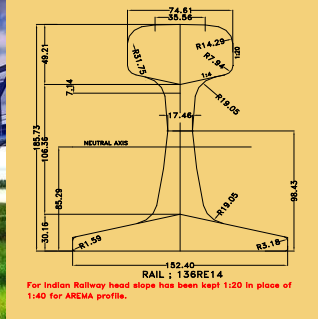
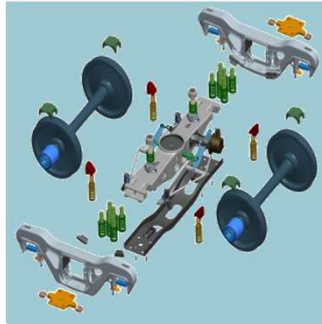




सत्यमेव जयते

Fog Vision



Project Proposal

Presentation Outline

- Need
- Work done
- A new approach
- Technology?
- Project Proposal

Need

- Fog a major problem for train operation
 - Severely restricts speed
 - Can compromise safety
- Projects in progress
 - Fog Pass
 - On board display of signal aspect (OBDSA)
- These do not address the requirement of vision

Work done

- Project of Fog Vision Under TMRS
 - Use of LASER scanning for generating computer images
 - Successful POC under laboratory conditions
 - Equipment and associated technology to port to a locomotive platform not available

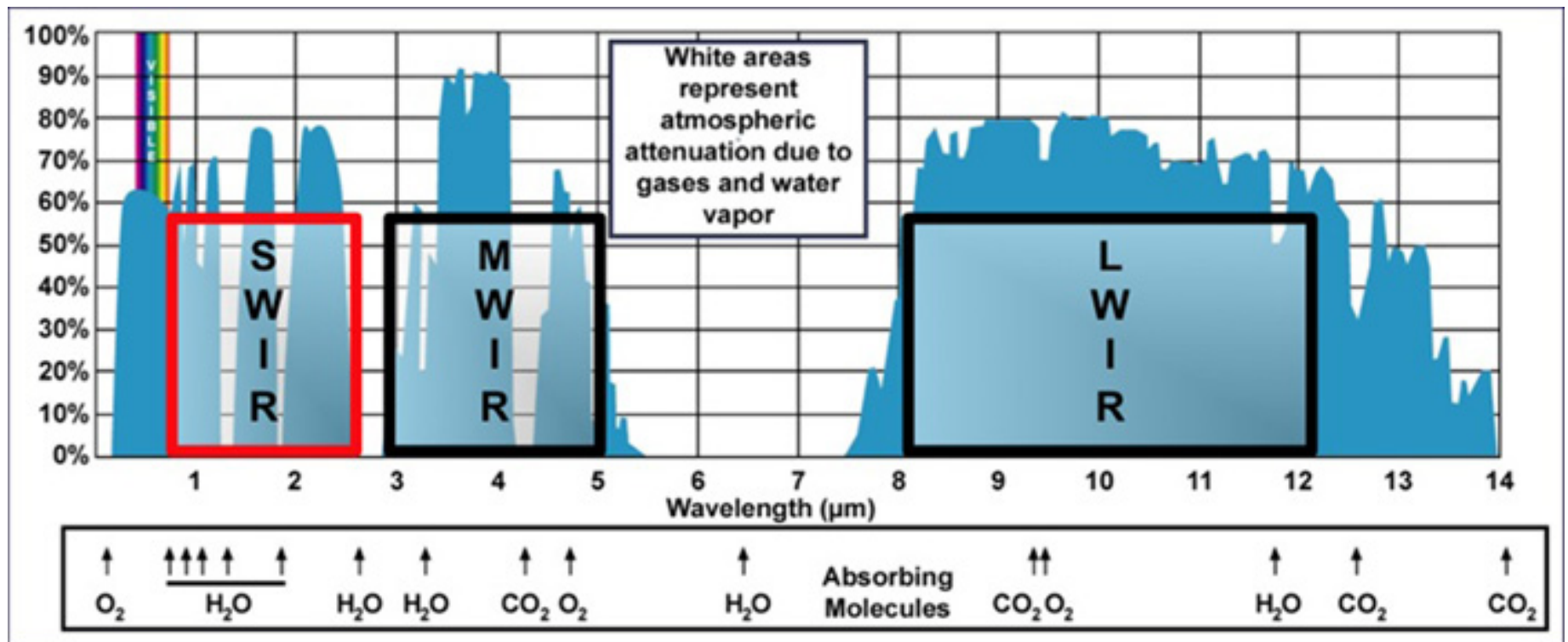
A new approach

- The cameras on U2 spy plane
 - Allowed photographing from 70,000ft in daylight
 - Through the clouds!
- Cryogenically-cooled Indium Antinomite sensor



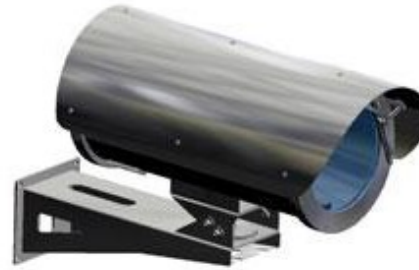
A new approach

- Use multiple IR Imaging
 - Combined use of SWIR, MWIR, LWIR + RADAR and reference visible image for vision enhancement



Technology?

- Survey on the internet
- www.optoprecision.de
- Has ready built solution
 - Anti Fog Driver Assistance System (AFDAS)
 - As per brochure the equipment is export restricted



Technology?

- Survey on the internet
- www.sensorinc.com
 - Non-cooled SWIR cameras
 - Hybrid imaging technology algorithm



Project Proposal

- Option 1:
 - Buy and test out AFDAS
- Option 2:
 - Develop hybrid imaging systems using cameras from Goodrich Sensors Inc.
- Option 3:
 - Follow up project proposal of VTT and Tooltech Global Engg for development of hybrid fog vision system using infrared and RADAR technology.

Demo: Visible Light and SWIR Photos



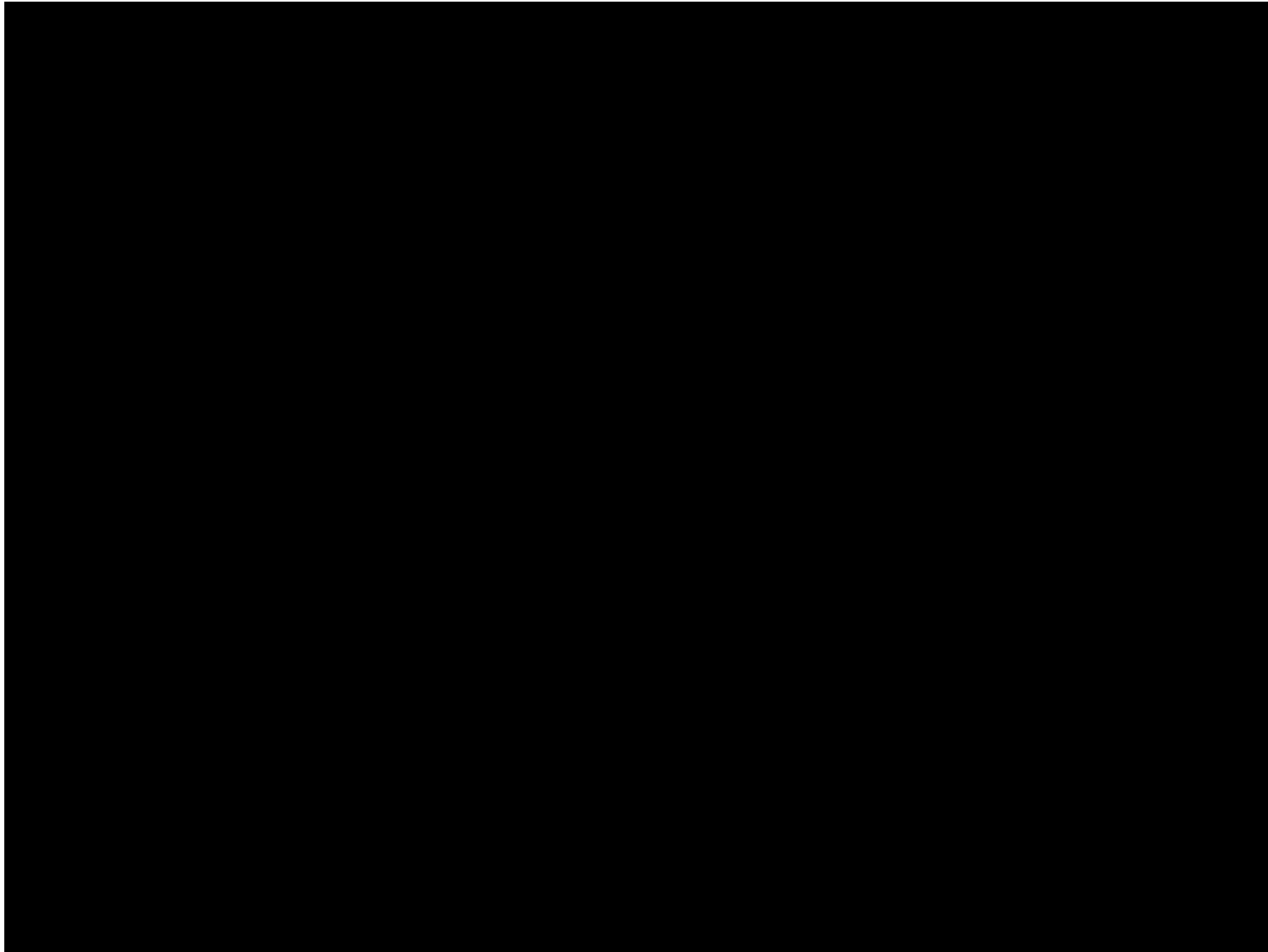
Demo: Visible Light and SWIR Photos



Demo: Aircraft Vision Enhancement



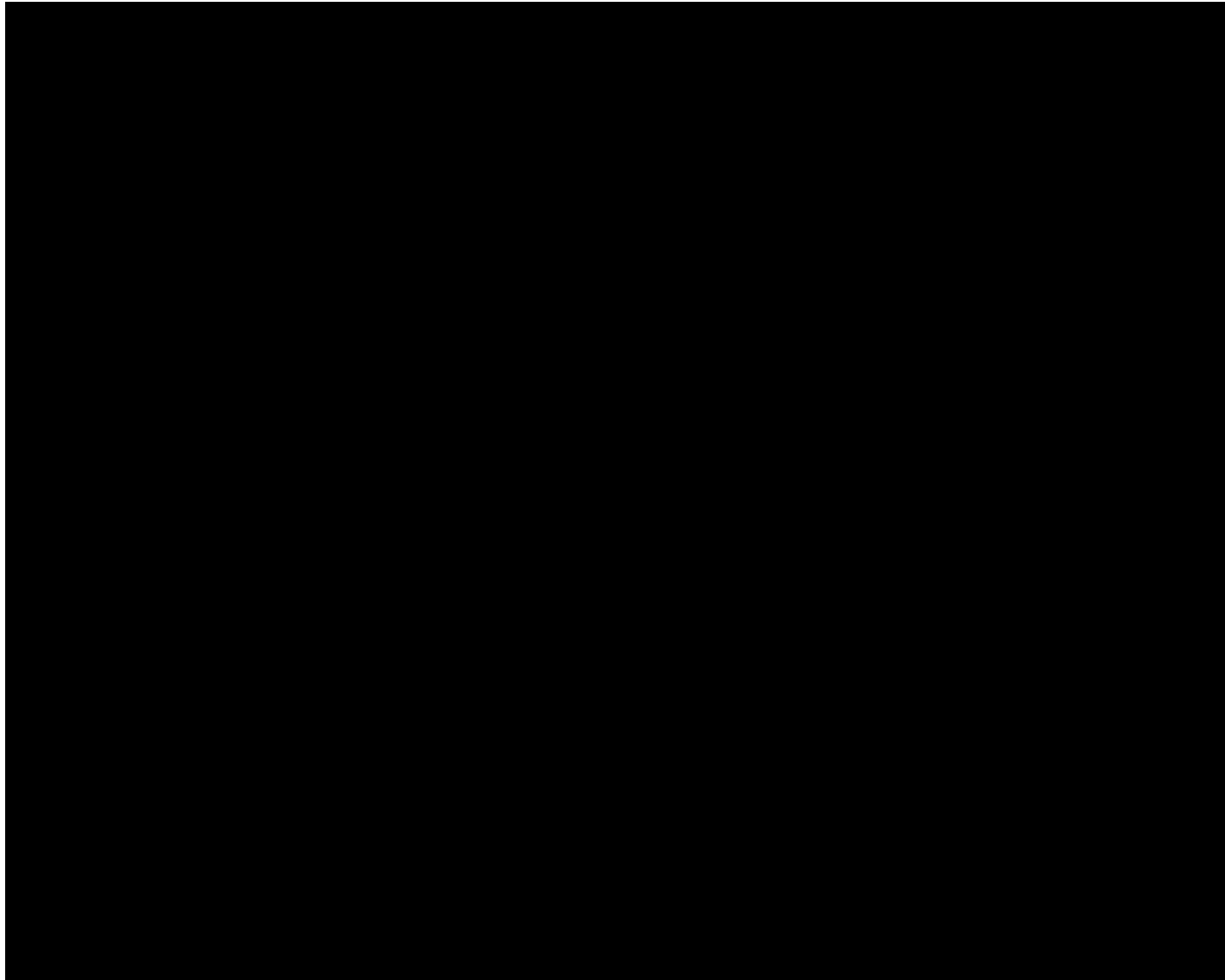
Demo: Vision through Haze



Demo: Hybrid Vision



Demo: Night Vision



“There are costs and risks to a program of action, but they are far less than the long-range risks and costs of comfortable inaction.”

John F. Kennedy

Thank You!