Airborne Imaging and Recording System (AIRS)

and

WB-57 Ascent Video Experiment (WAVE)

General Overview

July 28, 2009

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WB-57 Ascent Video Experiment (WAVE)

The WAVE project was conceived in response to the CAIB recommendation R3.4-1 to "...consider using mobile platforms to provide additional views of the Shuttle during launch."

The WAVE flight system consists of two WB-57F aircraft each carrying identical nose mounted sensor systems and associated support equipment at an altitude up to 60,000 feet.

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WAVE - System Components

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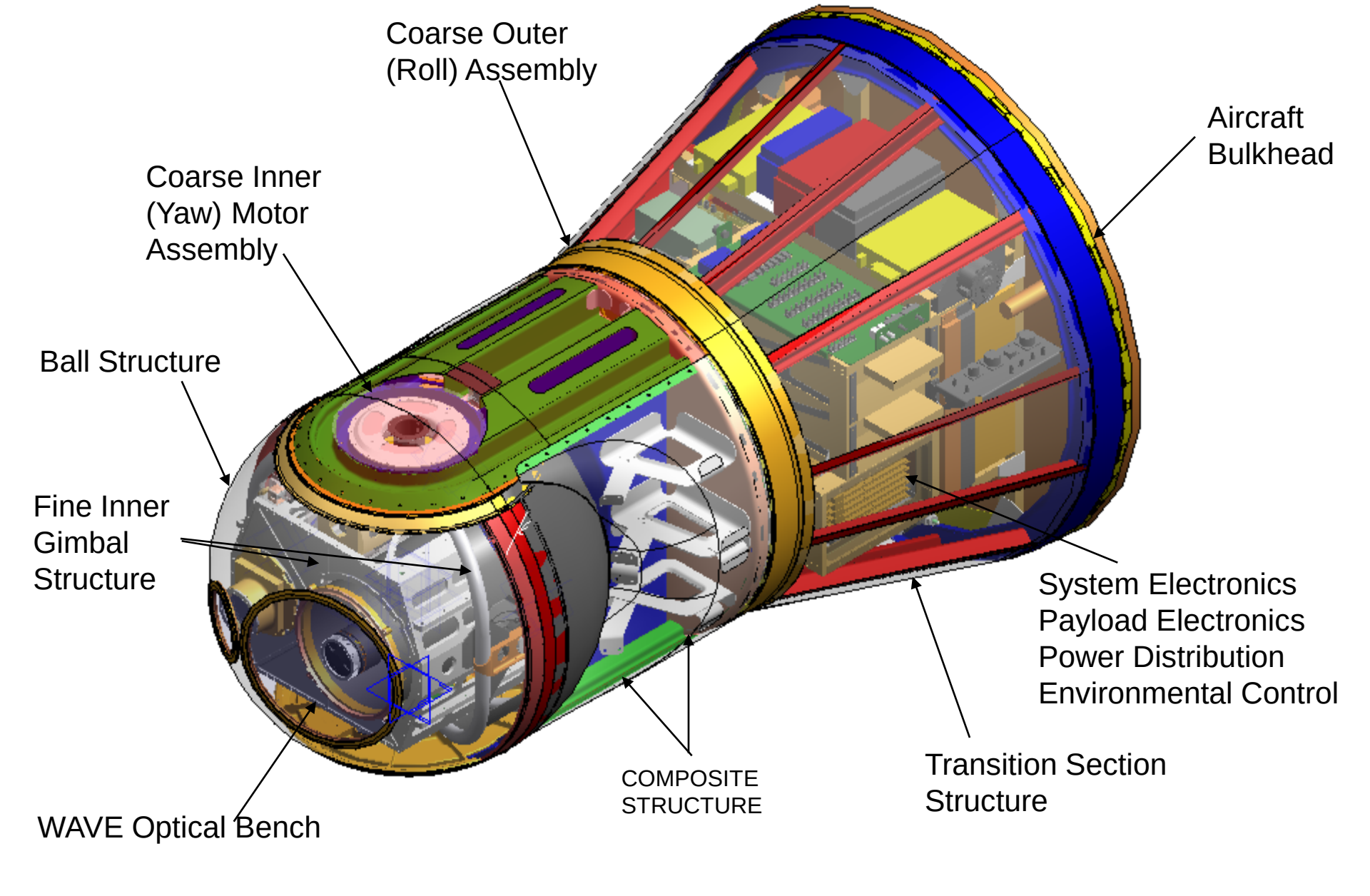
WAVE System Overview



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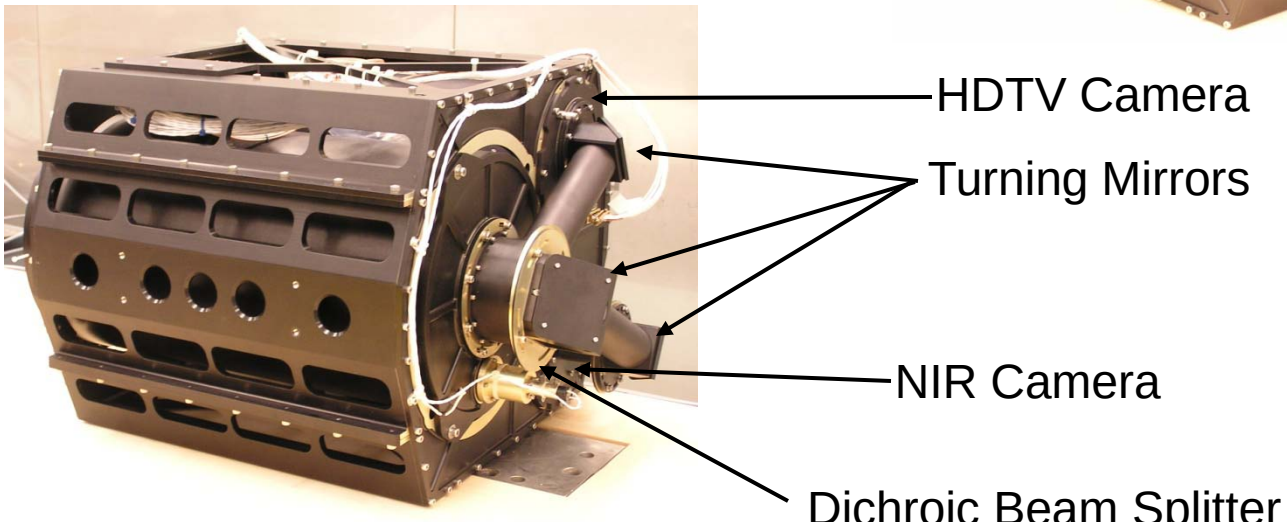
Turret Performance Parameters

Parameter	
Coarse Outer Axis (Roll) Angular Range	±110°
Coarse Inner Axis (Yaw) Angular Range	+105° to -180º
Fine Inner Axes Angular Range	±5°
Maximum Inertial Rates (LOS)	30°/sec.
Maximum Inertial Acceleration (LOS)	90°/sec.^{2}
Position Sensor Accuracy for Inertial Track	0.0175°
Position Sensor Resolution	18 bits -> $2\pi/2^{18}$ = 24μRad.
Stability (Goal, HD Requirement)	5μRad.

WAVE Optical Bench



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WAVE Optics & Cameras

- 4150mm Primary Lens
  - 11” primary aperture reflector lens
  - Same lens for both HDTV & NIR
  - Dichroic Beam Splitter & turning mirrors to split optical wavelengths
- HDTV Camera
  - 1280x720 60P Box Camera (same as ground system cameras)
    - $0^{o}8$’ horizontal angle of view for HDTV (13% of 1^{o})
    - 277’ x 156’ FOV at 120,000’
- Near IR Camera
  - 640x480 30 P
  - 900 – 1700 nm wavelength
  - $0^{o}13$’ horizontal angle of view for NIR (22% of 1^{o})
  - 462’ x 370’ FOV at 120,000’
    - NIR camera has larger sensor which gives greater FOV than HDTV
- NTSC Acquisition Camera
  - 22X Lens
  - $16^{o}4$’ horizontal FOV wide
    - 6.4 statute miles x 4.8 statute miles FOV at 120,000’
  - $0^{o}44$’ horizontal FOV tight
    - 1540’ x 1155’ FOV at 120,000’

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Optical Bench in Azimuth Gimbal

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SEO Control Panels

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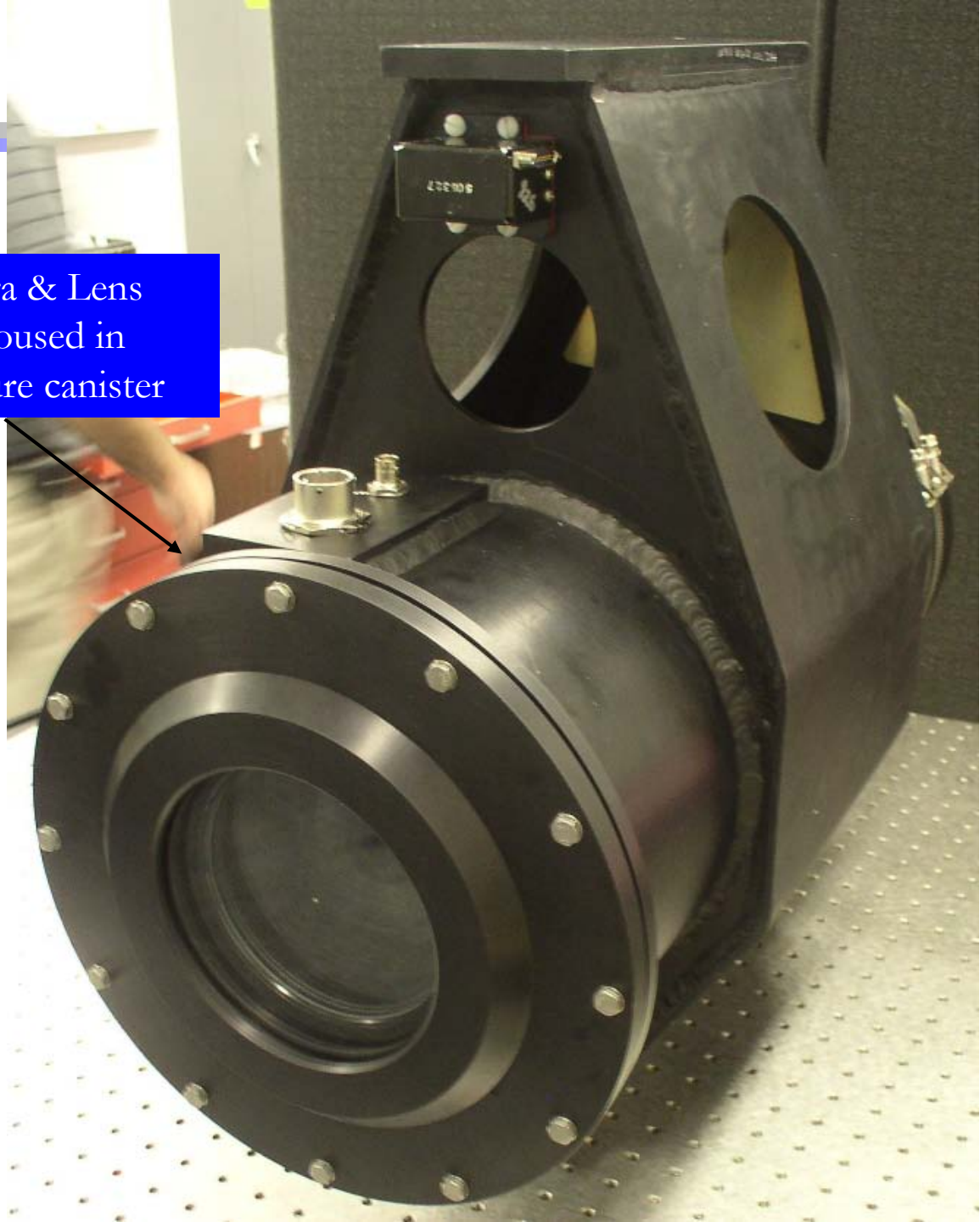
Optical Bench

Zoom Lens and HDTV Camera



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HDTV Camera and Lens Spec.

HDTV Camera	1280 x 720 pixels, progressive scan
Frame rate	60 frames per second
Focal Length	27 - 1140mm
Type	Refractive, Zoom 42:1
Pixel size @ 50K’	3.94 inches (@ max zoom)
Footprint @ 50K’	420’ x 237’

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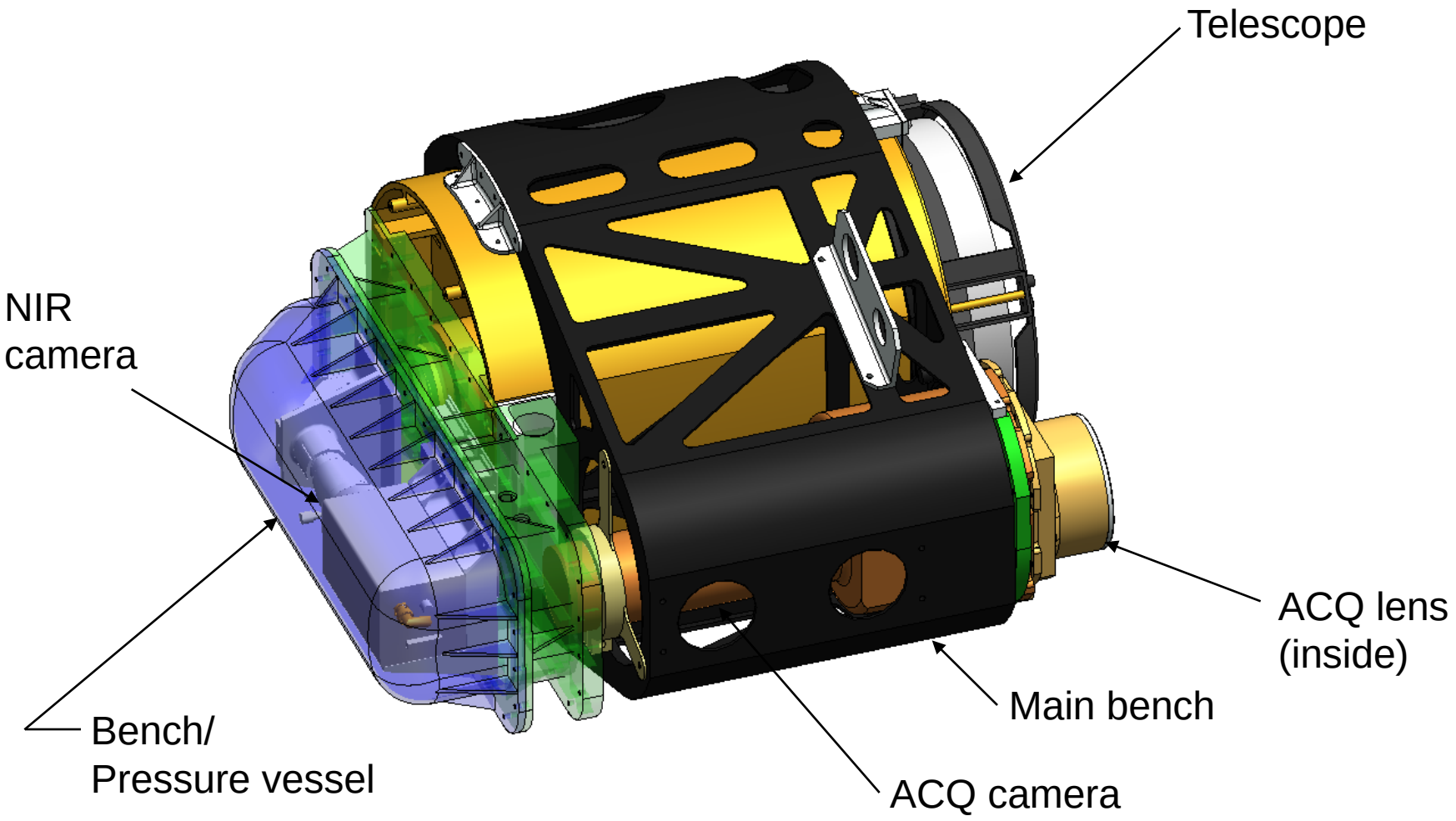
WAVE II Optical Bench

- with Near Infrared Camera (under development)



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WAVE Sample Imagery 50K' Alt.

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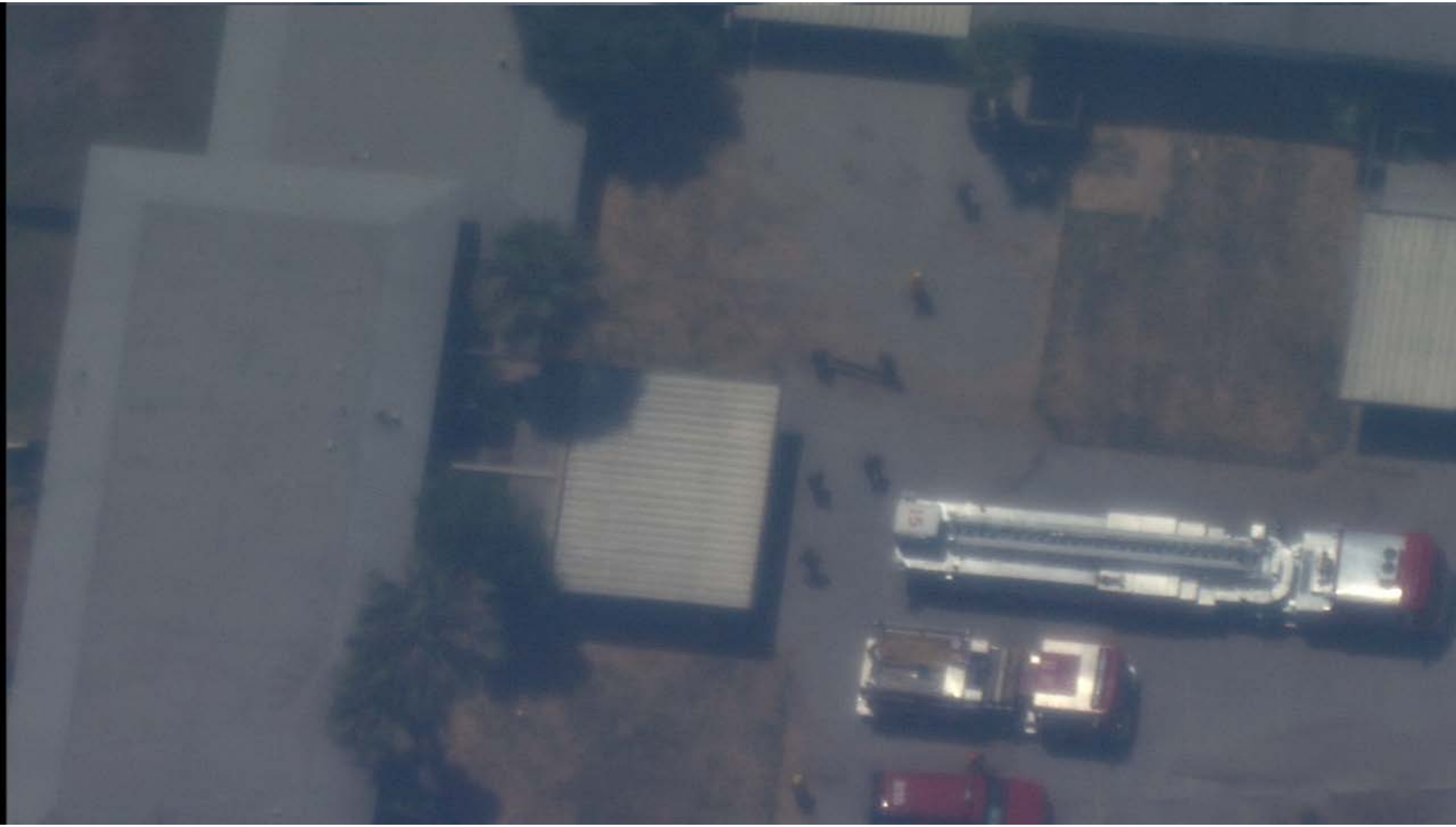
WAVE Sample Imagery 50K' Alt.



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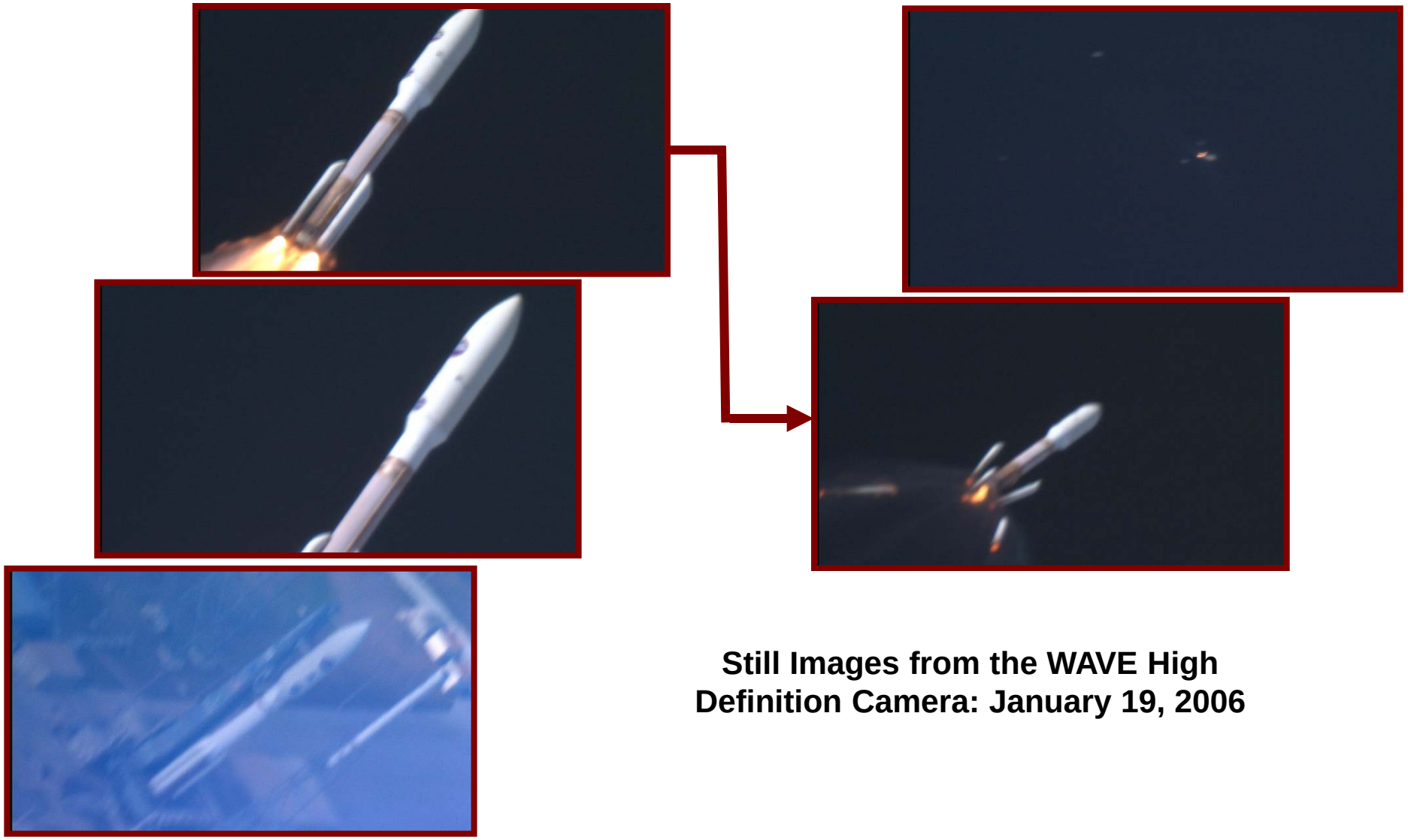
Pluto New Horizons Launch



Still Images from the WAVE High Definition Camera: January 19, 2006

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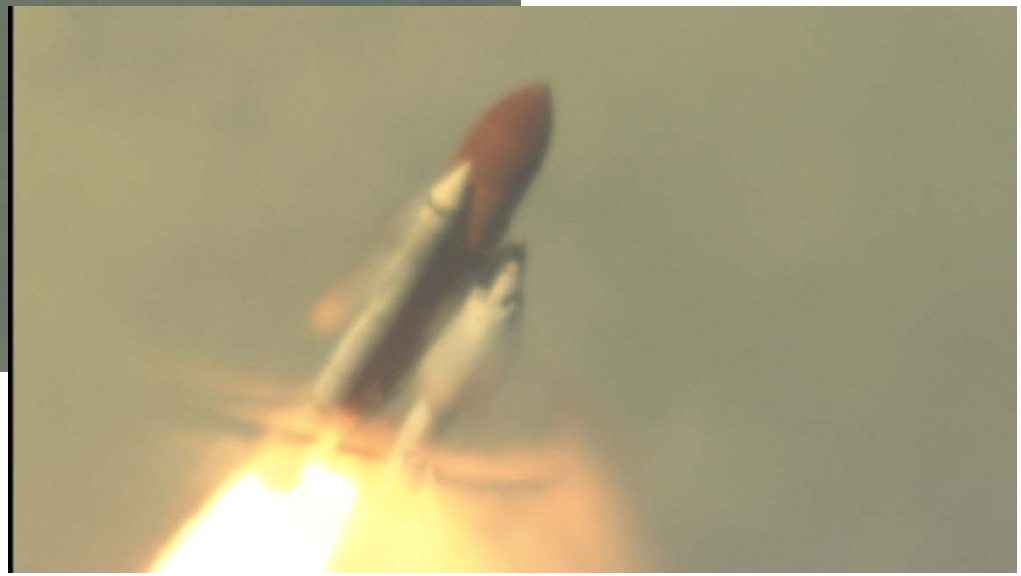
STS-115 Launch



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Questions?

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