Gulfstream®

A GENERAL DYNAMICS COMPANY

Gulfstream Enhanced Vision System

The Enhanced Vision System

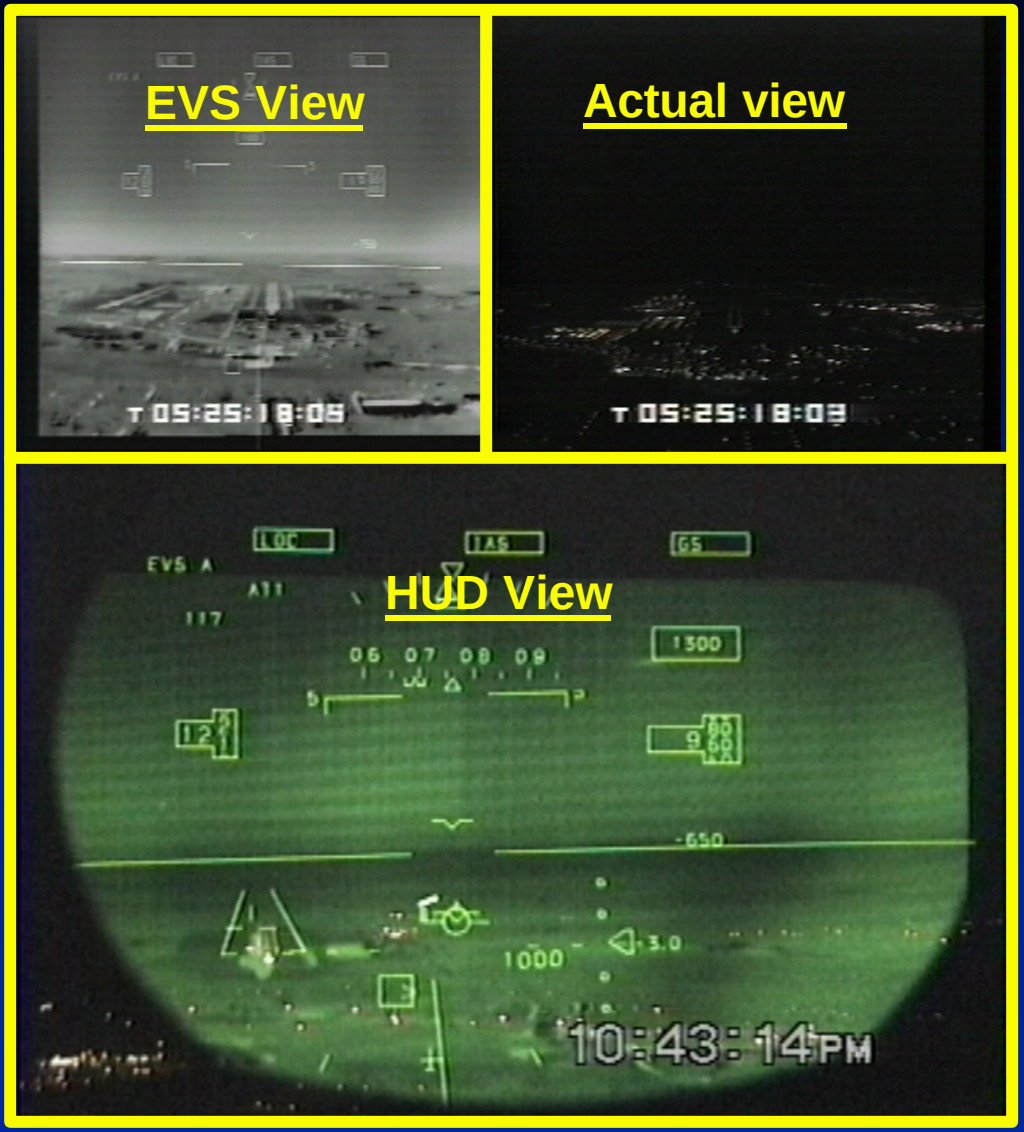
- What is EVS?
- What does it do for me?
- Components of an EVS System
  - HUD
  - Sensor
  - Program

What Is EVS

- Enhanced Vision System
- Method of Improving visual picture
  - CFIT
  - Runway Incursion
  - Approach Capabilities
- Types of EVS
  - Infrared
  - Radar
  - Synthetic Vision
    - No real time info

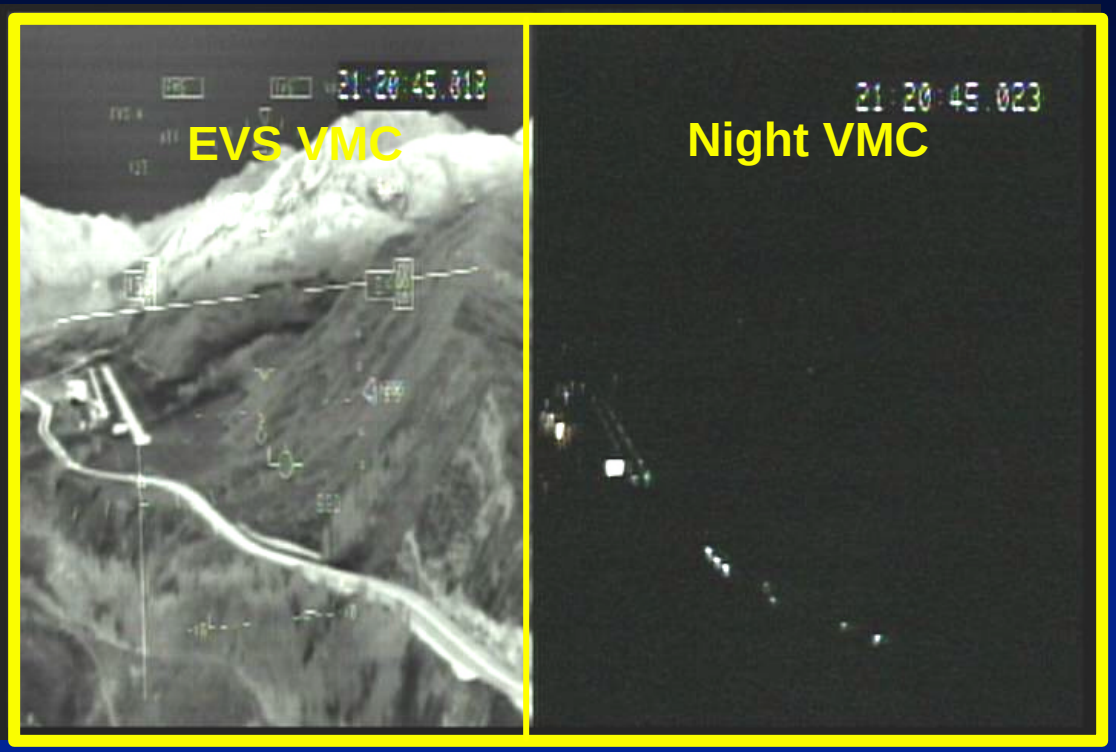
What makes up an EVS System

- Method of display
  - Real World Registration
- Display flight information
- EVS Sensor
- Process Image or Provide “Enhanced” Image to pilot
  - Real Time, Real World



The Gulfstream Enhanced Vision Solution

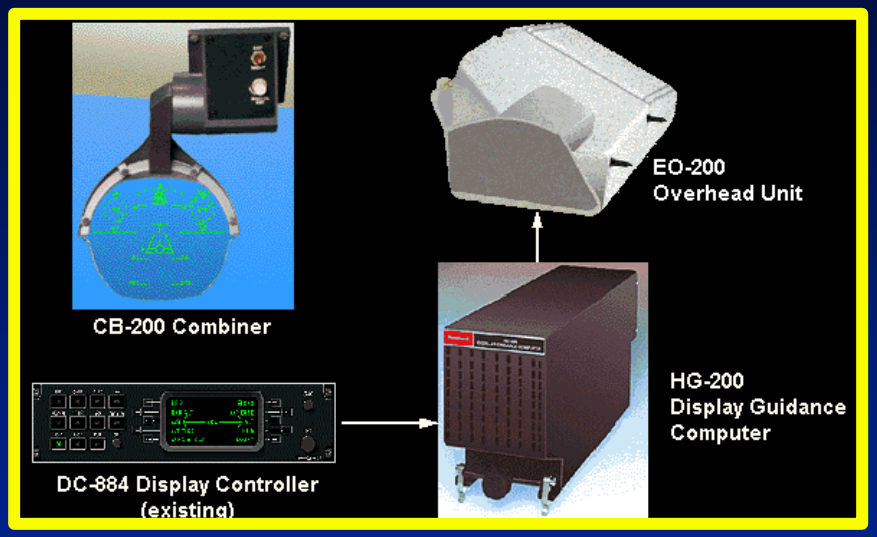
- System elements:
- HUD
  - Displays Symbology and EVS imagery
  - Synthetic Runways
- EVS Sensor
  - Kollsman FLIR
- Auxiliary Displays
  - Flat Panels
  - Cabin Display



EVS Aux Flat Panel Display

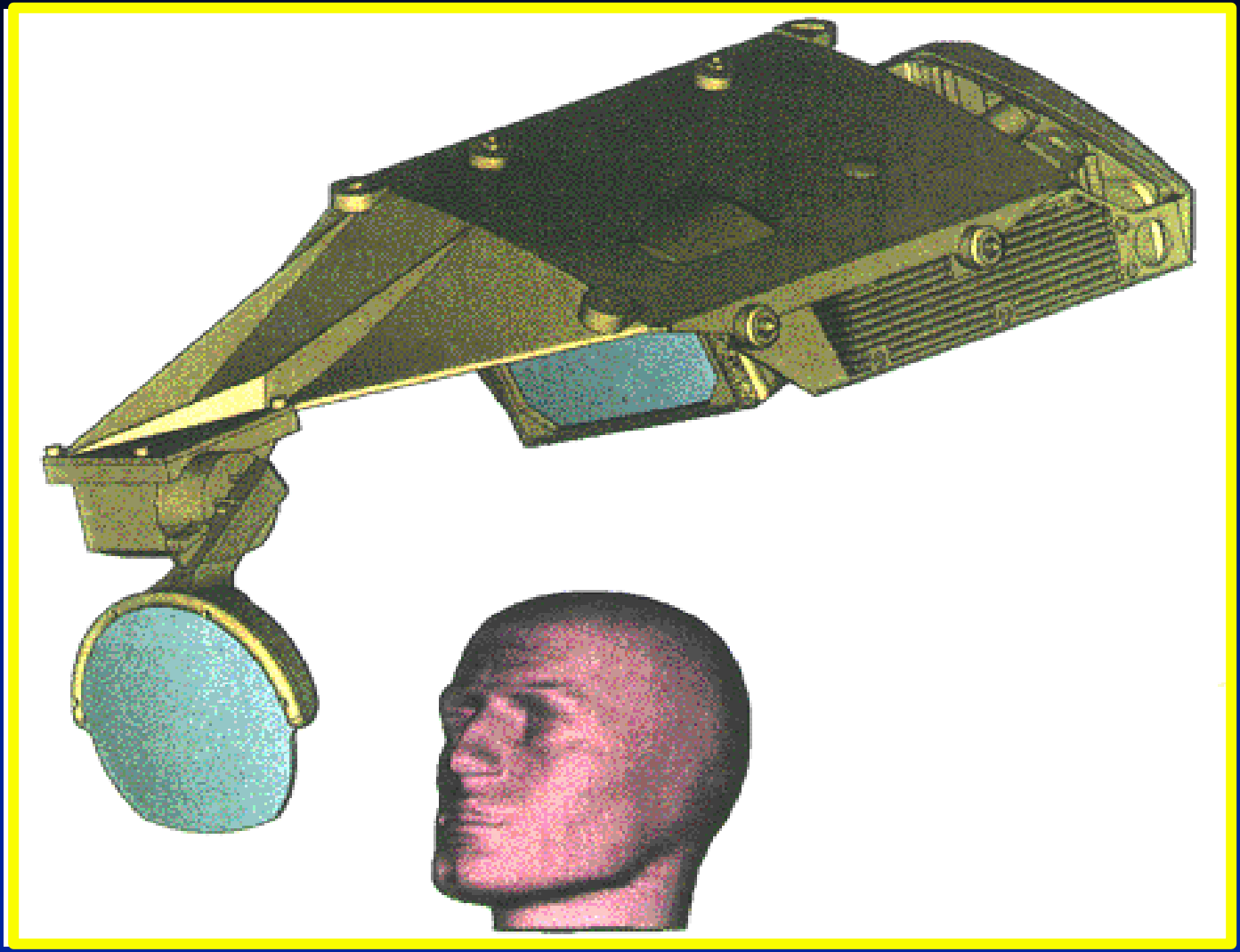
Gulfstream HUD 2020

- Program launched in 1993
  - More than 150 installed
- Honeywell and GEC-Marconi teamed
  - Optics
  - Software / Electronics
- Completed development, flight test and certification in 1997
- Cat II HUD for GIV and GV



Gulfstream HUD 2020 System

Gulfstream HUD 2020



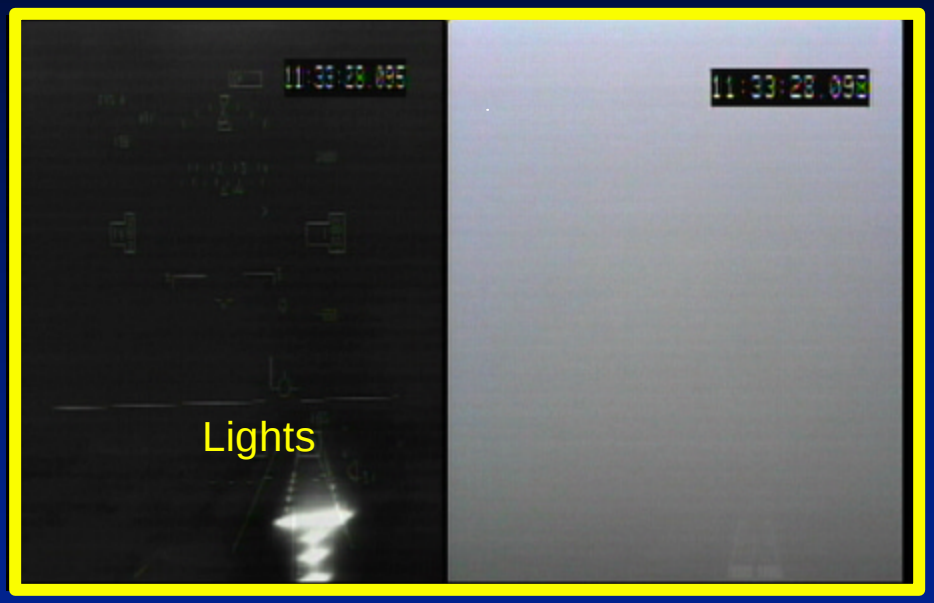
The Gulfstream EVS System Sensor

- Kollsman IR camera
- Uses advanced “InSb” technology
- Designed to Detect Runway and Approach Lights in low vis conditions
- Sapphire IR window
- Patented image processing algorithms

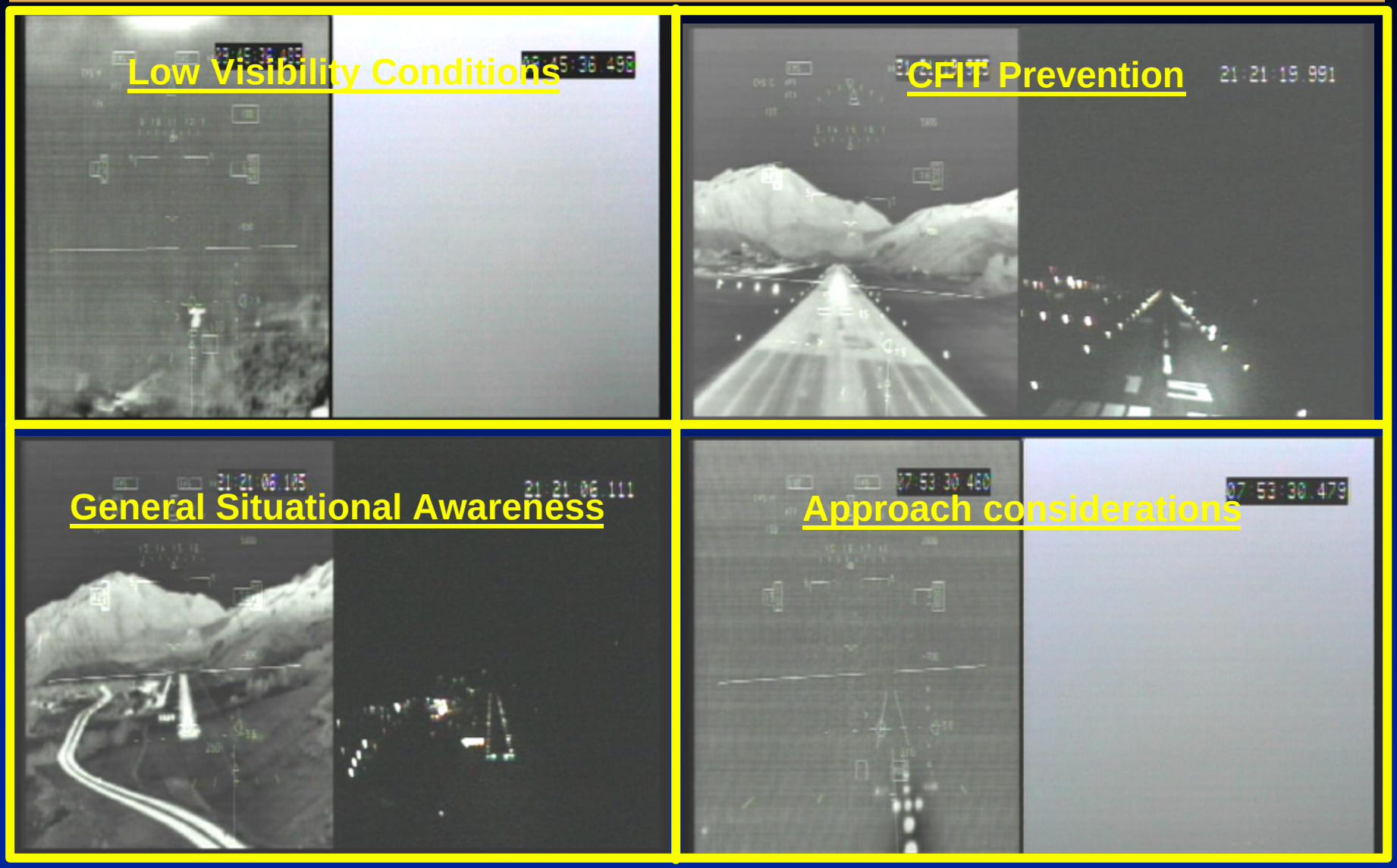
Sapphire Window

Infra Red Info

- Visible spectrum very narrow
  - .4 to .7 microns
- Military FLIRS
  - 8-12 microns
- Runway lights
  - Approx 1.2-2.2 microns
- Black Body 3-5 microns
- Over 70% of runway approach light energy is in the IR band



What Can EVS Do for Me?



EVS and Safer Skies

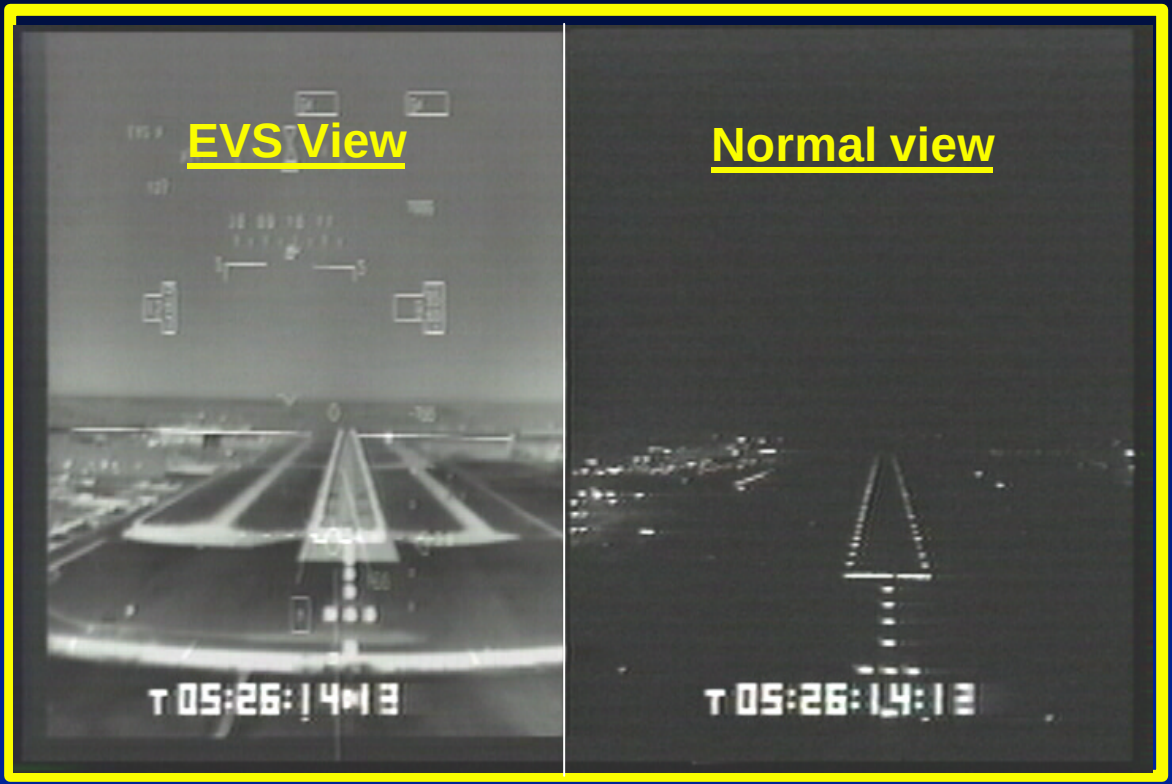
Items addressed by EVS

Approach Considerations

- US Approach Structure
  - 4600 Non Precision Approaches (600ft)
- 1150 ILS Precision Approaches
  - 848 Category I appr
  - (79% are 200 ft)
  - 73/99 Category II (100 ft)
  - 53/74 Category III (50 ft)

ILS Approaches World Wide

- **2,638 ILS Approaches in Jeppesen's Data Base**
- **211 Cat II**
- **126 Cat III**
- **EVS creates 2,301 potential Cat II/III runways!**

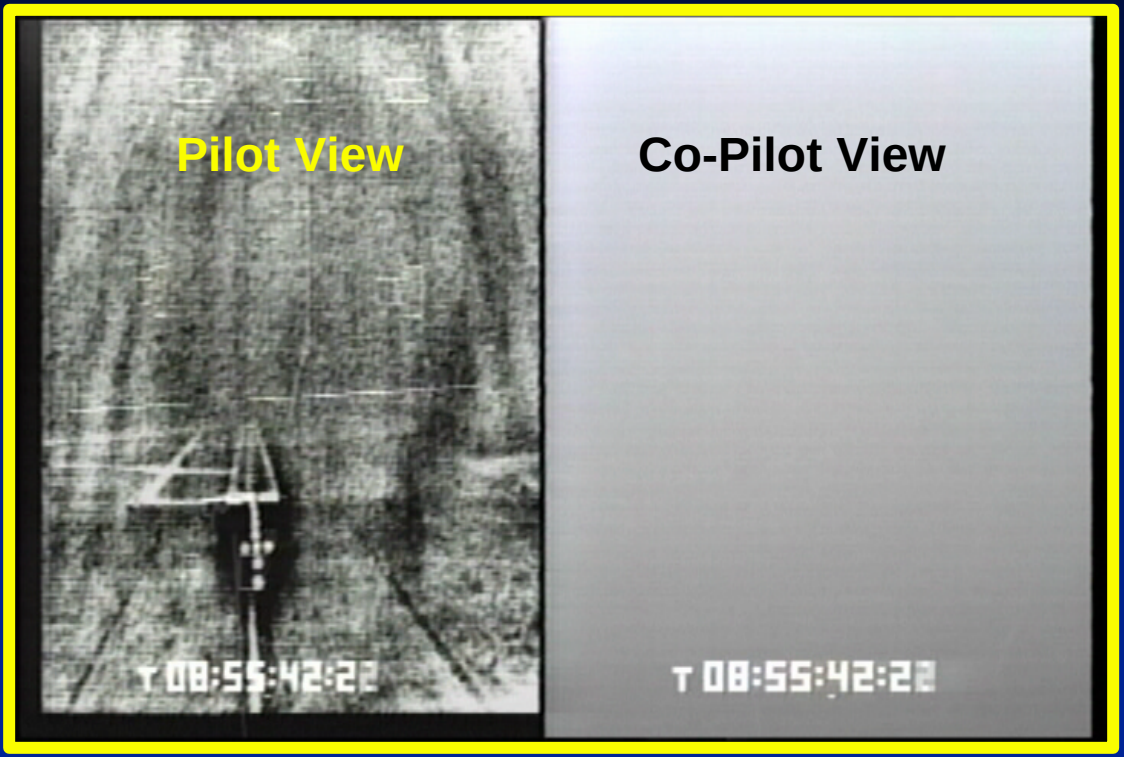


Western European ILS Approaches

- 657 ILS Approaches
- 80 Cat II Approaches
- 59 Cat III Approaches
- Improvement in over 500 approaches in Europe alone!

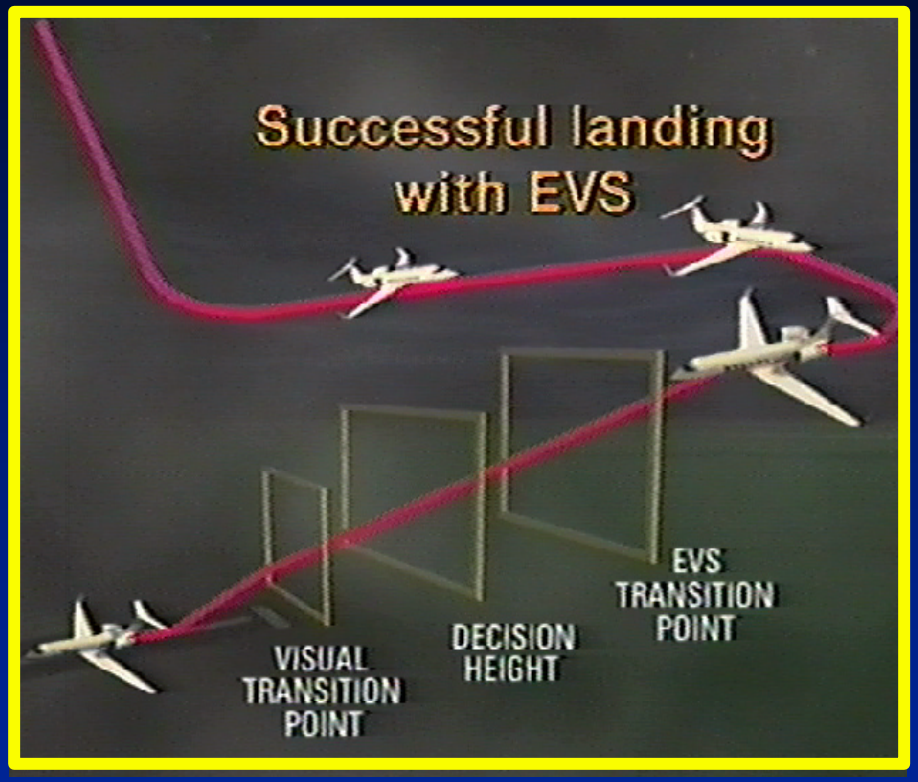
Rest of World

- 850 Approaches
- 41 Cat II Approaches
- 4 Cat III Approaches
- EVS creates over 800 Cat II / III equivalent approaches



EVS During Approaches

- Descend to normal approach minimums
- FAR Part 91.175 delineates visual requirements
- If requirements met--continue
- At required altitude, Real World must be visible
  - Phase 1 100 ft, 1200 RVR
- Future Possibilities
  - Phase 2 50 ft, 700 RVR

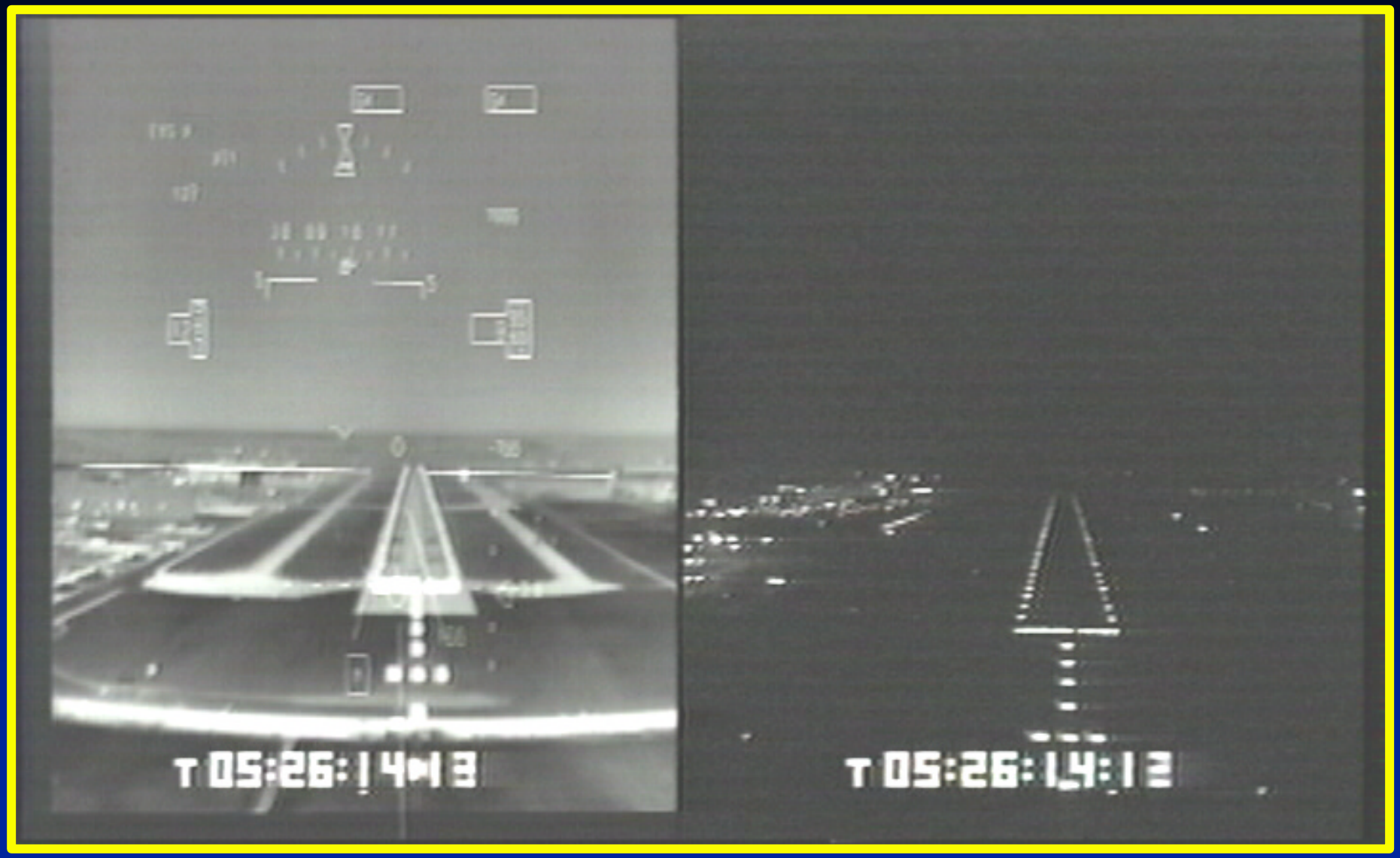


Runway Lights

Runway Incursion

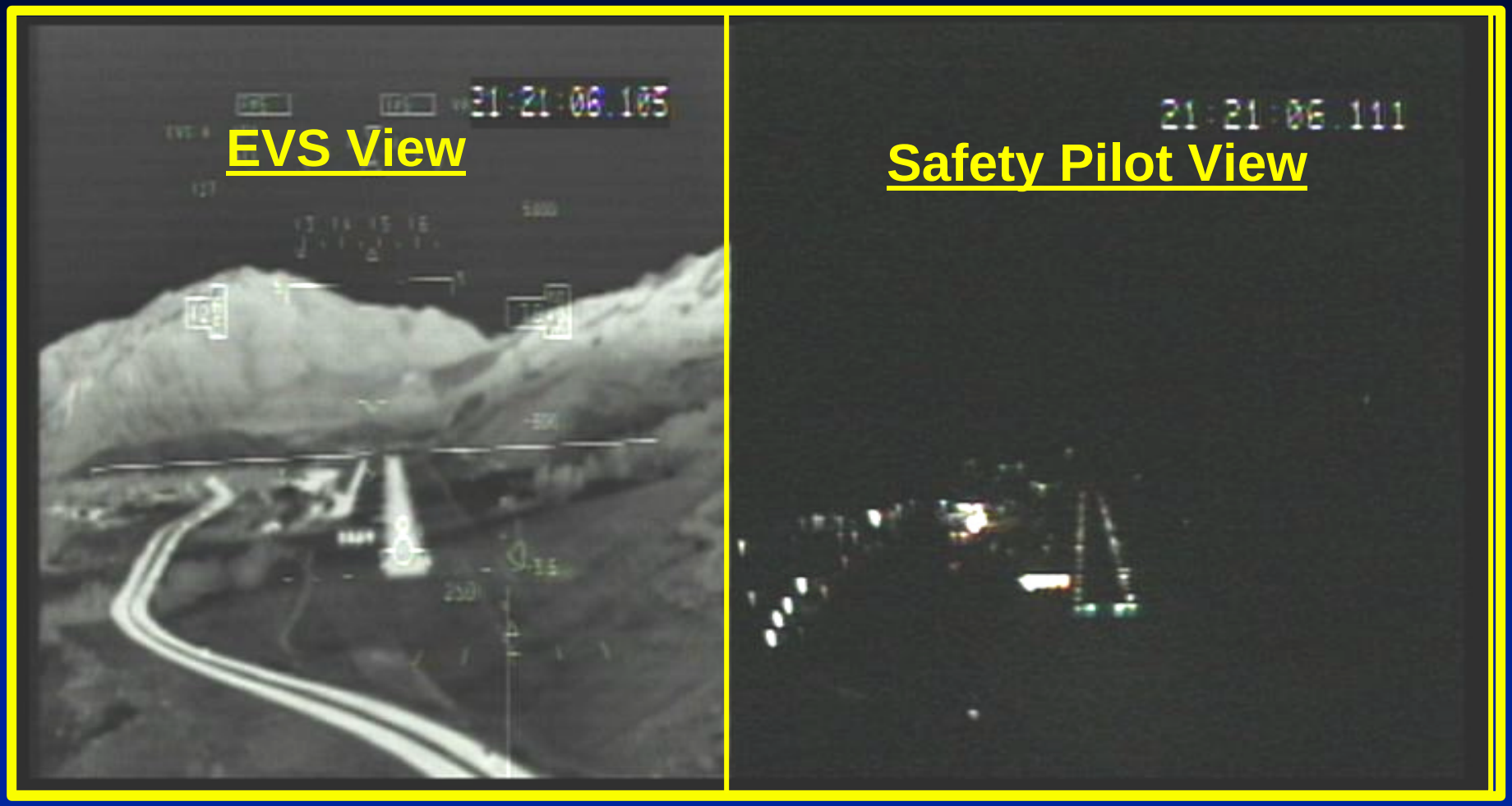
- See and Avoid

Night VMC



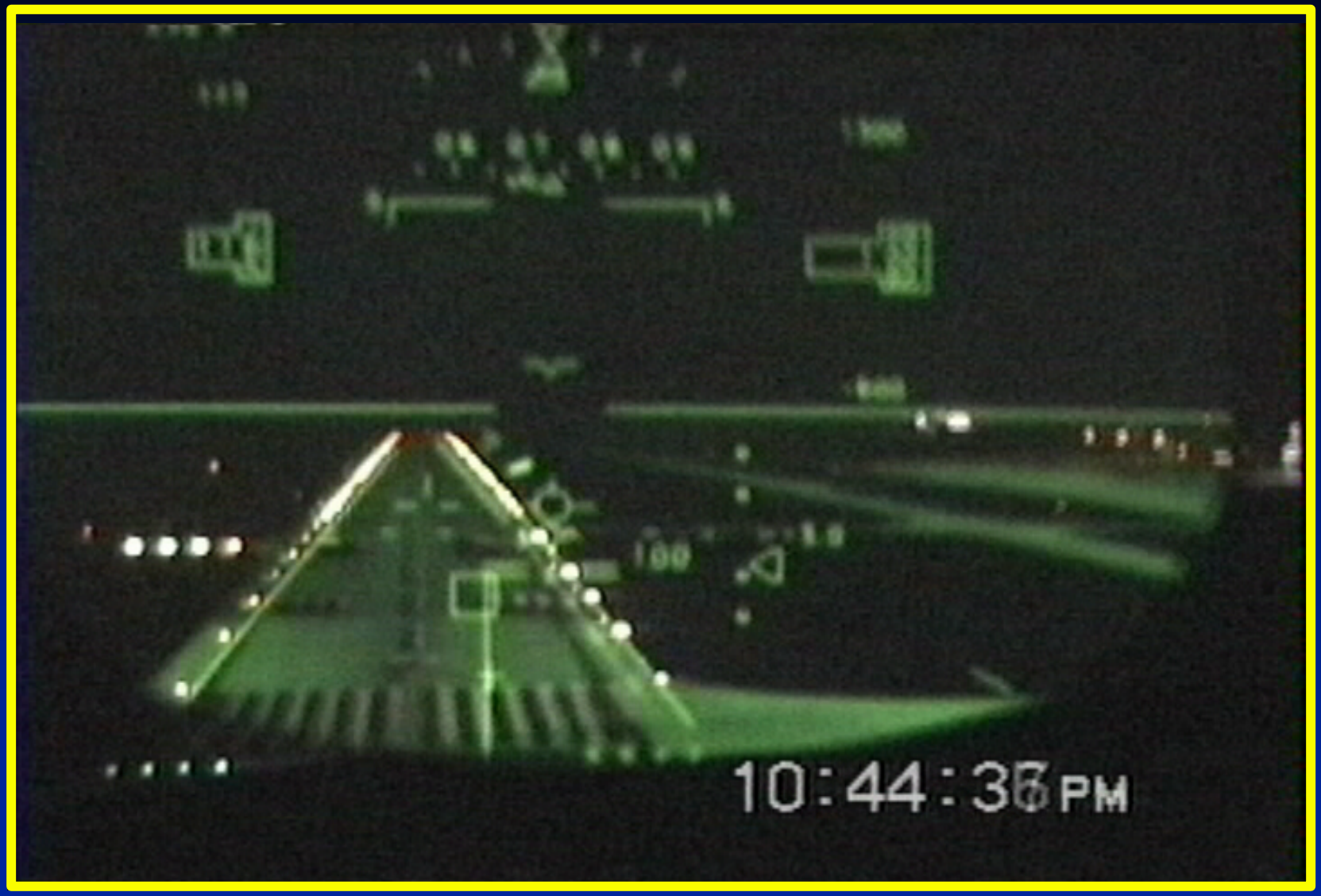
Controlled Flight Into Terrain Avoidance

- CFIT won't occur if the ground is visible



View of EVS Through HUD

View of EVS Through HUD



EVS Videos

Questions?

Bottom Line
EVS View
Runway Lights Visible
Safety Pilot View