

Task II.C: Visual Scanning and Collision Avoidance

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Lesson Overview

Objective

There are no roads in the sky, so you must be vigilant in staying away from other aircraft by scanning, listening, and **always maintaining situational awareness**.

Reference

- 14 CFR 91.113 (Right of way rules)
- AC 90-48, Pilot's Role in Collision Avoidance
- PHAK Chapter 14-28 (Airport Operations/Collision Avoidance)
- PHAK Chapter 17 (Aeromedical)
- FAA-H-8083-3B, Airplane Flying Handbook (Chapter 1)

Key Elements

- "See and avoid"
- Clearing procedures
- Trust your instruments

Elements

- "See and avoid"
- Proper visual scanning
- Clearing procedures
- Recognizing hazards
- Collision avoidance
- Conditions that degrade vision
- In-flight illusions
- Landing illusions

Equipment

- White board
- Markers
- References
- iPad

Schedule

- 30 Minutes - Ground

Instructor Actions

1. Discuss lesson objectives
2. Present lecture
3. Questions
4. Homework

Student Actions

- Participate in discussion
- Take notes

Completion Standards

- The student understands the importance of maintaining a vigilant traffic scan and consistently scans for traffic. In the onset of an illusion, the student understands it as an illusion and trusts the instruments to maintain safe flight.

Instructor Notes

Attention

AC90-48C Appendix 1: How much time do you think you would have to react if two planes were approaching each other at 360 mph from 10 miles out? 100 seconds. How about from 4 miles? 40 seconds. 1 mile? 10 seconds. ½ Mile? 5 seconds. What if the planes were approaching at 600 MPH? 12 seconds from 2 miles; 3 seconds from 0.5 mile So, it's probably important that we look out for other approaching traffic, isn't it?

Overview

Review Objectives and Elements/Key ideas

What

Visual scanning and collision avoidance is the ability to effectively scan the sky for potential collision threats.

Why

Safety. Visual scanning and collision avoidance is very important in creating safe skies. A diligent visual scan to avoid collision threats is paramount to the safety of all pilots.

Lesson Overview

1. Relationship between pilot's physical condition and vision
 - a. Vision is affected by sleep, drugs, alcohol, and overall health
2. Environmental conditions that degrade vision
 - a. Haze
 - b. Smoke
 - c. Mist
 - d. Clouds
 - e. Volcanic ash
 - f. Dust
 - g. Sunset/sunrise
 - h. Cleanliness of windscreen
 - i. Bugs
 - ii. Dirt
 - iii. Fingerprints
 - iv. Moisture
 - i. Sunglasses
 - j. Lighting conditions
3. Vestibular and visual illusions
4. The leans—bank too slow, fluid in ear canal doesn't move
 - a. Corolis Illusion—when turning long enough, fluid slows to be moving at the same speed
 - b. Graveyard spiral—Corolis illusion tricks pilot to return to bank, compensates for loss of altitude by pulling up and tightens descending spiral
 - c. Somatogravic illusion—rapid acceleration feels like nose up
 - d. Inversion illusion—change from climb to straight-and-level feels like tumbling backward
 - e. Elevator illusion—abrupt upward (or downward) movement feels like a climb
 - f. Postural Considerations—seat of pants flying
5. Proper visual scanning procedure - See and Avoid Procedures
 - a. Relationship between poor scanning and collision risk
 - b. Proper clearing techniques
 - i. Clearing turns are usually at least 180° change in direction, looking for traffic (Jeppesen Private Pilot pg. 4-6)
 - ii. A 90° turn in one direction and a turn back to the original heading has been deemed satisfactory
 - iii. Be vigilantly scanning for traffic during these clearing turns

- c. Consistently be looking for traffic - how to properly look for traffic out the window.
 - i. Scan the visual field in 10° increments, pausing at each section for a few seconds to notice any movement against the background
 - d. Listen to and make radio calls to visualize where other aircraft are located; direction, speed, and altitude
 - e. Alter your path/speed/altitude if necessary to create adequate spacing with other aircraft
6. Aircraft right of way rules
- a. In Distress
 - b. Converging Aircraft
 - c. Approaching head-on
 - d. Overtaking
 - e. Landing
 - i. Aircraft, while on final to land or while landing have the right of way
 - ii. When two or more aircraft are on final approach, the lowest aircraft has the right of way
 - iii. When an aircraft is on a runway you are approaching then it can become more complicated
 - iv. Under strict separation criteria you are able to land
 - v. You can verify separation requirements from ATC but the PIC must never be afraid of executing a go-around when the situation becomes uncomfortable
7. Importance of knowing aircraft blind spots
- a. By understanding where you know you can't see, you can maneuver the aircraft to see most of these areas.
 - b. There is a large portion behind and below the aircraft that is never seen from the cockpit, but clearing turns greatly reduce this void temporarily
8. Relationship between speed differential and collision risk
- a. How many mid-air collisions do you think happen between two flight crews being vigilant in scanning for traffic and taking precautions to avoid others?
 - b. Divide your attention between the cockpit and outside, with the vast majority of attention going toward outside the aircraft
9. Situations that involve greatest collision risk
- a. Where there is the most traffic
 - i. Traffic patterns
 - ii. Entering traffic pattern unaware of current traffic
 - iii. Approach to a busier airport
 - iv. Departure to common routes like Provo's practice areas
 - v. Enroute on popular Victor Airways
 - b. Clear cloudless beautiful days

- i. “It’s a great flying day today”--everyone and their dog seems to go flying on the days with beautiful weather
- ii. Weekends commonly have more recreational traffic
- c. Common departure and arrival times at international airports
- d. Not all VFR traffic is talking with Air Traffic Control, or on the airport frequency

Conclusion

Maintaining a proper, efficient visual scanning and keeping an eye out for traffic is very important. Also, in the case of illusions, it is extremely important we understand when and where they may happen and how to best prevent them from getting us into a dangerous situation.

ACS Requirements

To determine that the applicant exhibits instructional knowledge of the elements of visual scanning and collision avoidance by describing:

1. Relationship between a pilot’s physical condition and vision
2. Environmental conditions that degrade vision.
3. Vestibular and visual illusions.
4. “See and avoid” concept.
5. Proper visual scanning procedure.
6. Relationship between poor visual scanning habits and increased collision risk.
7. Proper clearing procedures.
8. Importance of knowing aircraft blind spots.
9. Relationship between aircraft speed differential and collision risk.
10. Situations which involve the greatest collision risk.