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Midair Collision Involving US Army PAT25 and PSA Airlines Flight 5342 Washington, DC January 29, 2025

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Overview of Helicopter Operations

- Automatic Dependent Surveillance-Broadcast (ADS-B) and how US Army used it
- Transponder issues
- UH-60L altimeter errors
- Night vision goggle (NVG) characteristics

Army ADS-B Out Procedures

- FAA regulation has exemptions for aircraft performing sensitive missions where transmitting ADS-B could compromise operational security
- The Army Aviation Brigade standard operating procedure (SOP) specified not broadcasting ADS-B Out when on a mission
  - Broadcast Modes 3/A/C (squawk code and altitude) in lieu of ADS-B
  - Restricted from changing Modes in flight

Army ADS-B Out Procedures

- PAT25 was not transmitting ADS-B Out during accident flight, but had active transponder
- Lack of ADS-B Out not a factor for altitude information received by ATC
- Review of ADS-B data of UH-60Ls at 12th Aviation Battalion
  - Accident helicopter had no history of transmitting ADS-B Out
  - 7 other UH-60L had no recent history of transmitting ADS-B Out (since 2023)
  - Incorrect transponder setting cause of ADS-B Out issue

What We Found: Army ADS-B Out Procedures

- Brigade SOPs restricted flight crews from changing transponder modes in flight
  - Prevents broadcasting ADS-B Out when flying non-sensitive portions of mission
- Did not require recurrent check of transponder to ensure ADS-B Out is transmitting
  - Unaware of ADS-B Out issue on 8 helicopters

What we propose:

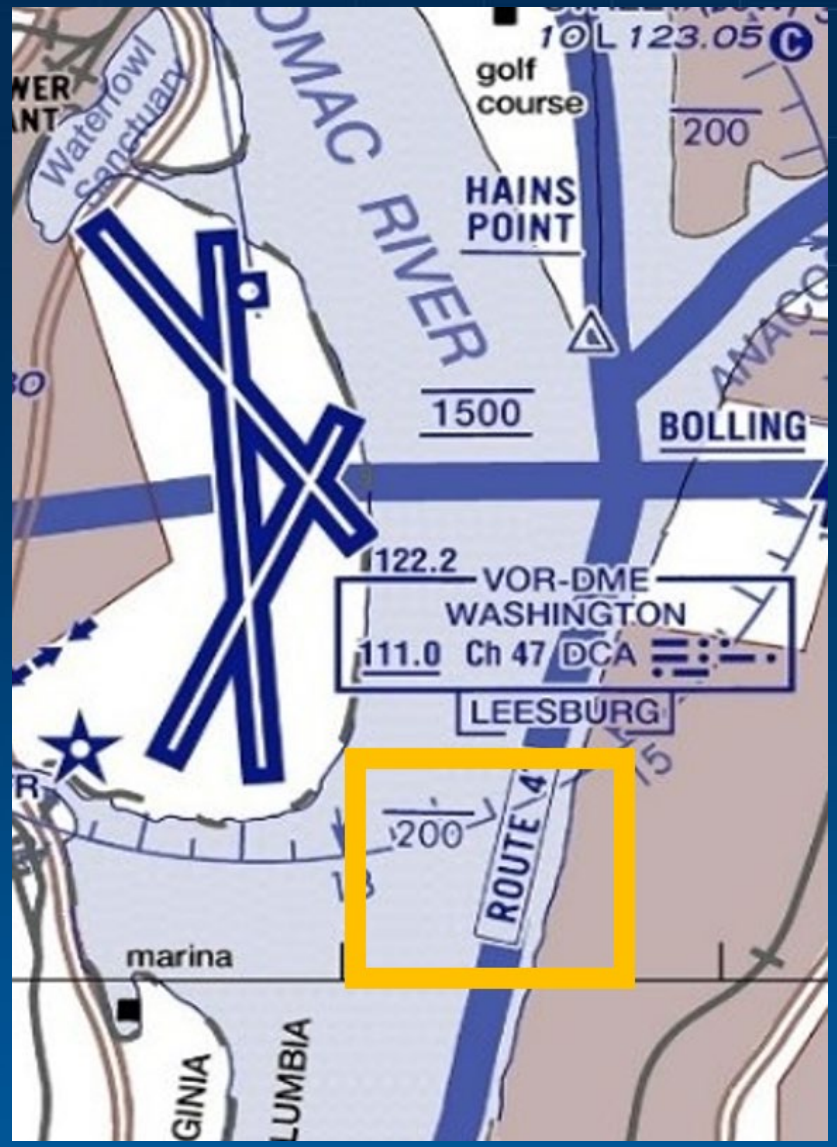
- One recommendation to US Army
- Two recommendations to Department of War

Helicopter Route Chart

- "Recommended paths" without defined lateral boundaries
- Conflicting information about whether published route altitudes were "recommended" or "maximum"
- Potential for pilot confusion

Recommended Route Altitude

500 Minimum 500 Maximum 500 Recommended



What We Found: Army Pilots Perceptions

- Regarded published altitudes as maximums
- Incorrectly presumed published altitudes separated them from airplanes
- Rarely encountered airplanes circling to runway 33
- ATC typically instructed them to hold for arriving airplanes

What we propose:

- One recommendation to US Army

Errors in Indicated Altitude

- Defined performance specifications for barometric altimeters, pitot-static systems
  - Includes tolerance for instrument and position errors
  - Errors can become additive
- PAT25's pressure altitude was 100 ft lower than other recorded altitude data
- Similar offset seen on other 12th Aviation Battalion helicopters

What We Found: Indicated Altitude

- Trained to use barometric altimeter to navigate helicopter route ceilings
- PAT25 crew likely saw indicated altitude 100 ft lower than true altitude
  - Likely believed they were remaining at or below maximum altitudes
- Army UH-60L manual contained no information on possible indicated altitude errors for different installations, such as external wing tanks
  - Crucial information for flights on routes with low altitude ceilings

What we propose:

- One recommendation to US Army

Night Vision Goggles (NVG)

- NVGs amplify low ambient light levels, which provides enhanced vision to air crew
- Advantages of NVGs include:
  - Night visual acuity of unilluminated objects improved
  - Ability to identify objects, obstacles, and other aircraft at a distance

Advantages of NVGs

Normal unaided night vision

Night vison aided by green and white NVGs

Disadvantages of NVGs

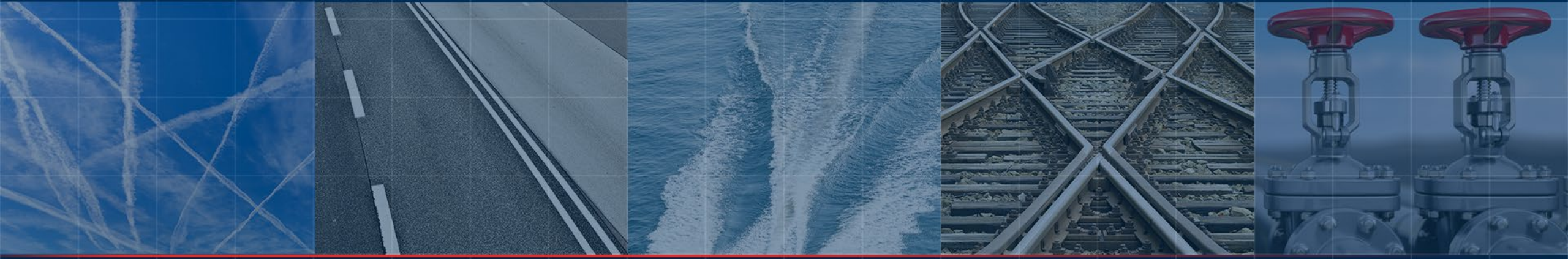
- Field of view limited to 40°
- Monochromatic images
- Degraded depth perception (difficult to determine distance of an object)
- Ground and airborne lights appear similar
- Halos around point light sources
- Aircraft silhouettes are very faint, difficult to determine type and size

Using NVGs on Helicopter Routes

- Pilots trained to compensate for the 40° field of view by using focused visual search in sectors by turning their head
- NVGs allow for obstacle detection at low level (cranes, towers, aircraft)
- NVGs allow for clear detection of aircraft above horizon over 14 nm away
- Cultural lighting interferes with detection of aircraft flying at or below horizon
- Size, type, distance, and orientation of other aircraft difficult to determine

PAT25 NVG Use for Accident Flight

- Flight crew using NVGs at time of accident
- 4 sets of NVGs on board
  - Two green NVGs
  - Two white NVGs
- Could not determine which crewmember was using which color NVG



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