



**NTSB** National Transportation Safety Board

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*Office of Aviation Safety*

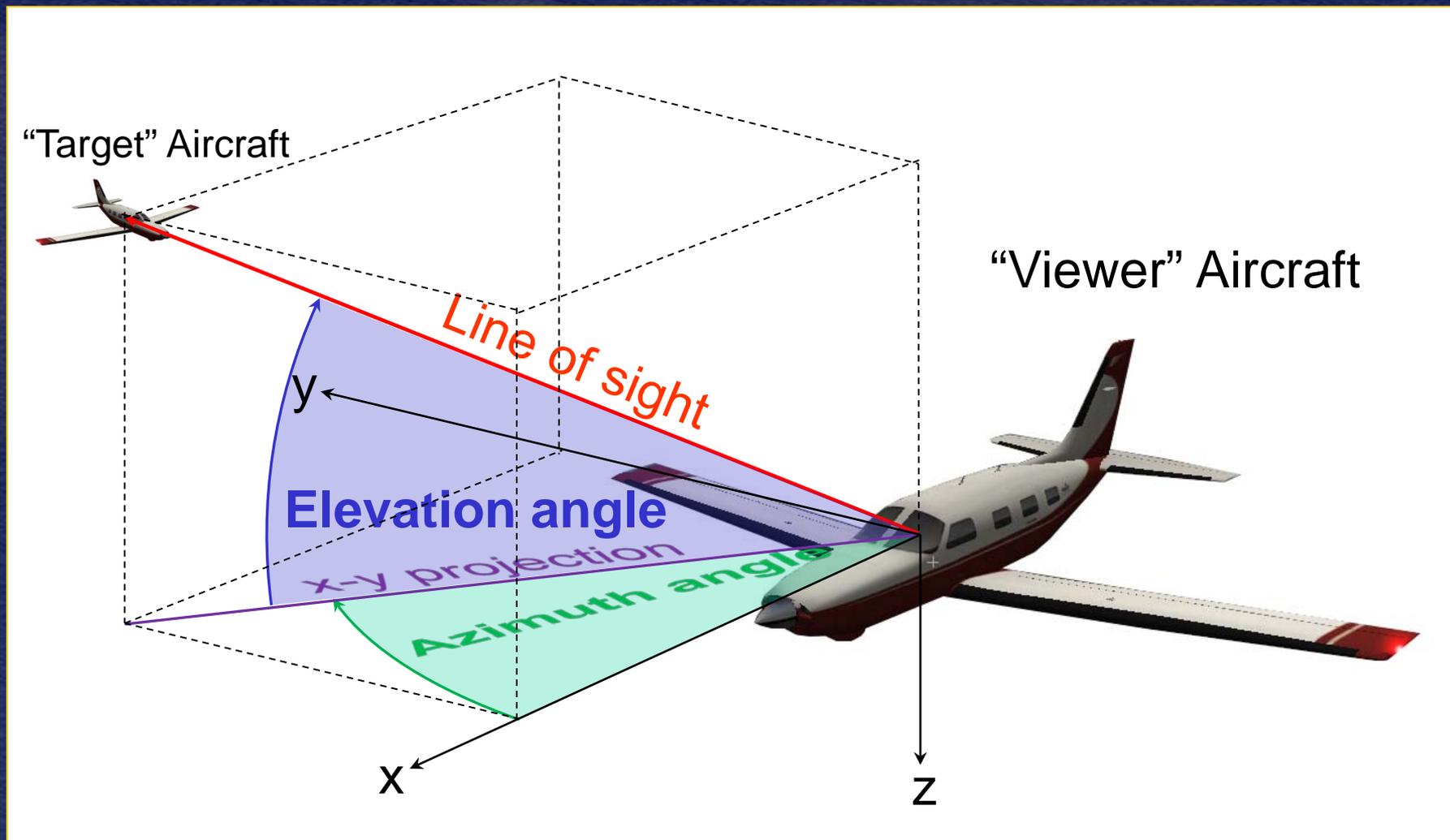
# **Cockpit Visibility and Traffic Information Service Study**

Aircraft Performance  
presentation

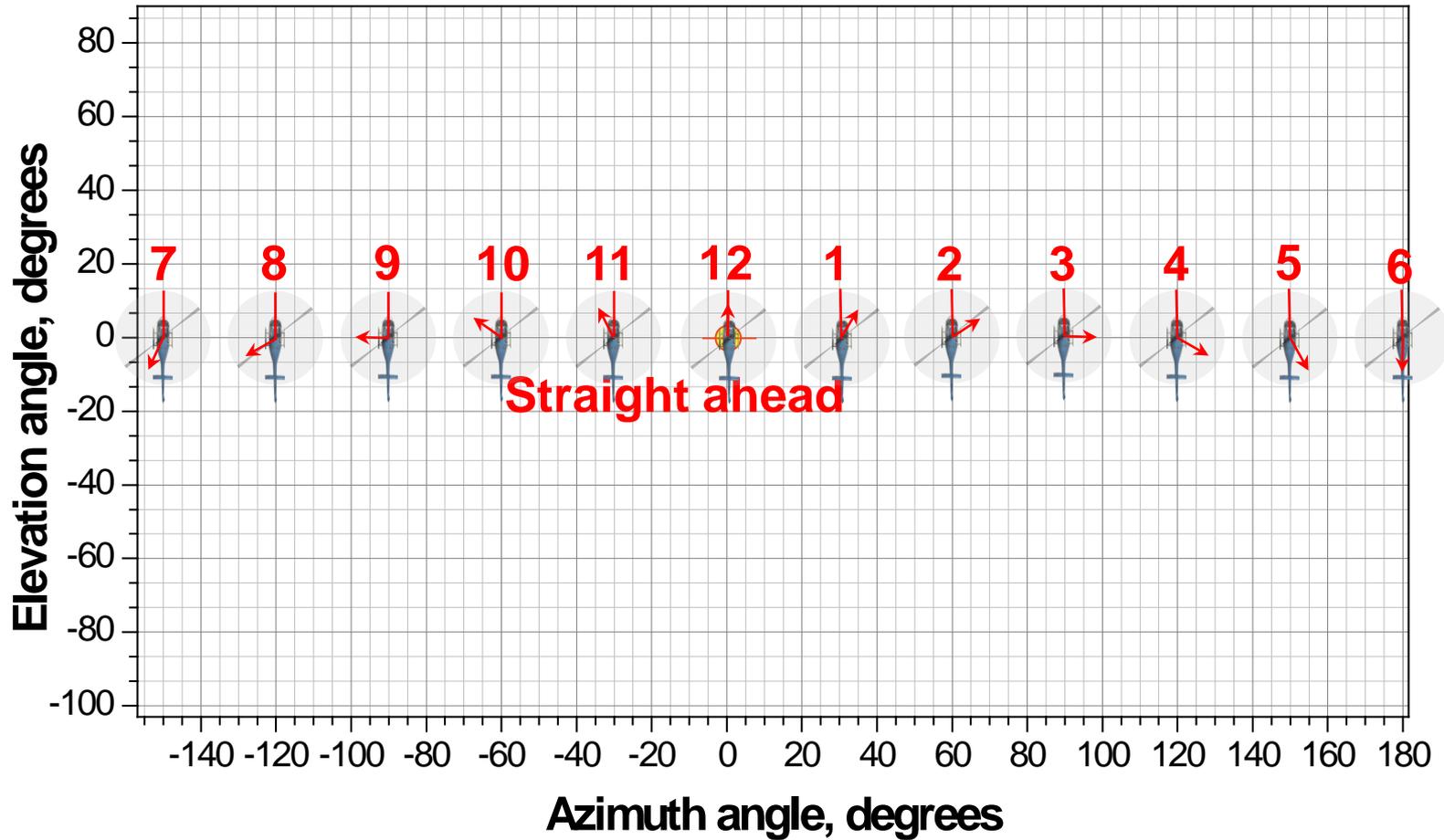
# Topics

- Cockpit visibility results
- Description of traffic information service (TIS)
- Sequence of time points depicting
  - Re-creation of views of helicopter from airplane
  - TIS information provided to both aircraft

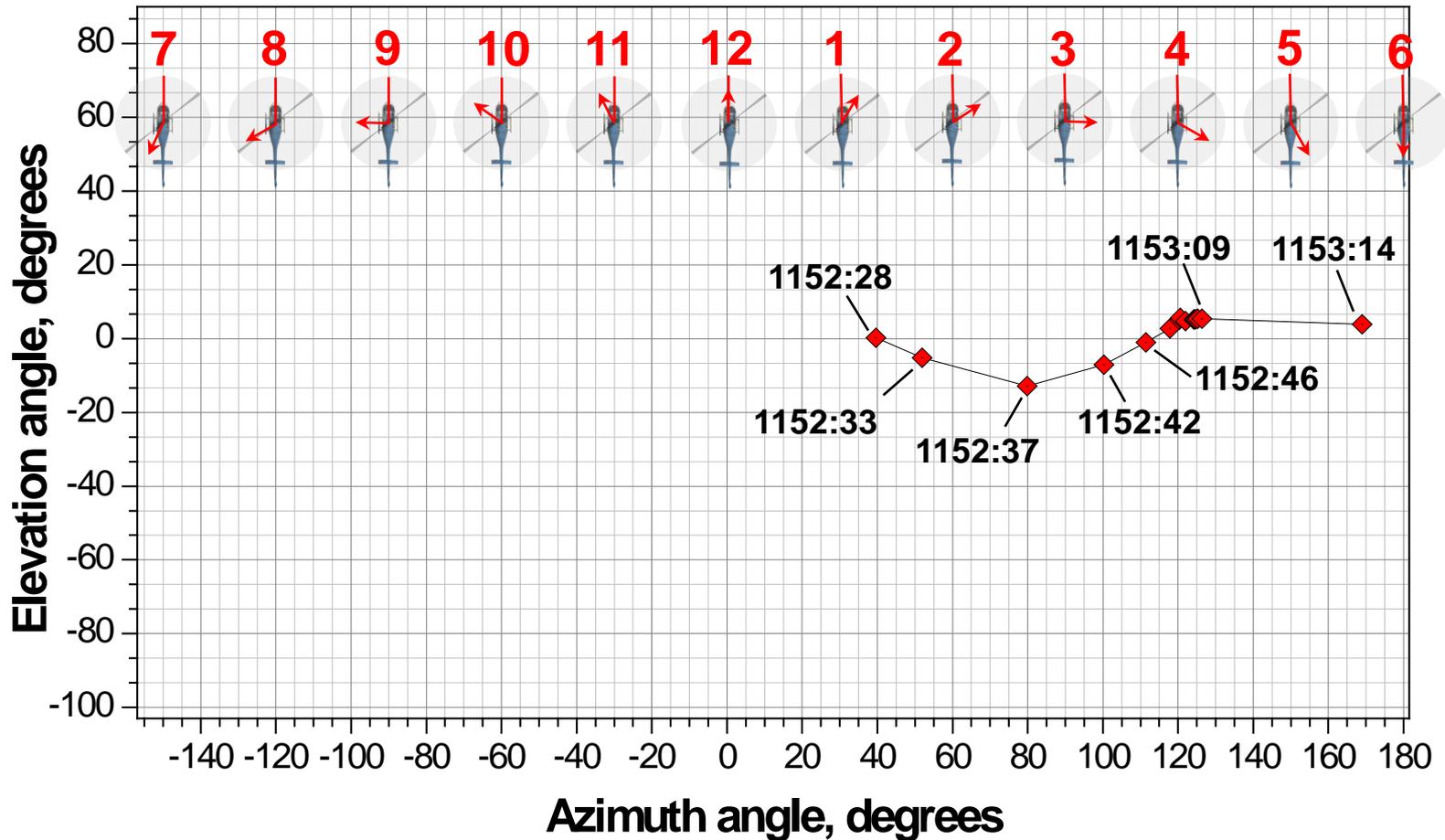
# Determining Cockpit Visibility



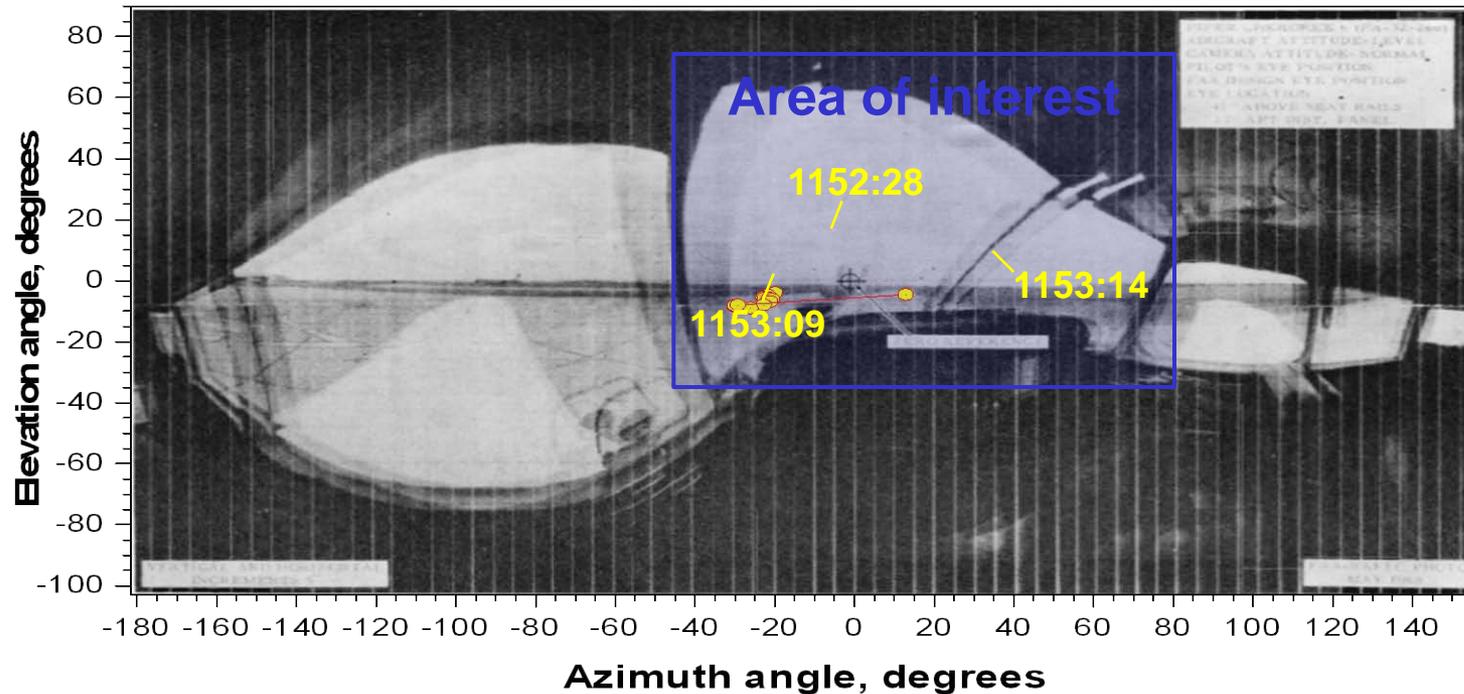
# Angles from Helicopter to Airplane



# Angles from Helicopter to Airplane



# Angles from Airplane to Helicopter



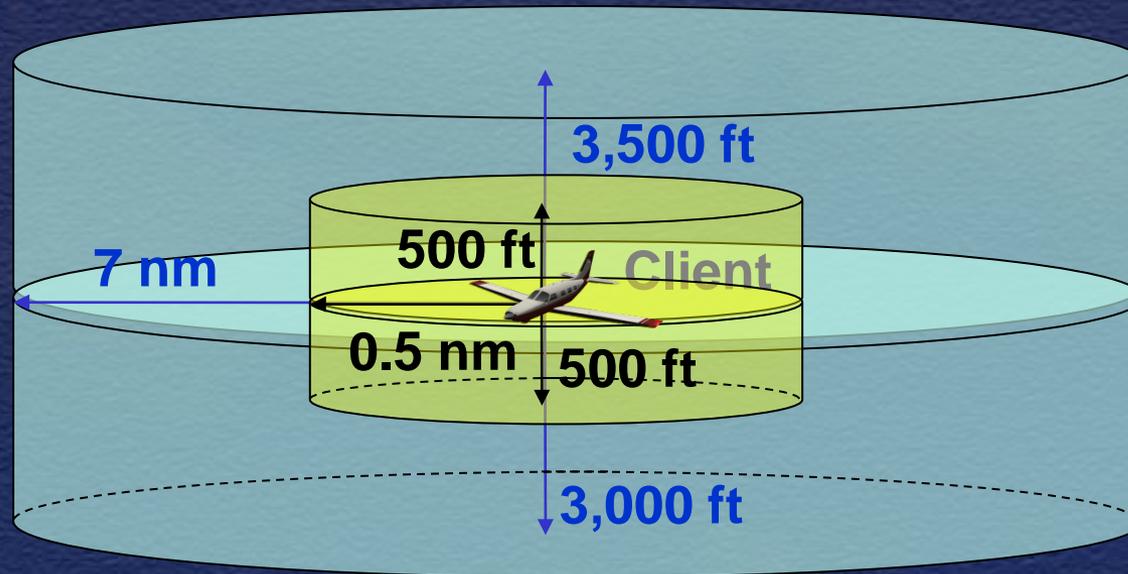
# Traffic Information Service (TIS)

- Radar-based system
- Intended as aid for spotting traffic visually (not collision avoidance system)
- Existing guidance discourages pilots from initiating evasive maneuvers based on TIS information only
- TIS information can be used to pre-empt need for future evasive maneuvers



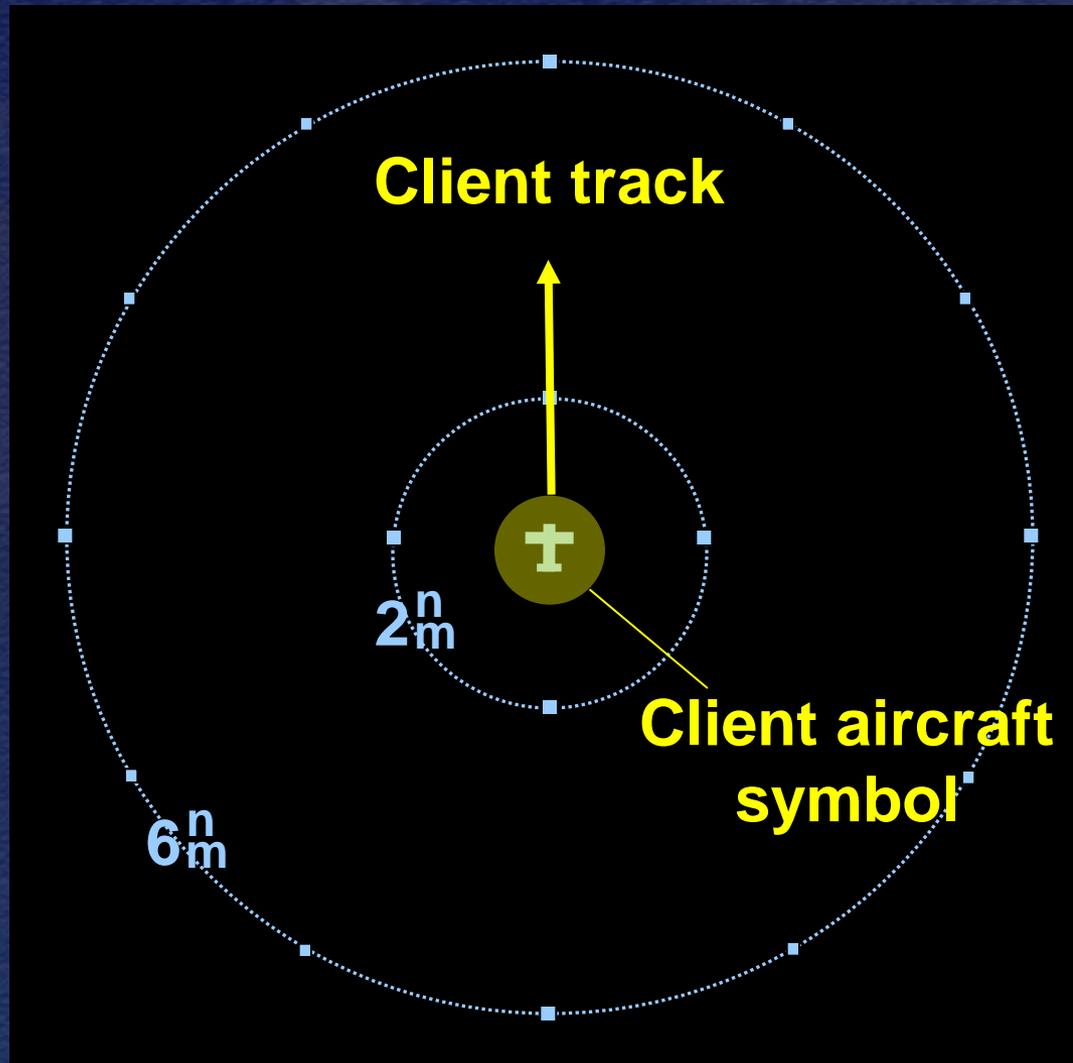
# TIS Service Volume and Alert Threshold

- TIS tracks up to eight intruder aircraft located within 7 nm horizontally and -3,000 to +3,500 ft vertically

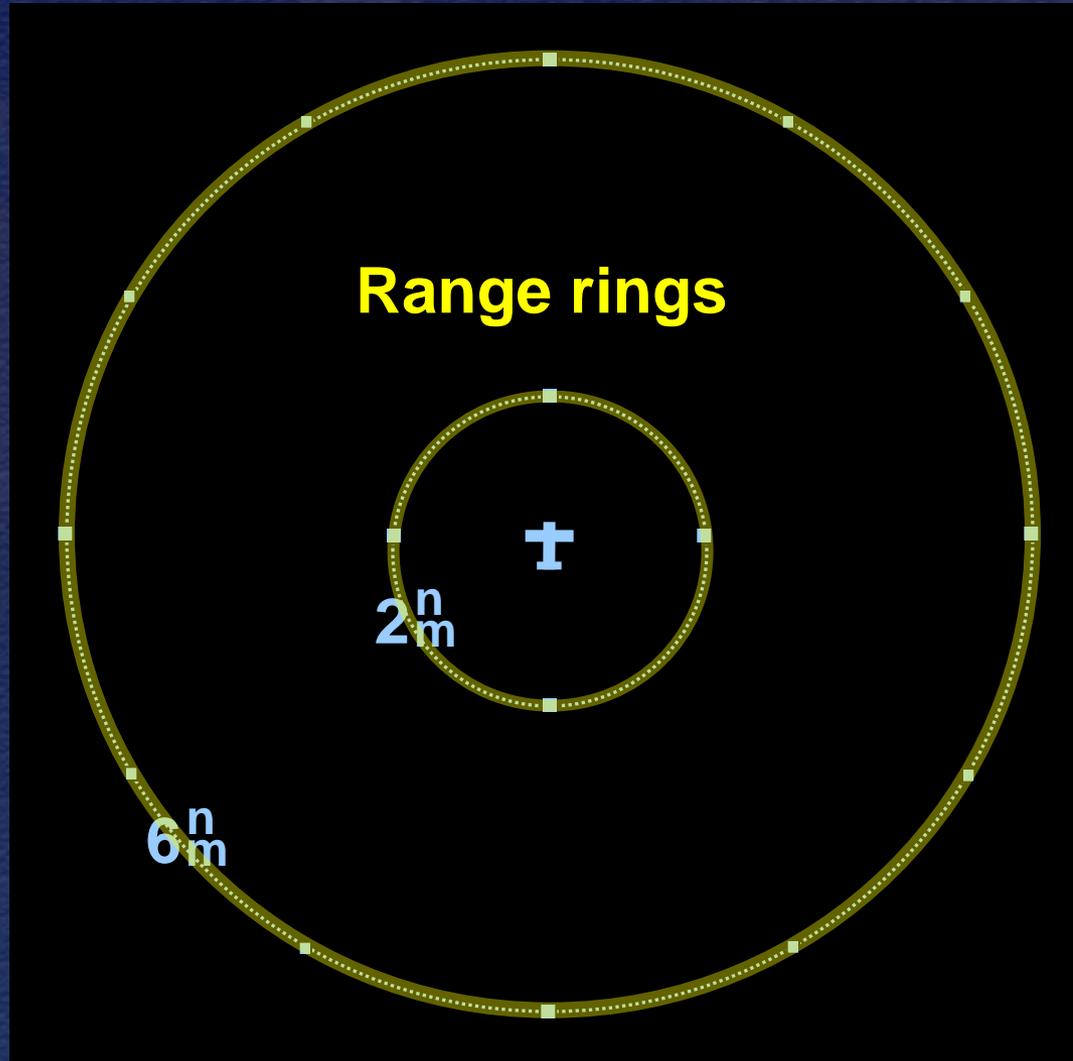


- Visual and aural alerts triggered when intruder estimated to intercept course within 0.5-nm radius and  $\pm 500$  ft within 34 seconds

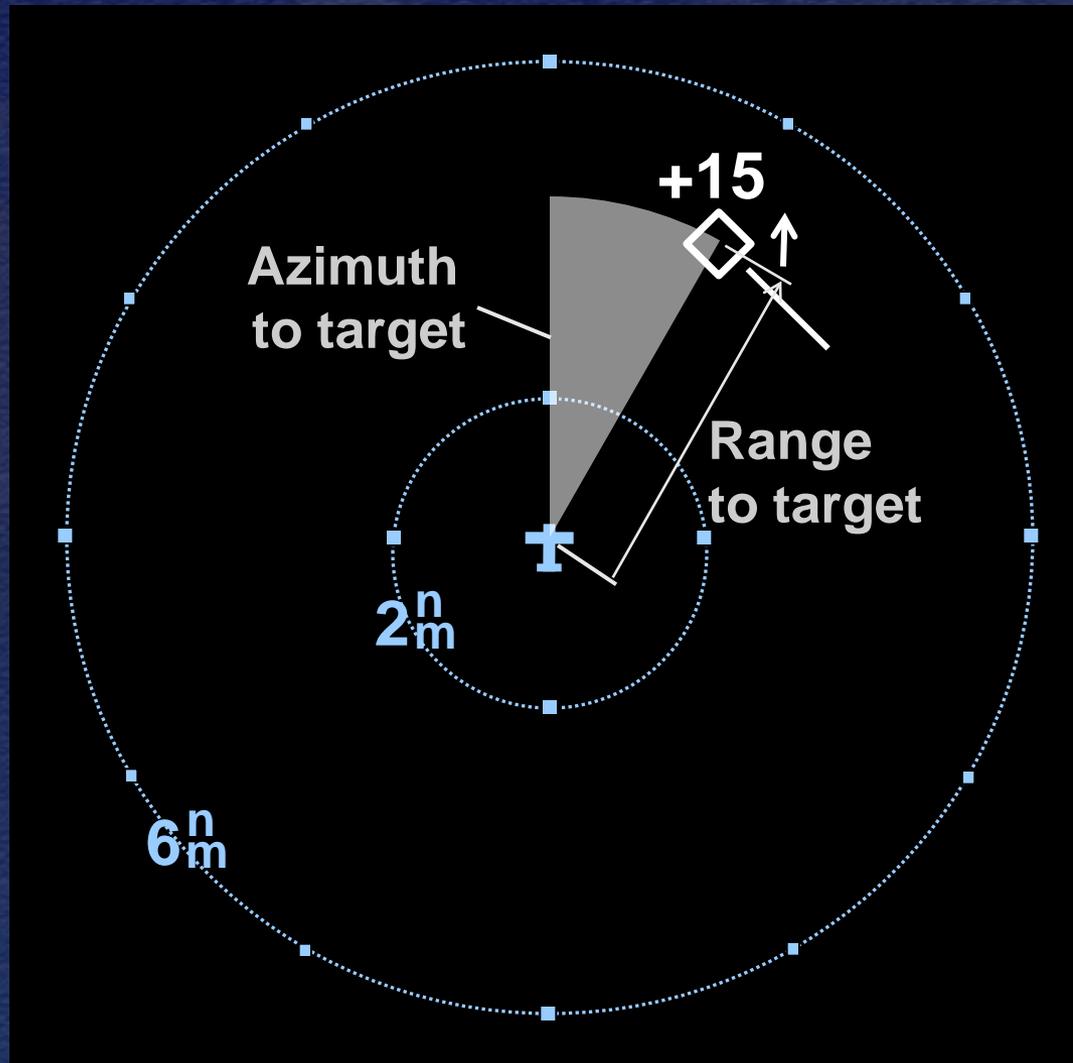
# TIS Cockpit Display Symbols: Client Aircraft



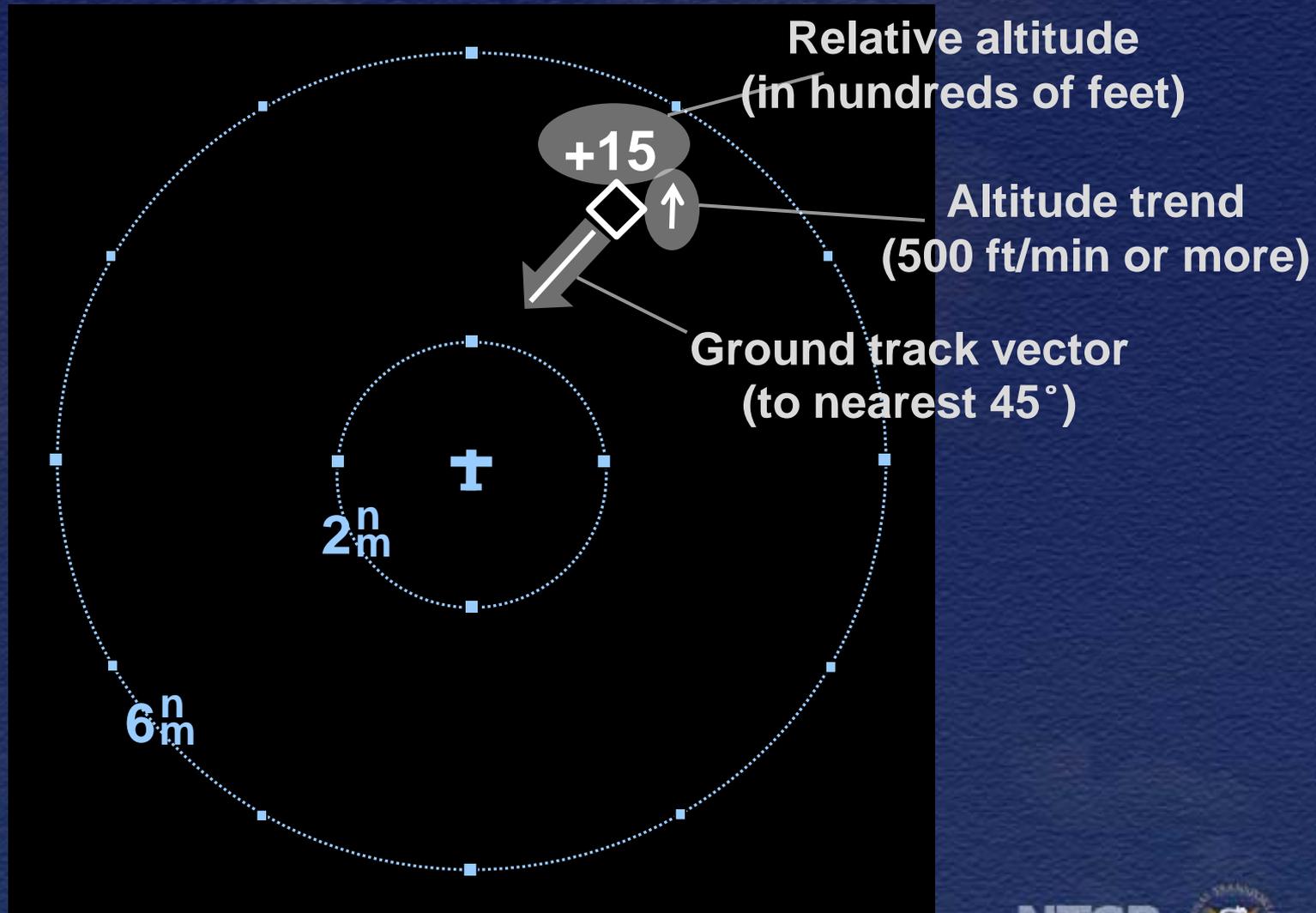
# TIS Cockpit Display Symbols: Range Rings



# TIS Cockpit Display Symbols: Proximity Alert



# TIS Cockpit Display Symbols: Proximity Alert



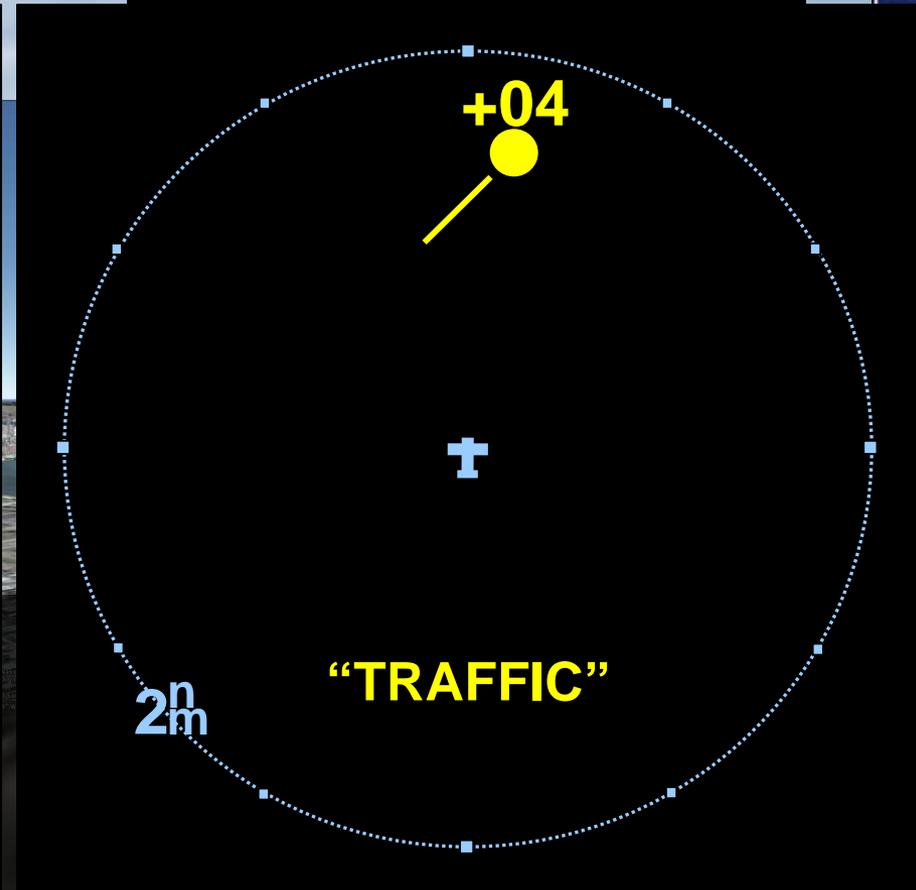
# TIS Cockpit Display Symbols: Traffic Alert



# View From Airplane 46 Sec. Before Collision

TIS display: Helicopter

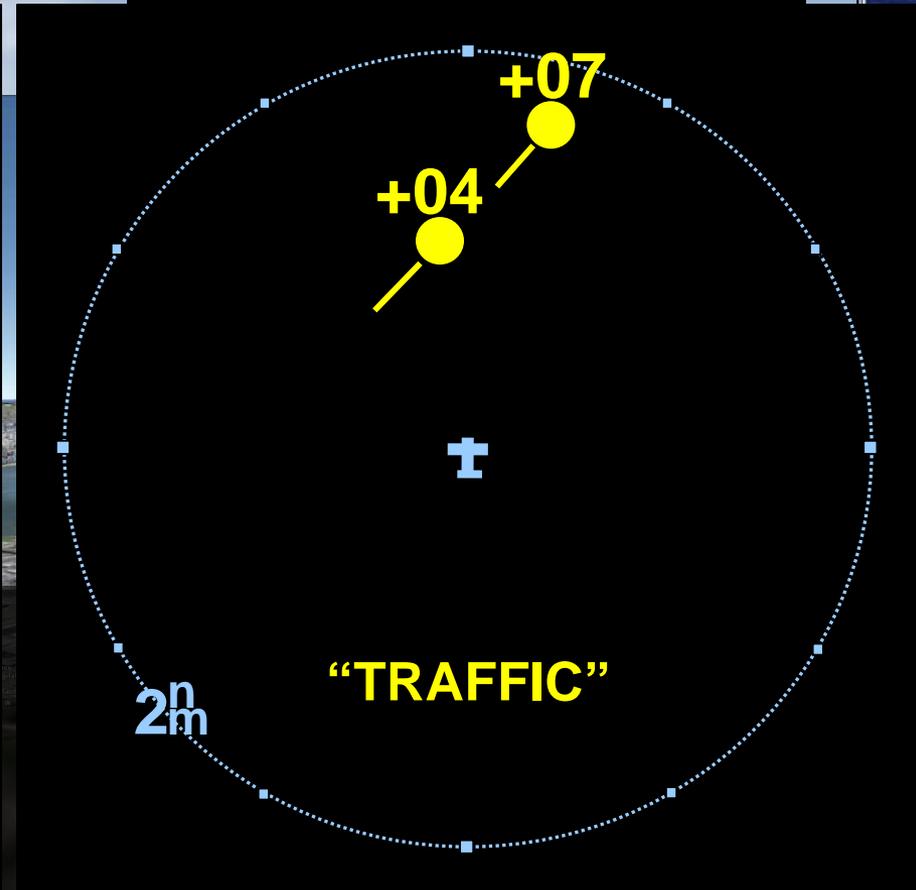
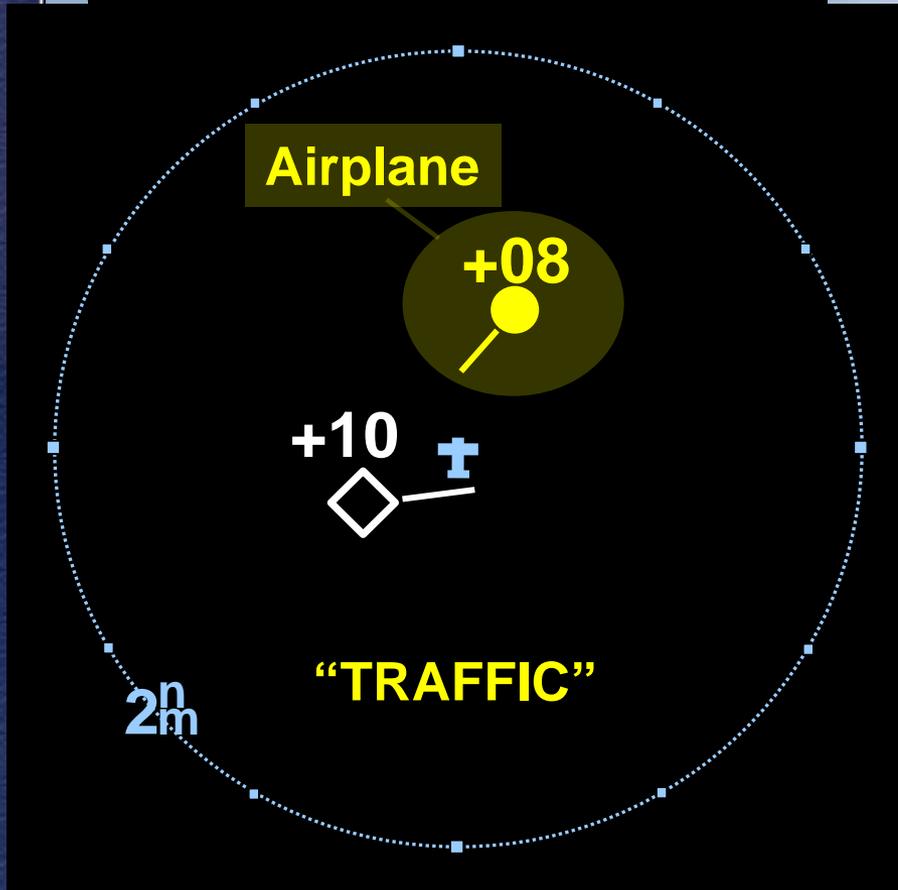
TIS display: Airplane



# View From Airplane 37 Sec. Before Collision

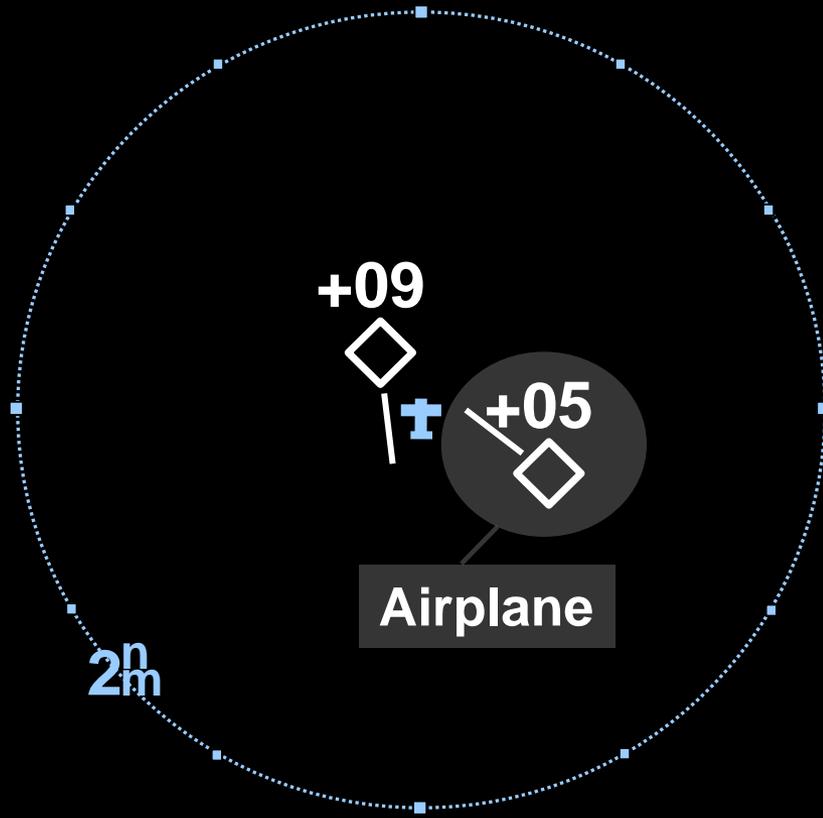
TIS display: Helicopter

TIS display: Airplane

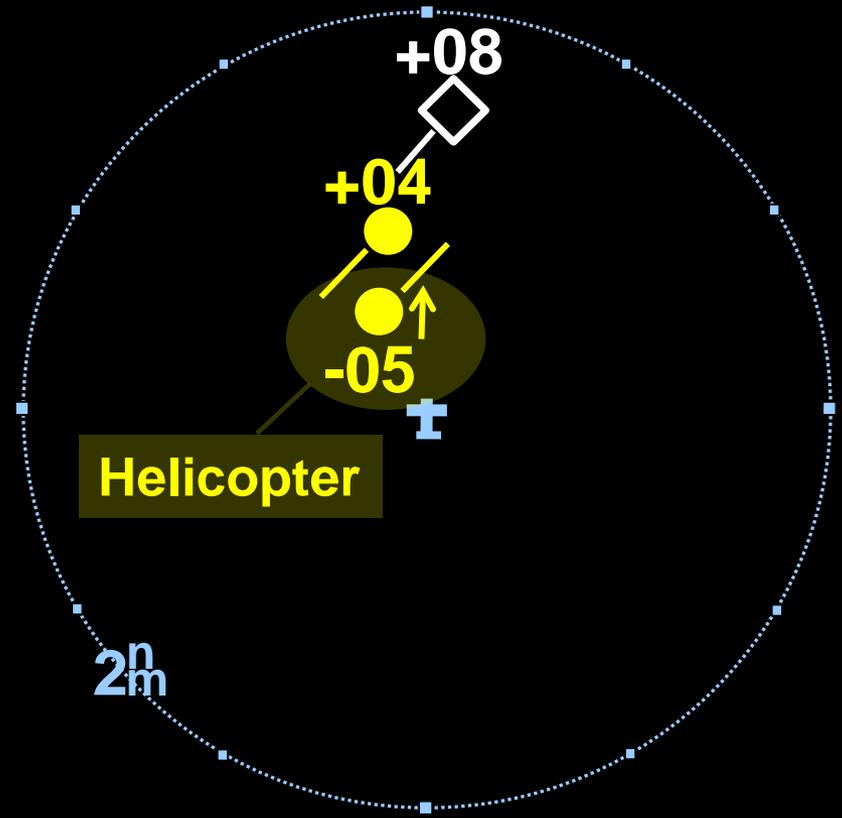


# View From Airplane 32 Sec. Before Collision

TIS display: Helicopter



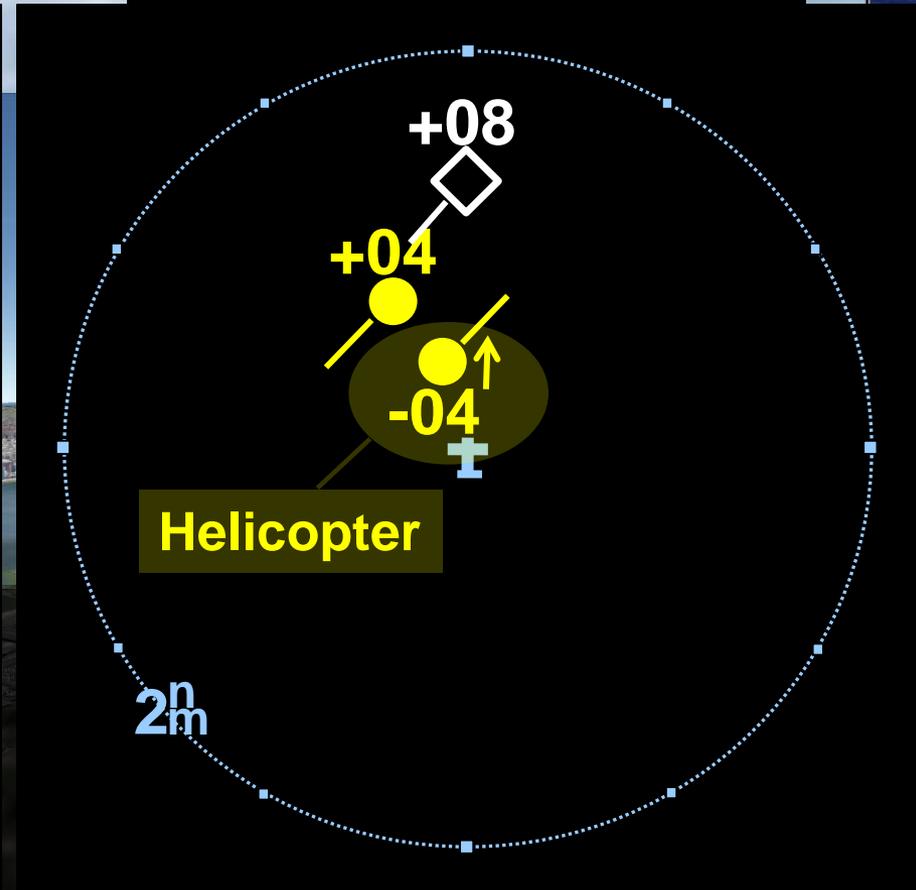
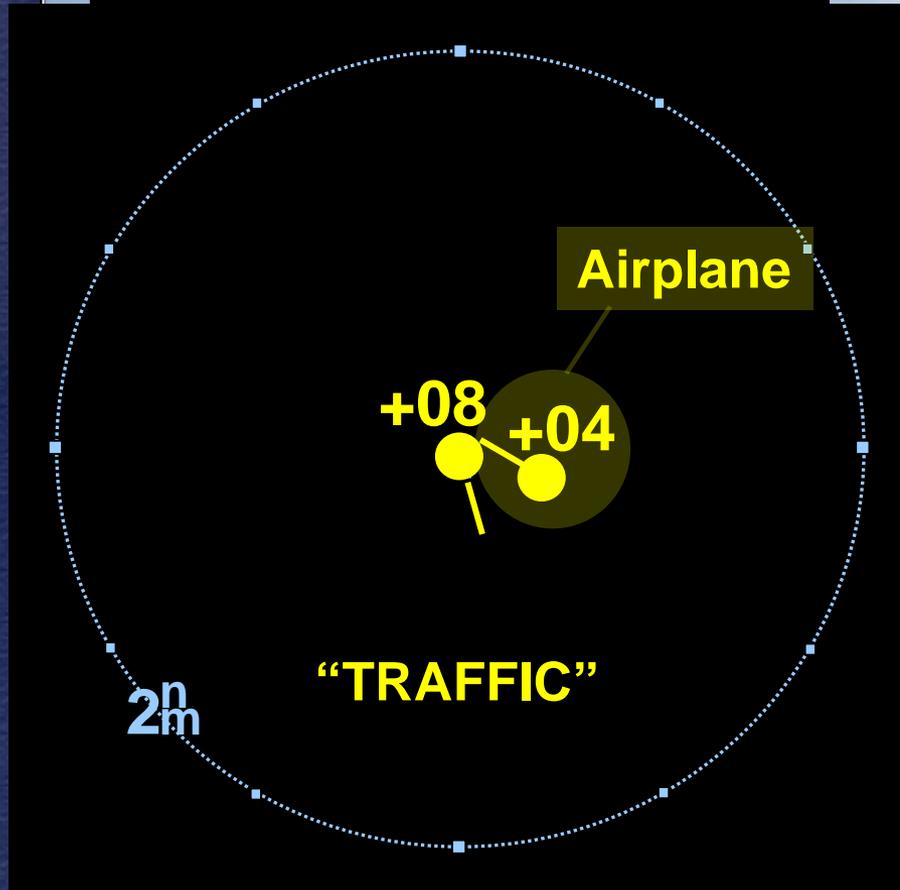
TIS display: Airplane



# View From Airplane 28 Sec. Before Collision

TIS display: Helicopter

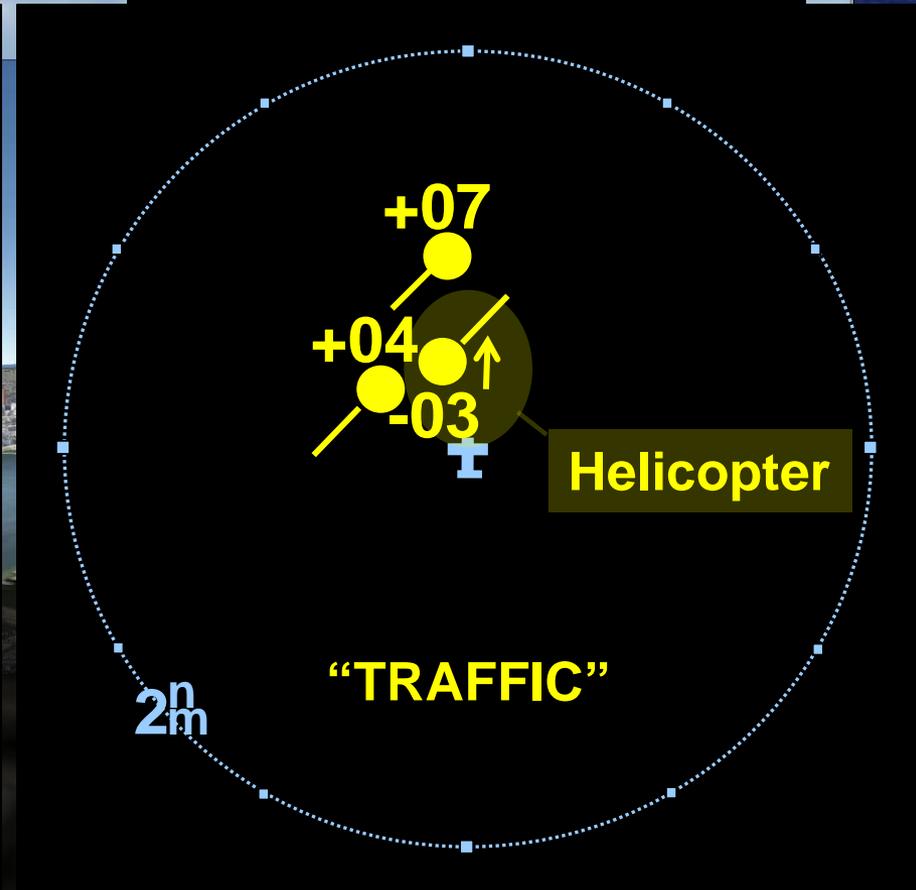
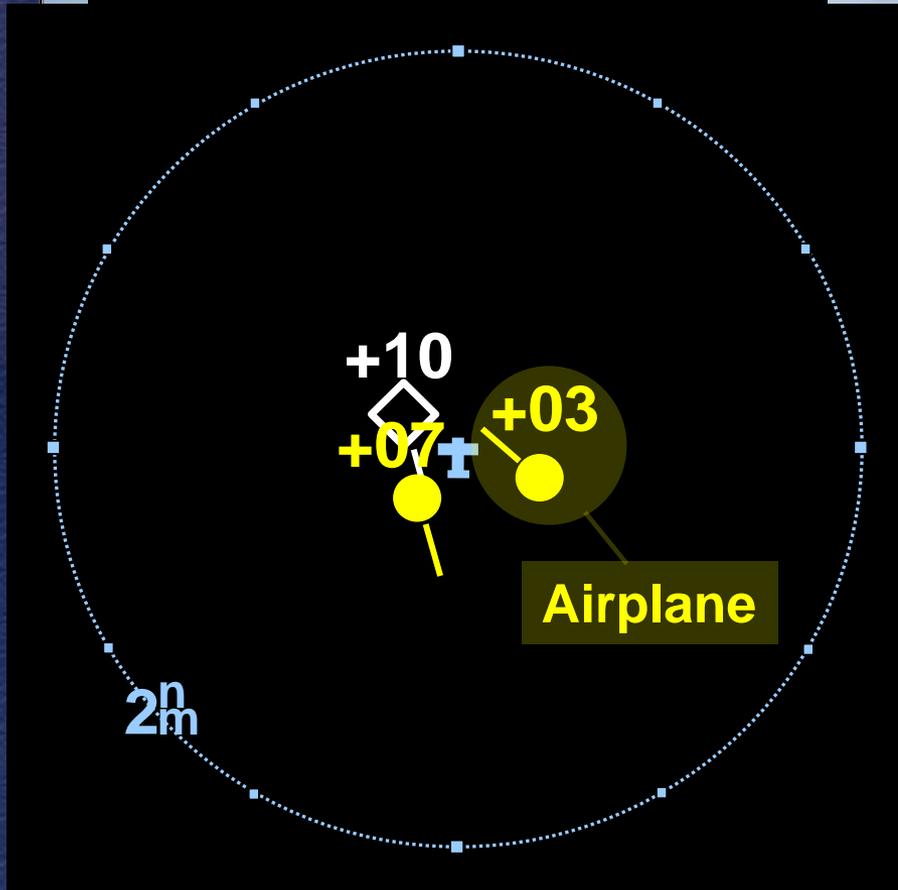
TIS display: Airplane



# View From Airplane 23 Sec. Before Collision

TIS display: Helicopter

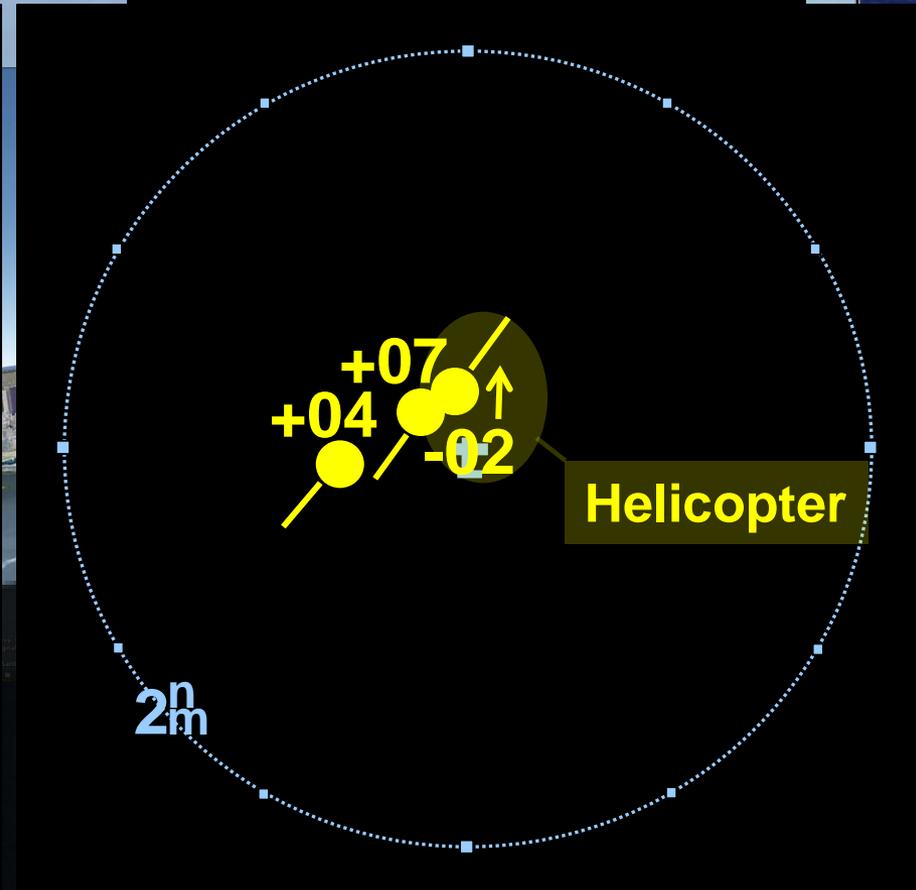
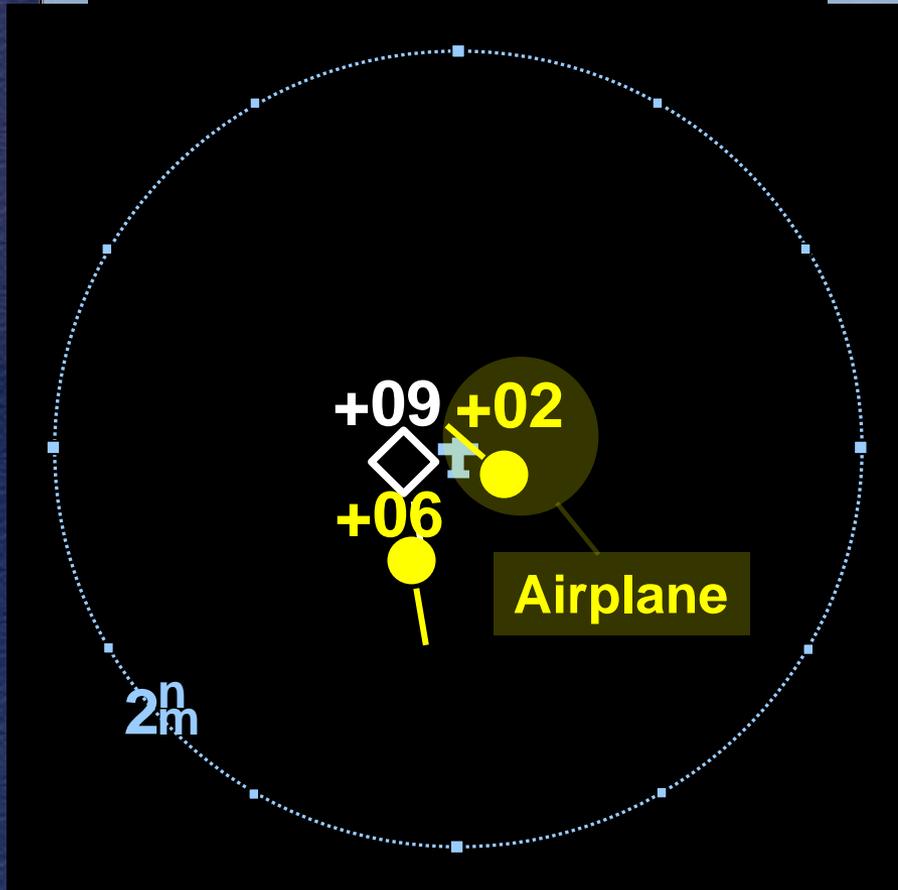
TIS display: Airplane



# View From Airplane 14 Sec. Before Collision

TIS display: Helicopter

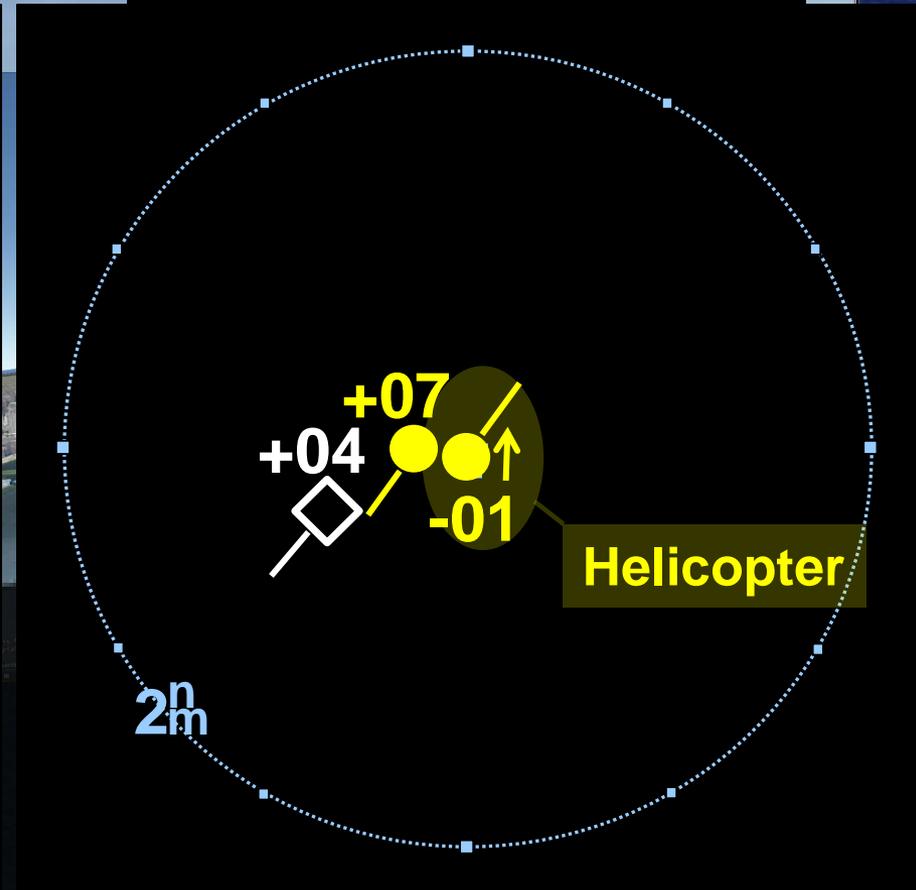
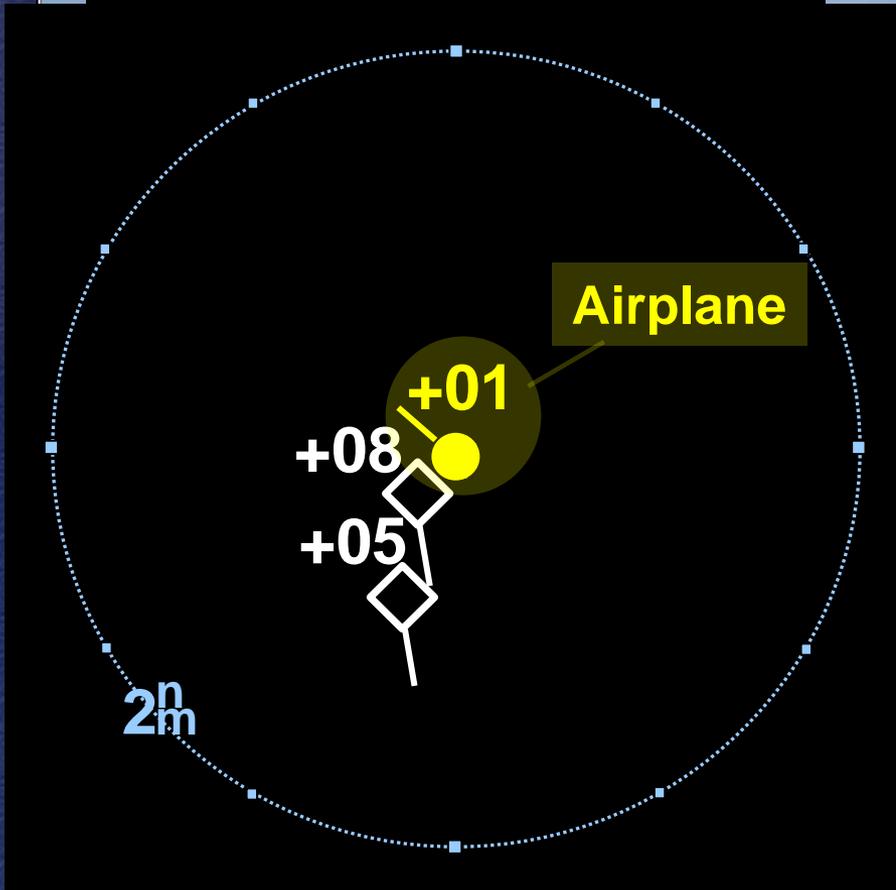
TIS display: Airplane



# View From Airplane 9 Sec. Before Collision

TIS display: Helicopter

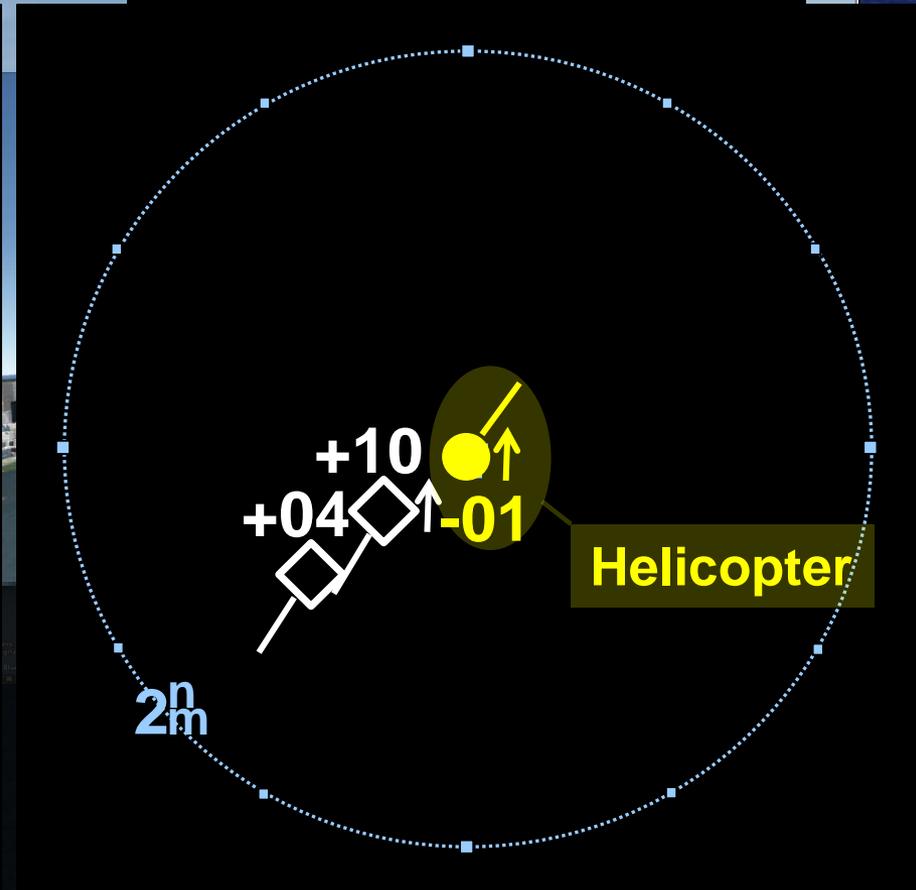
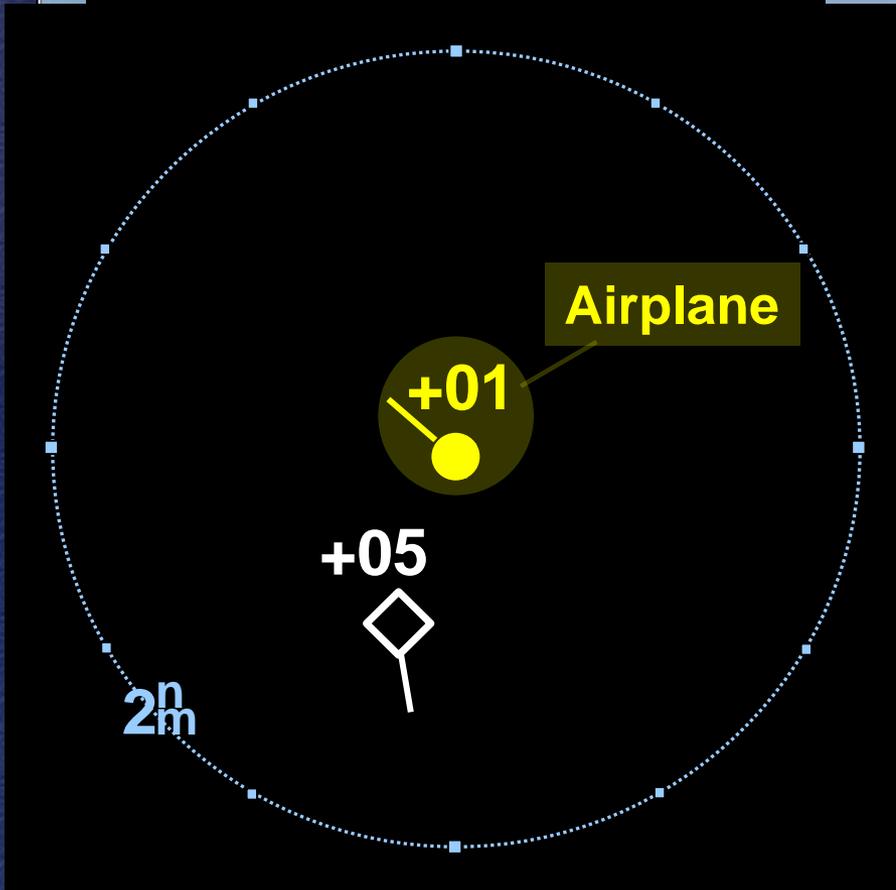
TIS display: Airplane



# View From Airplane 5 Sec. Before Collision

TIS display: Helicopter

TIS display: Airplane



# View From Airplane 4 Sec. Before Collision



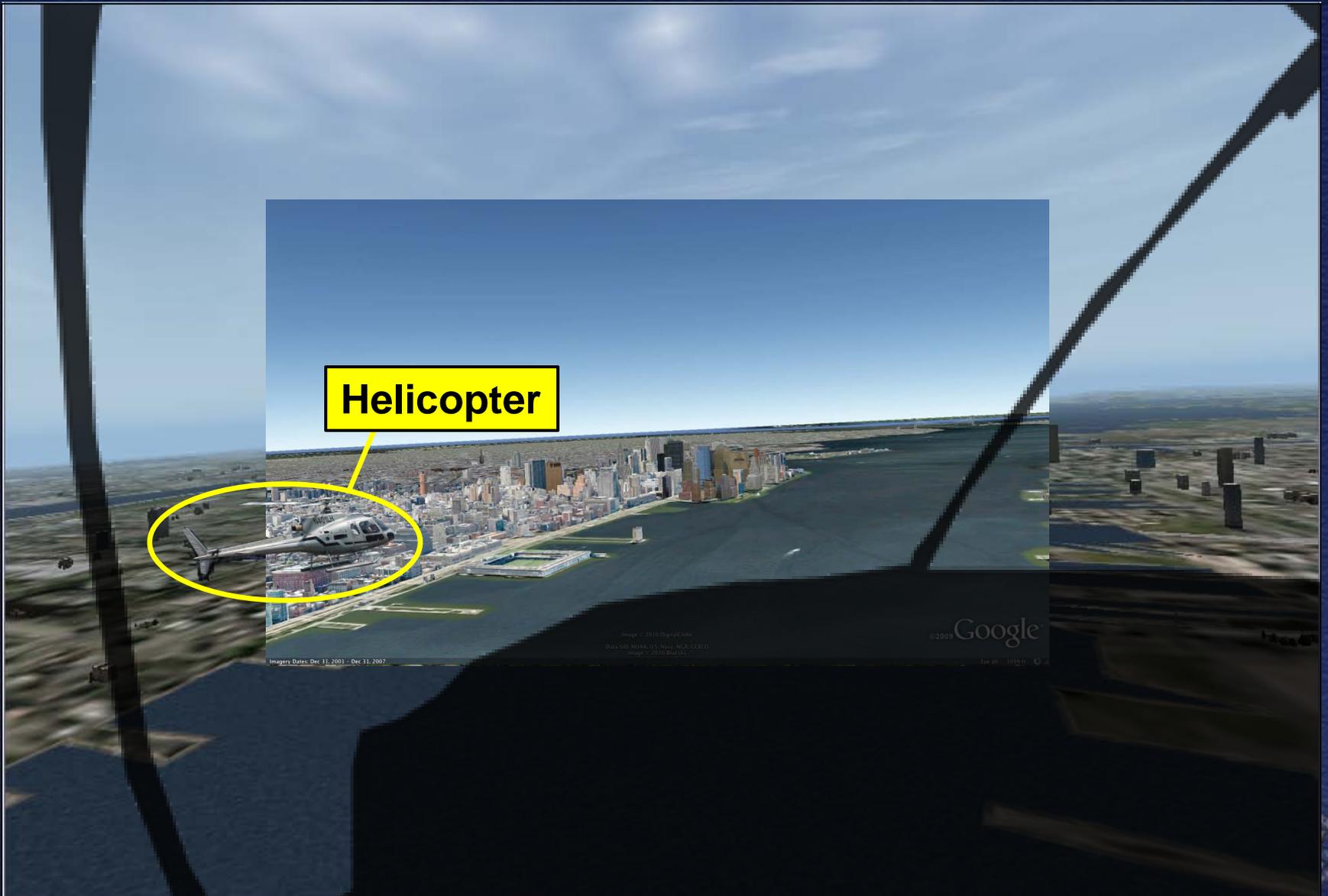
# View From Airplane 3 Sec. Before Collision



# View From Airplane 2 Sec. Before Collision



# View From Airplane 1 Sec. Before Collision



# Summary – Cockpit Visibility

- Airplane: outside helicopter pilot's field of view during 32 seconds before collision
- Helicopter: inside airplane pilot's field view at all times
- Helicopter: small, stationary object against background of buildings
- Helicopter: likely hard to see from airplane

# Summary – TIS

- System sent messages to both aircraft
- Airplane: received alerts concerning helicopter 46 seconds before collision
- Airplane: possibly no aural alerts concerning helicopter
- Helicopter: received alerts concerning airplane 37 seconds before collision
- Helicopter: likely received two aural alerts concerning airplane

# Summary – TIS

- Multiple traffic alerts for both aircraft indicate congested airspace
- Helicopter operations in congested airspace pose unique challenges for design of traffic alerting systems
- Staff proposes recommendations in this area



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