time if none received.
- Incorrectly timing legs.
- Incorrectly adjusting for wind.
- Not maintaining situational awareness or fixating on the hold procedure.
- Fixating on the CDI rather than scanning.

Non-Precision Approaches

Scenario

Many medium and small airports lack precision approaches, and some of those may lack any approaches but may be under a non-precision approach at a nearby airport. What impact will this have on your planning and what operational considerations will you address to successfully use these approaches to get to your destination.

Objectives

- Review stabilized approach, VOR, VOR / DME, LOC (BC), GPS, and ASR non-precision approach concepts, and DME arc concepts.
- Review straight-in and circling approach concepts.
- Review planning considerations, personal minimums, approach plate concepts, and missed approach procedures.
- Introduce instrument Air Traffic Control procedures.
- Introduce approach briefing techniques.
- Expand attitude instrument flying skills by dividing attention between airplane control, situational awareness, briefing an approach, and navigating an approach.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 10 (Instrument Flight)
- Aeronautical Information Manual
  - 5-4-5 (Instrument Approach Charts)
  - 5-4-6 (Approach Clearance)
  - 5-4-7 (Instrument Approach Procedures)
  - 5-4-20 (Approach and Landing Minimums)
  - 5-4-21 (Missed Approach)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Terminal Procedures Publication

Special Emphasis Areas

- Positive airplane control
- Collision avoidance
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Single-pilot Resource Management (SRM)
- Icing

Pre-flight (15 Minutes)

The instructor will choose various non-precision approaches and have the student brief and discuss them. Weather and traffic permitting, the instructor may choose to conduct the flight under VFR using practice approaches. Otherwise, the instructor and student will file an IFR flight plan.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 Hour)

Departure will proceed according to the flight rules, weather and traffic conditions. If necessary, the student will put on a view limiting device after takeoff and upon reaching a safe altitude.

If not operating under IFR, the student will either request VFR practice approaches or the instructor will simulate Air Traffic Control. In the case of ASR approaches, the instructor will simulate Air Traffic Control.

Conditions permitting, each flight should consist of one to three non-precision approaches and at least one hold.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss VOR, VOR / DME, LOC (BC), GPS, and ASR non-precision approach concepts.

Demonstrate ability to:

- ❑ Integrate appropriate approaches into flight planning
- ❑ Interpret and brief non-precision approach plates.
- ❑ Effectively divide attention between airplane control, navigation, briefing approaches in the air, and communication.
- ❑ Configure the airplane for a stabilized approach before reaching the final approach fix.
- ❑ Maintain situational awareness while flying approaches and missed approaches.
- ❑ Use straight-in or circling minimums as appropriate. Maintain visual contact with and appropriate distance from the airport during circling maneuvers.
- ❑ Identify missed approach conditions and execute missed approach procedures in a timely manner.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Mistakes

- Not following actual or simulated Air Traffic Control clearances.
- Misinterpreting the approach plate.
- Not briefing the approach in the air.
- Incorrectly configuring the navigation equipment and not identifying radio navigation aids.
- Fixating on the CDI rather than scanning.
- Reacting too slowly to movement of the CDI.
- Chasing the CDI due overcorrection and using headings not appropriate for the wind conditions.
- Using inappropriate corrections on the back course.
- Disorientation and inability to determine the airplane's position within the approach.
- Losing visual contact with or exceeding the appropriate distance from the airport during circling maneuvers.

Precision Approaches

Scenario

An airport with precision approaches available generally provides pilots with a great deal more flexibility than an airport with only non-precision approaches due to lower decision heights / altitudes. How will you modify your planning and what operational considerations will you address when a precision approach is available?

Objectives

- Review stabilized approach, ILS, GPS, and PAR precision approach concepts and DME arc concepts.
- Review straight-in and circling approach concepts.
- Review planning considerations, personal minimums, approach plate concepts, and missed approach procedures.
- Review approach briefing techniques.
- Expand attitude instrument flying skills by dividing attention between airplane control, situational awareness, briefing an approach, and navigating an approach.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 10 (Instrument Flight)
- Aeronautical Information Manual
  - 5-4-5 (Instrument Approach Charts)
  - 5-4-6 (Approach Clearance)
  - 5-4-7 (Instrument Approach Procedures)
  - 5-4-20 (Approach and Landing Minimums)
  - 5-4-21 (Missed Approach)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Terminal Procedures Publication

Special Emphasis Areas

- Positive airplane control
- Collision avoidance
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Single-pilot Resource Management (SRM)
- Icing

Pre-flight (15 Minutes)

The instructor will choose various precision approaches and have the student brief and discuss them. Weather and traffic permitting, the instructor may choose to conduct the flight under VFR using practice approaches. Otherwise, the instructor and student will file an IFR flight plan.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 Hour)

Departure will proceed according to the flight rules, weather and traffic conditions. If necessary, the student will put on a view limiting device after takeoff and upon reaching a safe altitude.

If not operating under IFR, the student will either request VFR practice approaches or the instructor will simulate Air Traffic Control. In the case of PAR approaches, the instructor will simulate Air Traffic Control.

Conditions permitting, each flight should consist of one to three precision approaches and at least one hold.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

The student will:

- ❑ Discuss ILS, GPS, and PAR precision approach concepts.

Demonstrate ability to:

- ❑ Integrate approaches into flight planning and choose approaches appropriate for different situations.
- ❑ Interpret and brief precision approach plates.
- ❑ Effectively divide attention between airplane control, navigation, briefing approaches in the air, and communication.
- ❑ Configure the airplane for a stabilized approach before reaching the final approach fix.
- ❑ Maintain situational awareness while flying approaches and missed approaches.
- ❑ Use straight-in or circling minimums as appropriate. Maintain visual contact with and appropriate distance from the airport during circling maneuvers.
- ❑ Identify missed approach conditions and execute missed approach procedures in a timely manner.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Mistakes

- Not following actual or simulated Air Traffic Control clearances.
- Misinterpreting the approach plate.
- Not briefing the approach in the air.
- Incorrectly configuring the navigation equipment and not identifying radio navigation aids.
- Fixating on the CDI rather than scanning.
- Reacting too slowly to movement of the CDI.
- Chasing the CDI due overcorrection and using headings not appropriate for the wind conditions.
- Using inappropriate corrections on the back course.
- Disorientation and inability to determine the airplane's position within the approach.
- Losing visual contact with or exceeding the appropriate distance from the airport during circling maneuvers.

Partial-Panel, Non-Precision Approaches

Scenario

Make no mistake, a real vacuum failure is an emergency. Just as you train for engine fires, engine failures, etc., you will practice partial-panel instrument approaches. How should you plan ahead for a loss of gyroscopic instruments and how will you cope with the loss in the air?

Objectives

- Review partial-panel attitude instrument flying concepts.
- Review non-precision approach concepts, planning, and personal minimums.
- Expand attitude instrument flying skills by dividing attention between airplane control without an attitude indicator or directional gyro, situational awareness, briefing an approach, and navigating an approach.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)

Special Emphasis Areas

- Positive airplane control
- Collision avoidance
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Single-pilot Resource Management (SRM)
- Icing

Pre-flight (15 Minutes)

The instructor will choose various non-precision approaches and have the student brief and discuss them. Weather and traffic permitting, the instructor may choose to conduct the flight under VFR using practice approaches. Otherwise, the instructor and student will file an IFR flight plan.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 Hour)

Departure will proceed according to the flight rules, weather and traffic conditions. If necessary, the student will put on a view limiting device after takeoff and upon reaching a safe altitude. The instructor will simulate a vacuum failure.

If not operating under IFR, the student will either request VFR practice approaches or the instructor will simulate Air Traffic Control. In the case of PAR approaches, the instructor will simulate Air Traffic Control.

Conditions permitting, each flight should consist of one to three non-precision approaches and at least one hold.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

Demonstrate ability to:

- ❑ Integrate approaches into flight planning and choose approaches appropriate for different situations.
- ❑ Interpret and brief precision approach plates.
- ❑ Effectively divide attention between airplane control without an attitude indicator or directional gyro, navigation, briefing approaches in the air, and communication.
- ❑ Configure the airplane for a stabilized approach before reaching the final approach fix.
- ❑ Maintain situational awareness while flying approaches and missed approaches.
- ❑ Use straight-in or circling minimums as appropriate. Maintain visual contact with and appropriate distance from the airport during circling maneuvers.
- ❑ Identify missed approach conditions and execute missed approach procedures in a timely manner.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Mistakes

- Not following actual or simulated Air Traffic Control clearances.
- Misinterpreting the approach plate.
- Not briefing the approach in the air.
- Incorrectly configuring the navigation equipment and not identifying radio navigation aids.
- Fixating on the CDI rather than scanning.
- Reacting too slowly to movement of the CDI.
- Chasing the CDI due overcorrection and using headings not appropriate for the wind conditions.
- Using inappropriate corrections on the back course.
- Disorientation and inability to determine the airplane's position within the approach.
- Losing visual contact with or exceeding the appropriate distance from the airport during circling maneuvers.
- Not compensating for magnetic compass errors during turns.

Partial-Panel, Precision Approaches

Scenario

Partial-panel attitude instrument flying during a precision approach is not much different than during a non-precision approach. However, what extra operational considerations might you need to address before attempting a partial-panel precision approach?

Objectives

- Review partial-panel attitude instrument flying concepts.
- Review precision approach concepts, planning, and personal minimums.
- Expand attitude instrument flying skills by dividing attention between airplane control without an attitude indicator or directional gyro, situational awareness, briefing an approach, and navigating an approach.
- Have fun!

References

- Instrument Flying Handbook
  - Chapter 6 (Attitude Instrument Flying, Part I or Part II as appropriate)

Special Emphasis Areas

- Positive airplane control
- Collision avoidance
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Single-pilot Resource Management (SRM)
- Icing

Pre-flight (15 Minutes)

The instructor will choose various non-precision approaches and have the student brief and discuss them. Weather and traffic permitting, the instructor may choose to conduct the flight under VFR using practice approaches. Otherwise, the instructor and student will file an IFR flight plan.

The student will perform a preflight inspection of the airplane. The instructor and student will discuss possible hazards to the flight, the weather conditions, local procedures, communications procedures, and the PIC role.

In Flight (1 Hour)

Departure will proceed according to the flight rules, weather and traffic conditions. If necessary, the student will put on a view limiting device after takeoff and upon reaching a safe altitude. The instructor will simulate a vacuum failure.

If not operating under IFR, the student will either request VFR practice approaches or the instructor will simulate Air Traffic Control. In the case of PAR approaches, the instructor will simulate Air Traffic Control.

Conditions permitting, each flight should consist of one to three non-precision approaches and at least one hold.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

Demonstrate ability to:

- ❑ Integrate approaches into flight planning and choose approaches appropriate for different situations.
- ❑ Interpret and brief precision approach plates.
- ❑ Effectively divide attention between airplane control without an attitude indicator or directional gyro, navigation, briefing approaches in the air, and communication.
- ❑ Configure the airplane for a stabilized approach before reaching the final approach fix.
- ❑ Maintain situational awareness while flying approaches and missed approaches.
- ❑ Use straight-in or circling minimums as appropriate. Maintain visual contact with and appropriate distance from the airport during circling maneuvers.
- ❑ Identify missed approach conditions and execute missed approach procedures in a timely manner.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Mistakes

- Not following actual or simulated Air Traffic Control clearances.
- Misinterpreting the approach plate.
- Not briefing the approach in the air.
- Incorrectly configuring the navigation equipment and not identifying radio navigation aids.
- Fixating on the CDI rather than scanning.
- Reacting too slowly to movement of the CDI.
- Chasing the CDI due overcorrection and using headings not appropriate for the wind conditions.
- Using inappropriate corrections on the back course.
- Disorientation and inability to determine the airplane's position within the approach.
- Losing visual contact with or exceeding the appropriate distance from the airport during circling maneuvers.
- Not compensating for magnetic compass errors during turns.

Cross-Country Flight

Scenario

Cross-country flights are a chance to bring every skill you have learned together into a single flight. Your cross-country flights will take you to a variety of airports, controlled and uncontrolled, in a variety of airspaces with a variety of approach options. Some departure airports will have ODPs or SIDs, and some arrival airports will have STARs. You may have preferred routes to consider. You will have to consider weather conditions and forecasts at a level of detail you never have before, and planning for emergencies will take on a whole new level of significance and detail.

You are ready for this! Let's go flying!

Objectives

- Introduce IFR cross-country flight planning including:
  - Weather information
  - Aircraft performance and limitations
  - Airspace
  - Filing IFR flight plans and preferred routes
  - Use of ODPs / SIDs and STARs
  - Use of Air Traffic Control
  - Choosing appropriate alternates
  - Planning for and coping with emergencies
- Review and exercise all skills learned so far.
- Complete multiple cross-country flights to a destination at least 50 nautical miles from the training airport and a final long cross-country flight.
- Have fun!

References

- Pilot's Handbook of Aeronautical Knowledge
  - Chapter 11 (Weather Theory)
  - Chapter 12 (Aviation Weather Services)
  - Chapter 17 (Aeronautical Decision Making)
- Instrument Flying Handbook
  - Chapter 10 (Instrument Flight)
  - Chapter 11 (Emergency Operations)
- Aeronautical Chart User's Guide
  - § 3 (Terminal Procedures Publication)
- Terminal Procedures Publication
- AC 00-6A (Aviation Weather for Pilots and Flight Operations Personnel)
- AC 00-24C (Thunderstorms)
- AC 00-54 (Pilot Windshear Guide)
- AC 00-45G (Aviation Weather Services)
- Aeronautical Information Manual; Chapter 7 (Safety of Flight)

Special Emphasis Areas

- Positive airplane control
- Collision avoidance
- Wake turbulence avoidance
- Land and Hold Short Operations (LAHSO)
- Runway incursion avoidance
- Controlled Flight into Terrain (CFIT)
- Aeronautical Decision Making (ADM) and risk management
- Single-pilot Resource Management (SRM)
- Icing

Pre-flight (30 minutes)

The student will present a complete cross-country flight plan to and from a destination specified by the instructor. The flight plan shall include approaches at three different airports and the student shall plan for a variety of approach types and at least one hold.

If the training airport does not have ODPs / SIDs, the student may choose between making a quick VFR hop to a local airport with an ODP or SID and proceed IFR from that airport, or plan a full-stop landing at one of the destination airports to open a new IFR flight plan.

The flight plan shall address all operational aspects of the flight. The student will brief expected departure, arrival, and approach procedures, the expected route, ATC facilities to be used, personal minimums, risk management, and plans for handling emergencies.

The student shall have current copies of all required charts and procedures (either paper or digital) organized logically and readily available.

During the preflight inspection, the student will verify that the airplane has all the necessary equipment to complete the flight.

In Flight (2 – 3 hours)

The flight will proceed according to the student's flight plan. If necessary, the student will put on a view limiting device after takeoff and upon reaching a safe altitude.

While en route, the instructor will inject scenarios en route to test the student's situational awareness and ability to cope with simulated emergencies.

Post-flight (15 minutes)

The student and instructor will review and assess the flight.

Completion Standards

Demonstrate ability to:

- ❑ Choose appropriate ODPs / SIDs, preferred routes, and STARs.
- ❑ Choose appropriate navigation facilities and equipment.
- ❑ Observe airspace requirements, especially around uncontrolled airports.
- ❑ Obtain, interpret, and incorporate all relevant weather products and NOTAMs.
- ❑ Incorporate aircraft performance and limitations, and determine that the airplane has the appropriate equipment to complete the flight.
- ❑ Employ risk management principles while planning, and develop contingency plans for common emergencies.
- ❑ Choose appropriate alternate airports.
- ❑ Make an informed and appropriate go- / no-go decision.
- ❑ Organize charts logically and effectively for the flight.
- ❑ Communicate effectively with Air Traffic Control, obtain clearances from a variety of sources (Clearance Delivery, Flight Service RCO, etc.), and comply with clearances.
- ❑ Fly departure, arrival, and approach procedures correctly.
- ❑ Cancel IFR flight plans at appropriate times.
- ❑ Maintain complete situational awareness from engine start to engine shutdown.
- ❑ Cope with simulated emergencies using the correct procedures and techniques.
- ❑ Maintain altitude ± ____', heading ± ____°, IAS ± ____ knots, bank ± ____°, CDI ± ____ scale deflection.
- ❑ **PTS**: altitude ±100', heading ±10°, IAS ±10 knots, bank ±5°, CDI ±¾ scale deflection (Private) or ±½ scale deflection (Commercial).

Common Mistakes

- Choosing inappropriate departure, arrival, and approach procedures.
- Choosing inappropriate navigation facilities or misconfiguring navigation equipment in flight causing confusion and distraction.
- Not incorporating weather products and NOTAMs into route planning or misinterpreting weather information or NOTAMs.
- Not incorporating aircraft performance and limitations.
- Not incorporating VFR flight planning principles when choosing routes and alternates.
- Choosing inappropriate alternate airports.
- Not considering airspace requirements.
- Not effectively planning for common emergencies.
- Not logically and effectively organizing charts causing confusion and distraction in flight.
- Not pre-planning how departure clearances will be obtained.
- Not complying with clearances or misinterpreting clearances.
- Not maintaining situational awareness during all phases of flight including taxi.