

Ground Lesson: XC #1: Planning, Navigation, Filing

Objectives:

1. to understand pertinent route planning information
2. to understand basic navigational techniques
3. able to safely plan cross country flights

Justification:

1. in practicality, cross country flying is the main objective of real world flying.
2. knowledge of, and proper execution of cross country flights is required for the private pilot checkride.

Schedule:

Activity	Est. Time
Ground	1.5
Total	1.5

Elements Ground:

- Charts
- Basic Navigation
- Route Planning
 - basic planning
 - weather briefing
 - E6B calculations
 - Weight and Balance
 - Performance Charts
- Flight Plan Filing

Completion Standards:

1. when the student understands and can use all the cross country information available.
2. when the student can safely plan and fly a pre-planned flight plan

Presentation Ground:

Charts

1. discuss pertinent information on the charts, including all symbols and representations
2. WAC vs Sectional vs Terminal charts
 - (1) WAC - 1:1,000,000 scale
 - (2) Sectional - 1:500,000 scale
 - (3) Terminal - 1:250,000 scale
3. Airspace review and representation on Charts

Basic Navigation

1. Pilotage

- (1) *:technique of navigation where the pilot uses a chart and flies from one visible landmark to another*
- (2) requires relatively low altitudes so that landmarks can be seen and recognized more easily
- (3) advantages:
 - i. easy to perform
 - ii. does not require special equipment
- (4) disadvantages:
 - i. direct course is usually impractical as it is often necessary to follow a zigzag route to prominent landmarks, resulting in longer flights

2. Dead Reckoning

- (1) *:navigation of an aircraft solely by means of computations based on airspeed, course, heading, wind direction and speed, ground speed, and elapsed time.*
- (2) advantages:
 - i. straighter line courses possible
- (3) disadvantages
 - i. requires calculations prior to flight
 - ii. may be inaccurate as weather changes rapidly on some cases
- (4) more typically, a course is determined and flown by calculations made from dead reckoning, and then backed up by pilotage during the flight

Route Planning

1. review navigation log and discuss necessary information
2. basic way to plan a route:
 - (1) choose destination, and use a chart to draw a straight line from departure to destination
 - (2) adjust line for the following criteria:
 - i. use of landmarks
 - (i) be aware of landmarks that disappear (such as mountains or dense foliage)
 - (ii) never rely on just one landmark. A combination of two is more reliable
 - (iii) study map for big picture before picking landmarks
 - (iv) pick distinct and unique landmarks (intersections next to a river, next to a bridge)
 - ii. avoidance of airspace
 - iii. method of navigation
 - iv. alternate airports
 - v. emergency considerations

vi. fuel/rest stops and leg lengths

vii. terrain clearance

viii. aircraft/pilot capabilities

(3) discuss checkpoints from PAO to RNO

(4) altitude selection considerations:

i. terrain clearance over entire flight should be at least 1000' AGL

ii. cloud bases (ideally highest possible altitude within performance limitations)

iii. wind - pick an altitude which favors your route of flight

iv. airspace avoidance

v. VFR cruising altitudes (see 14 CFR 91.159)

vi. distance of leg - no need to climb so high if only going a short distance

3. review navigation log upon completion of basic route plan

4. Weather Briefing

(1) 3 types of briefings

i. standard briefing : *a complete picture of the reported and forecast weather along a route of flight*

ii. outlook briefing : *forecast briefing for flights departing more than 6 hours in the future*

iii. abbreviated briefing : *update briefing for a pilot who has already received primary briefing elsewhere*

(2) standard briefing in-depth

i. always goes through a specific order:

(i) overall synopsis of the route

(ii) departure -> en route -> destination reported weather

(iii) departure -> en route -> destination forecast weather

(iv) winds/temp aloft

(v) icing and freezing levels

(vi) NOTAMS and advisories for airport/runway/taxiway closure, nav aids out, special airspace restrictions, etc.

5. E6B calculations

(1) wind correction angle (from winds aloft)

(2) groundspeed

(3) calculate compass heading:

i. $TC \pm WCA = TH$; $TH \pm MV = MH$; $MH \pm CD = CH$

(i) WCA -> -left, +right

(ii) MV -> -east, +west

(iii) CD -> -east, +west

(4) calculate cruise time using ground speed and distance

6. Weight and Balance Calculations

(1) calculate for practice scenario

(2) determine fuel requirements (including practical reserves) (14 CFR 91.151)

(3) review Section 6 of POH

7. Performance Charts

(1) Calculate

i. time, fuel, distance to climb

- ii. fuel consumption per hour, and total fuel consumption
- iii. takeoff and landing requirements for weight and weather/winds
- iv. determine if fuel is within W&B limits

Filing a Flight Plan

1. can be filed in either UTC or local time
2. VFR flight plan is filed by telephone with FSS, or via internet filing
 - (1) 1-800-WX-BRIEF
3. plan is opened via radio with departure FSS, closed via radio OR telephone with destination FSS
4. can be amended with an FSS during flight
5. must be closed within half hour of ETA (*not* ATA), otherwise search process will commence
 - (1) good idea to build in a little bit of room in ETE
 - (2) after landing, CLOSE IMMEDIATELY