



Visual Scanning & Collision Avoidance

Overview

WHAT

- The ability to recognize hazards, and effectively scan the sky for potential collision threats

WHY

- Safety
- Avoiding other aircraft is very important to creating safe skies
- A diligent visual scan is paramount to the safety of all pilots

CONTENT

- See and Avoid
- Proper Visual Scanning
- Collision Risks
- Clearing Procedures
- Recognizing Hazards
- Collision Avoidance
- Conditions that Degrade Vision
- Illusions



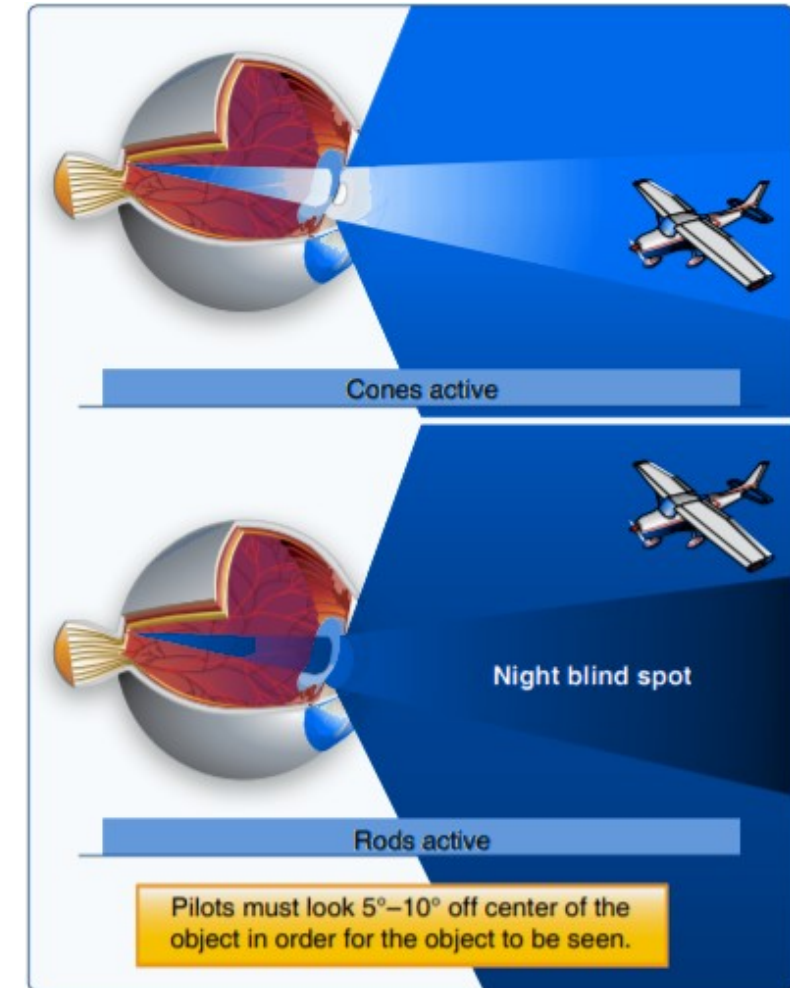
See & Avoid

- Vigilance shall always be maintained to see and avoid other aircraft
 - Whether IFR or VFR
- Although often a shared job, the pilot is always responsibly to see and avoid



Visual Scanning

- Eyes
 - Day: Fovea sends a clear, sharp image to the brain
 - Night: Fovea is essentially a blind spot
 - Peripherals (outside of center) are most effective
- Effective Scan
 - Short, regularly spaced eye movements bringing successive areas of the sky into the center of vision
 - 10-degree sectors observed for at least 1 second
 - Night: Use peripherals, look 5-10 degrees off center of an object
- Poor scanning & distractions increase risk of midair collisions



Collision Risks

- High Traffic Areas
 - Airports
 - VORs
 - VFR Corridors & Waypoints
 - Training Areas
 - Airways
- Distractions
 - Overconcentration on things other than flying
 - Poor visibility conditions
- Division of Attention
 - 90% outside, 10% inside



Clearing Procedures

- Before Takeoff
 - Ensure the runway & final approach are clear
- Climbs & Descents
 - Execute gentle banks left and right, and maintain a consistent scan
- Straight-and-Level
 - Execute clearing turns at periodic intervals, and maintain a consistent scan
- Traffic Patterns
 - Enter at pattern altitude, scanning for traffic; use aircraft radio calls to assist



Clearing Procedures

- VORs
 - Highly transited areas, scan vigilantly
- Training Areas
 - Execute clearing turns prior to, and between maneuvers
- Blind Spots
 - Momentarily raise/lower the wing as necessary to clear prior to turning or climbing/descending



Recognizing Hazards

- Aircraft Speed & Collision Risk
- Relative Altitude
 - Horizon is a general reference
 - Aircraft above the horizon are generally higher and vice versa
- Collision Course Targets
 - Aircraft that appear to have no relative movement
 - Similar to an aim point when landing
- Taking Action
 - If on a collision course, take immediate action
 - Within the FARs, if able, but do whatever is necessary

AIRCRAFT ID & REACTION

Event	Seconds
See Object	0.1
Recognize Aircraft	1.0
Become Aware of Collision Course	5.0
Decision to Turn Left or Right	4.0
Muscular Reaction	0.4
Aircraft Lag Time	2.0
TOTAL	12.5



Collision Avoidance

- Flight Deck Management
 - Preparation & organization allows for more focus outside
- Visual Obstructions
 - Move to see around blind spots
 - Raise/lower the wings to clear behind them
 - Do not block the windscreen or windows with maps, checklists, etc.
 - Ensure clean windscreens
- Be Visible
 - Use exterior lights, and keep interior lights low at night to preserve night vision
- ADS-B & ATC
 - ADS-B displays other traffic often with visual/audio alerts
 - Use flight following for traffic advisories whenever possible
- Safety Pilot



Degraded Vision

Physical Health

- Very important to good vision
- Vision can be degraded by:
 - Medicines
 - Exhaustion
 - Poor physical conditioning
 - Alcohol & tobacco
 - Stress & fatigue
 - Missing meals
 - Hypoxia



Degraded Vision

Environmental Conditions

- Dim Lighting
 - Small print & charts become unreadable, taking focus from flying and scanning
- Dark adaptation
 - Takes 30 minutes for eyes to adapt to dark, but only a few seconds to lose adaptation
 - Night vision can be impaired by pressure altitudes > 5,000', CO, Vitamin A deficiency, & bright light
- Excessive Illumination
 - Can produce glare resulting in squinting, watering eyes, even temporary blindness



Degraded Vision

Environmental Conditions

- Outside Visibility
 - Smoke, haze, dust, rain, and flying toward the sun can limit ability to see other aircraft
- Empty Field Myopia
 - With nothing to focus on, the eyes focus on a point slightly ahead of the plane, resulting in poor scanning
 - Day: Force eyes to focus further ahead
 - Night: Focus on distant light sources



Illusions

Vestibular / In Flight / Visual

- Leans
 - Can create the illusion of banking in the opposite direction
- Coriolis
 - Illusion of rotation or movement in an entirely different axis
- Graveyard Spin
 - Illusion of a spin in the opposite direction
- Graveyard Spiral
 - Illusion of a wings level descent
- Somatogravic
 - Acceleration can create illusion of nose up attitude, and vice versa



Illusions

Vestibular / In Flight / Visual

- Inversion
 - Illusion of tumbling backwards
- Elevator
 - Upward vertical acceleration creates illusion of being in a climb
- False Horizon
 - Illusion of not being aligned correctly with the horizon
- Autokinesis
 - A static light, when stared at, will appear to move about

**PREVENTION: Recognize the illusion, and
reference the instruments and/or fixed ground points**





Questions?