

PRECISION OPTICS AND ASSEMBLIES

High-performance, reliable optics for ground and space-based observation

Dazzling details of Earth and insights into the mysteries of the universe have one thing in common – L3Harris precision optics. High-performance optical components and assemblies have been integral to the world's most sophisticated ground- and space-based telescopes and satellites for more than 50 years.

SPECIALIZING IN CUSTOM, LARGE-SCALE OPTICS

L3Harris provides optomechanical design, optical fabrication, test and assembly capabilities for precision optics solutions and systems. The company manufactures large optical components, including lightweight and solid mirrors in most geometric shapes, to meet low surface microroughness and tight surface figure error specifications. This experience, along with a rigorous metrology and testing program and state-of-the-art in-house facilities, enables us to meet demanding quality and delivery requirements.

L3Harris provides solutions for high-performance systems, including:

- > Ground- and space-based telescopes
- > Solid and lightweight optics for autocollimating systems
- > Lightweight fast-steering mirrors
- > High-energy laser optics
- > Optical test systems
- > Relay mirrors
- > Observation and vacuum compatible viewing windows
- > Grating substrates
- > Inspection instruments
- > Interferometers



L3Harris provides precision optics for the most advanced ground telescopes, like the Keck 1 and Keck 2 at the W.M. Keck Observatory in Hawaii

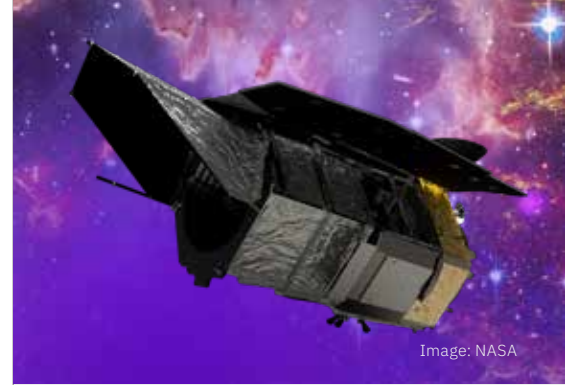


Image: NASA

Wide Field Infrared Survey Telescope (WFIRST)

BENEFITS

- > Meet the most demanding requirements for spatial frequency, mounting and application-specific needs
- > Provide end-to-end capabilities with cost-effective fabrication
- > Create surface finish to less than two-nanometer root mean square (RMS) on glass and glass ceramic materials

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KEY CAPABILITIES

- > Polish aspheric, spherical, and flat surfaces in glass, glass ceramic and crystalline materials up to 3.5 meters with surface figure quality less than 10-nanometer RMS
- > Process both lightweight and solid mirror configurations
- > Employ state-of-the-art deterministic finishing systems, including ion beam figuring, magneto-rheological finishing and small tool processing
- > Provide surface microroughness less than 2-nanometer RMS on glass and glass ceramic materials
- > Meet demanding requirements for spatial frequency, mounting and other application-specific needs
- > Machine complex part geometries by computer numerical control systems

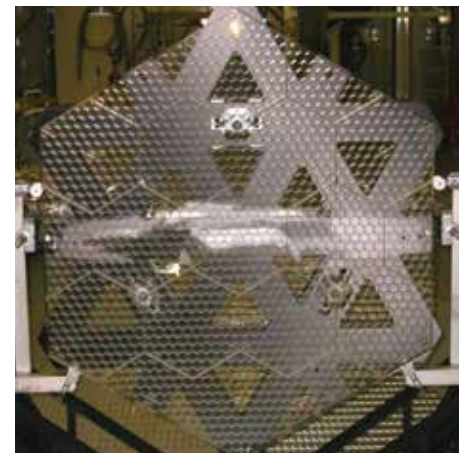
SPECIALIZED TEST SYSTEMS

- > Ritchey-Common test facility for full-aperture flat optics testing up to 1.8 meters in diameter
- > Numerous large vertical test towers
- > 0.9-meter aperture Fizeau interferometer system
- > Capability phase measuring interferometers up to 0.6-meter aperture

| TECHNOLOGIES AND PROCESSES | |
|----------------------------------|--|
| Ion beam figuring | Removes material at the atomic level, converging the optical figure to specification. This provides deterministic processing and exceptional edge control for segmented and full-aperture systems. |
| Magneto-rheological finishing | Provides deterministic finishing and figuring to meet the most stringent requirements. |
| Small tool processing | Processes surfaces to optical surface figure to within a few microns. |
| Specialized coatings | Provide high-reflectance protected silver and aluminum coatings with low stress and high durability. |
| Testing and metrology | Accommodates optics as large as 3.5 meters with ASC 9100 / ISO 9001:2008 certified accuracy to less than 10-nanometer RMS. |
| Simulation of space environments | Compensates for gravity and vacuum from 300° K to 30° K. |
| Assembly facilities | Provide clean environments using certified, experienced professionals. |

PROGRAMS OF NOTE

- > Chandra X-ray Observatory
- > James Webb Space Telescope (JWST)
- > Wide Field Infrared Survey Telescope (WFIRST)
- > Large Synoptic Survey Telescope (LSST)
- > Thirty Meter Telescope International Observatory (TMT)
- > DigitalGlobe's IKONOS, Quickbird
- > GeoEye-1 and WorldView-1, -2, -3
- > Lawrence Livermore National Laboratory National Ignition Facility



Primary mirror segment for deep-space optical system

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Nonexport-controlled Information

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.



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