



*Wide-Field Infrared Survey Telescope
Astrophysics Focused Telescope Assets
Coronagraphic Science Investigation*

Lockheed Martin Advanced Technology Center

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WFIRST Requirements

- The (WFIRST-AFTA) mission will have a subset of requirements that are critical to the coronagraphic science mission.
- Many of these requirements are associated with the GFE telescope assets and require a thorough understanding of both the system and component level requirements and the baseline performance of the GFE telescope hardware.
- The LM-ATC has a detailed knowledge of the class of telescope assets that are being provided by the AFTA original equipment manufacturer.
- LM also has experience with the manufacturing processes, materials and test capabilities for this class of instrument.

LM-ATC Coronagraph Experience

- **LM ATC has been collaborating with the University of Arizona and the NASA Ames Research Center on exoplanet coronagraphic payloads for the past six years.**
- **EXCEDE PIAA coronagraph demonstration currently being carried out in LM vacuum chamber facility in Palo Alto. (Schneider, Belikov et. al.)**



Understanding Complex Requirements

Requirement / Characteristic	Comments
Mid and high spatial frequency uncorrectable wavefront error minimization	Deformable mirror is capable of low order corrections only
Low order wavefront sensing and control	Low order correction consistent with diffraction limited 2.4 meter aperture
Attitude Control System and LOS control	LOS control consistent with $< 1/10$ diffraction limit of 2.4 meter aperture
Pupil amplitude uniformity	Spatially Variant contamination as well as coating uniformity will affect PSF due to pupil amplitude variations
Polarization characteristics of the optical train	Polarization Maintaining Beam Train Necessary
Thermal control	Room Temperature Control to minimize WFE
PSF contamination by segmented aperture	GFE hardware has secondary mirror support obscuration

Driving requirements and desirable instrument characteristics associated with the WFIRST AFTA Coronagraph mission.

Lockheed Martin Relevant Experience

- Our assessment derives from our experience in line of sight control, Wavefront Sensing and Control, stray light management, and other capabilities required to integrate large precision electro-optical systems.



Hubble Space Telescope prime contractor



Airborne Laser beam control



Lockheed Martin Relevant Experience

- NIRCAM
- IRIS
- GOES-R
- AEHF
- MUOS
- Orion
- GPS III

