



INNOVATIVE ANTENNA SOLUTIONS FROM CONCEPT TO CREATION

PRODUCTS & IN HOUSE CAPABILITIES

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INNOVATIVE ANTENNA SOLUTIONS FROM CONCEPT TO CREATION

Haigh-Farr has been providing mission critical antennas and support equipment to the defense, aerospace, and commercial industries worldwide since 1969.

From concept to creation, we handle all aspects of the design, build, and test of our hardware in house. Our state of the art facility, leading edge manufacturing and testing equipment, and experienced staff ensures our proven history of flight success continues.

Custom Antenna Design

Advanced Computer Simulation Modeling

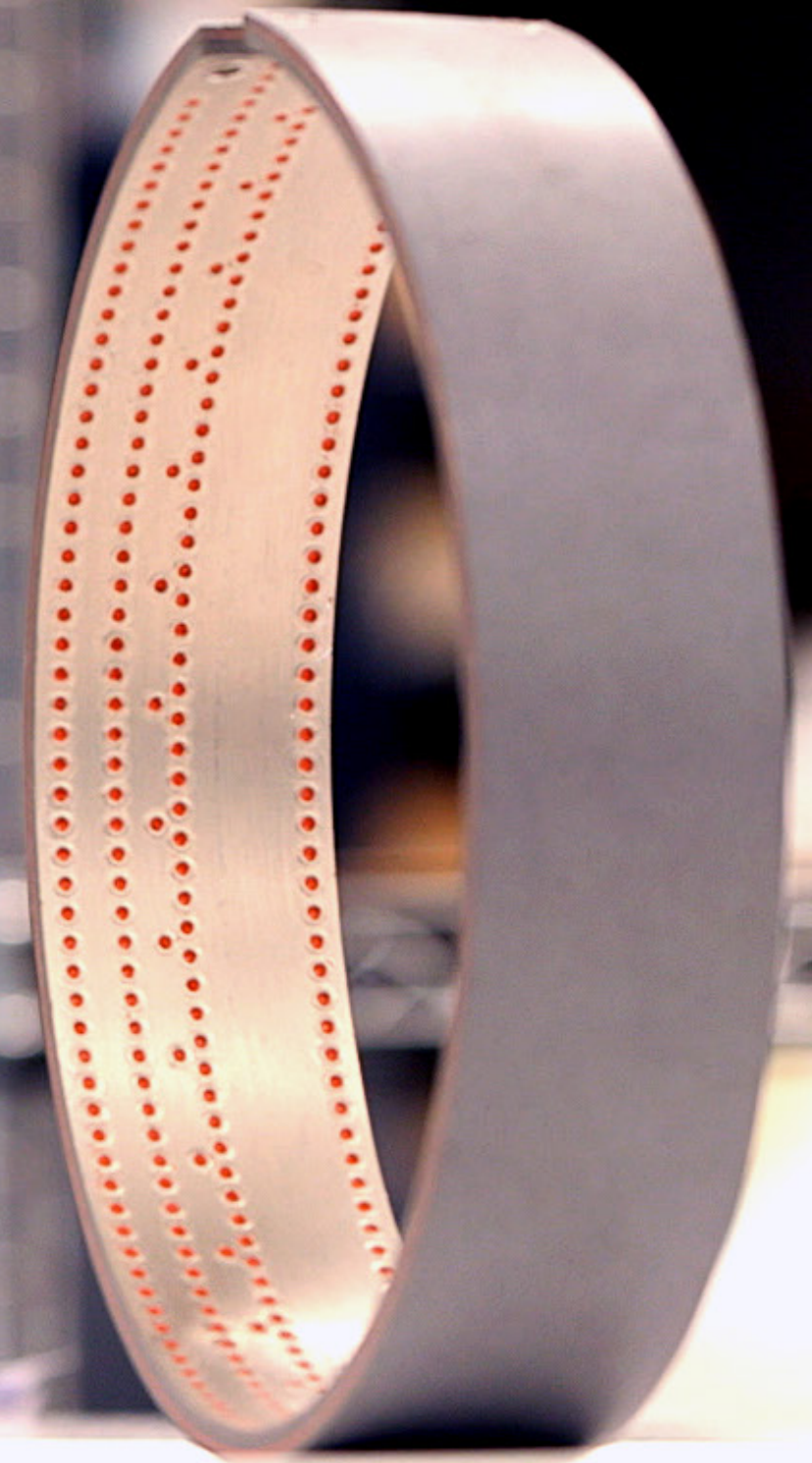
Manufacturing

Environmental Testing

RF Testing

Full Size and Scale Modeling

Product Hardware Selection



CUSTOM SOLUTIONS

Haigh-Farr specializes in custom antenna design.

Haigh-Farr has a proven track record designing and providing reliable high performance antenna solutions since 1969. Our team of experts take a consultative approach to antenna design, partnering with our customers on application requirements and making recommendations for the optimal solution. Our engineers have experience adapting our technology to provide solutions for a vast array of applications, from robust designs for launch vehicle environments through size and geometry constraints of satellite applications.

With our heritage of flight proven designs to draw from and our complete on-site manufacturing and testing capabilities, our engineers see customized solutions through from concept to creation.

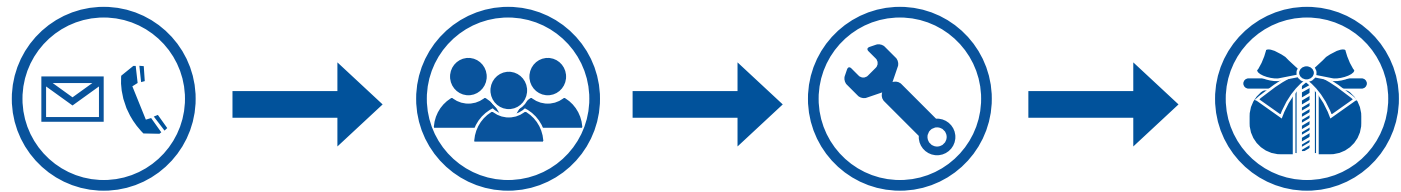


Ready to get started

Please complete our Antenna Questionnaire with information about your needs, vehicle and mission environments.

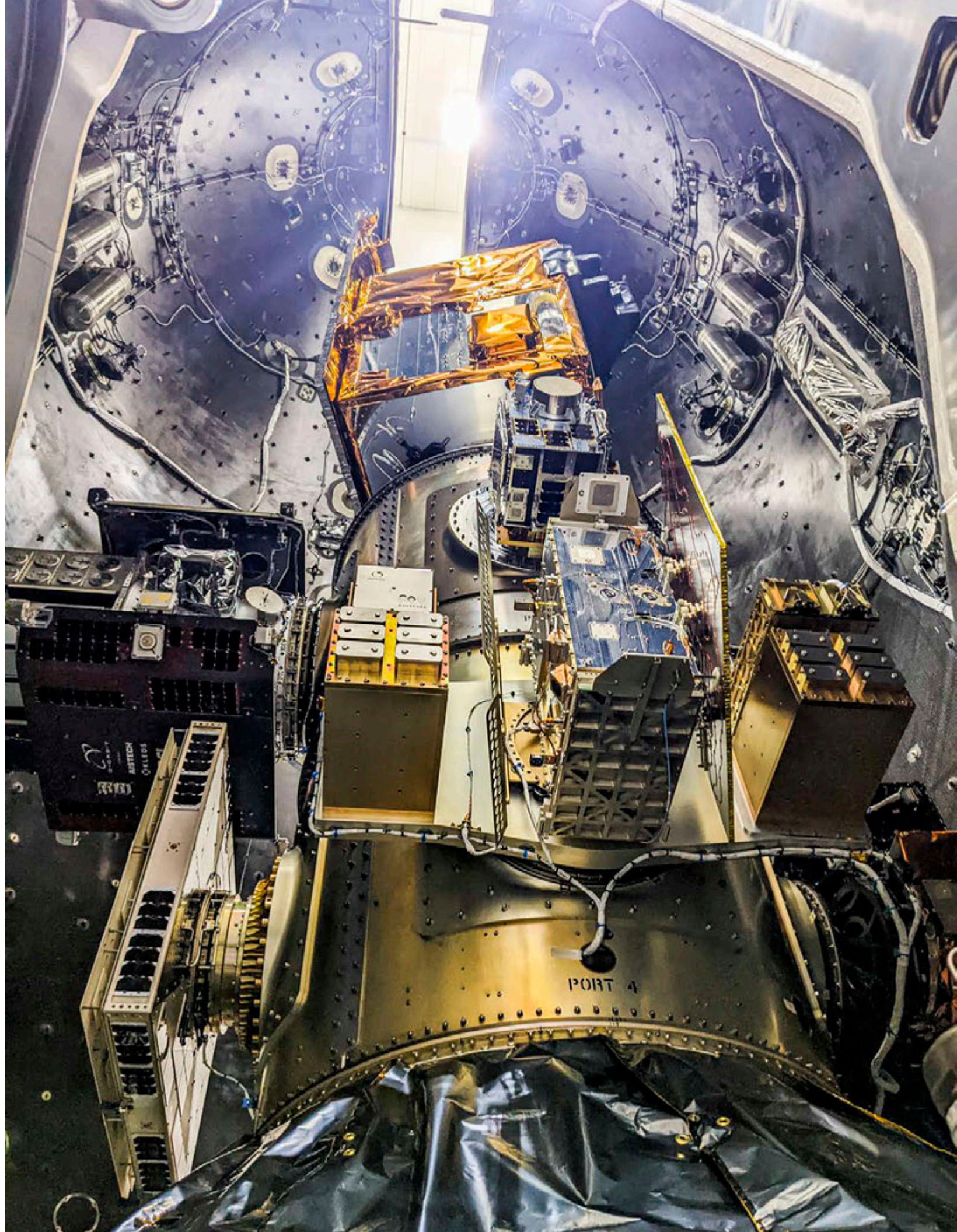
Our team of Engineers will develop a solution for you

A custom solution developed specifically for your mission



Contact Us with your mission requirements

We design, build and test your part



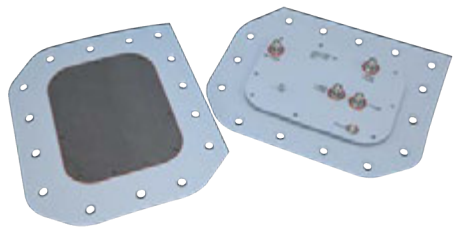
CUSTOM SOLUTIONS – THE HAIGH-FARR ADVANTAGE

Haigh-Farr has a longstanding history in the design, manufacture and test of antennas for high-performance aerospace applications.

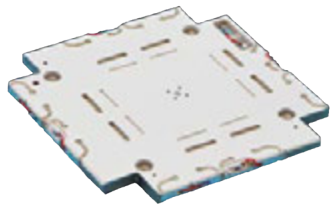
Our team of experienced engineers routinely draw upon previously engineered products as baselines for new approaches to customer-specific applications. This ability to leverage our proven history often results in shorter design cycles and cost savings for our customers.

We continue to customize our technology to meet our customers' needs:

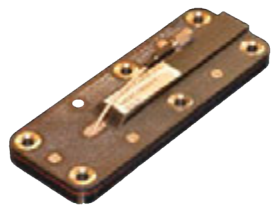
- Antennas for Harsh Environments
- High Frequency Antennas
- High Gain Antennas
- Custom Geometries
- Unique Antenna Applications
- Electronically Steerable Arrays (ESA)



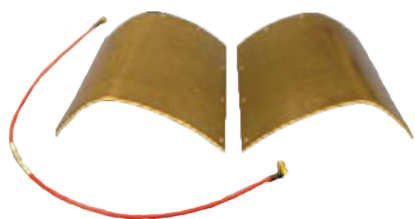
Antennas integrated into access panels.



Non-antenna functionality integrated into patch antenna.



Antennas used for proximity sensing application.



Antennas formed in complex conformal shapes.



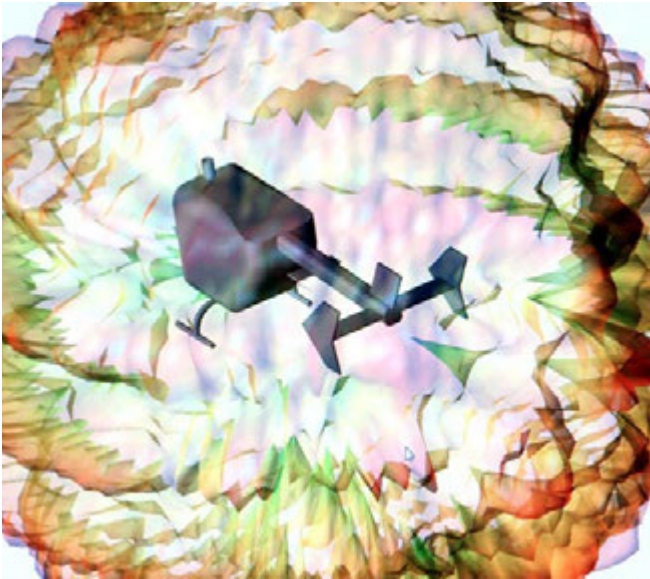
Photo Credit: United States Air Force.

ADVANCED COMPUTER SIMULATION MODELING

Haigh-Farr combines its expertise in antenna design with specially developed software tools to simulate the performance of antennas in real world environments.

Complex shapes in the working environment of the antenna can affect the radiation patterns in an unanticipated manner. The resulting change in the coverage may adversely affect the performance of the communication link. In order to avoid costly and time consuming trial-and-error procedures to fix these problems, computer modeling is used to optimize the performance of the antenna in its actual environment.

Early in the design cycle simulation may be used to change the shape and spacing of structures to further increase antenna performance. Simulation is also used to optimize the performance of complex arrays of antennas by modeling the electrical, mechanical and spacing parameters of the antennas to mitigate the effect of nearby antennas.

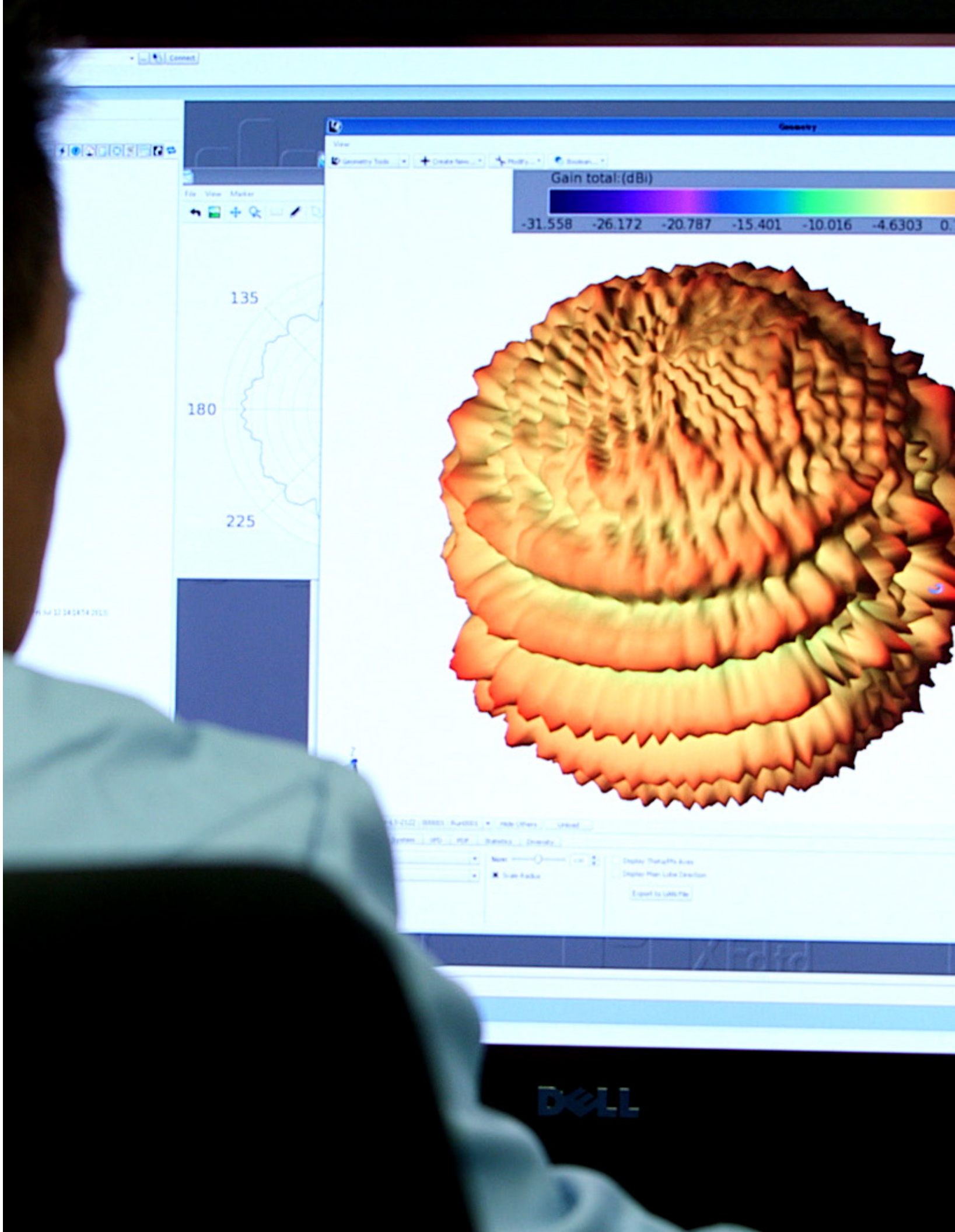


BENEFITS & FEATURES

- Used to simulate antenna performance of complex antenna configurations
- Used to simulate antenna performance on vehicle prior to manufacture
- Provides far field views of radiation patterns and the effects of vehicle protrusions, e.g., wings, fins, etc.
- Reduces development time by minimizing 'build and test' cycles
- Capable of simulating full model of many vehicles including launch vehicles, missiles, UAVs, cars, etc.
- Provides optimized positioning of antenna for best radiation performance

TYPICAL APPLICATIONS

- Aircraft, Helicopters
- UAVs
- Spacecraft, Launch Vehicles, Rockets
- Ships and Ground Vehicles
- Structures, such as oil rigs and towers

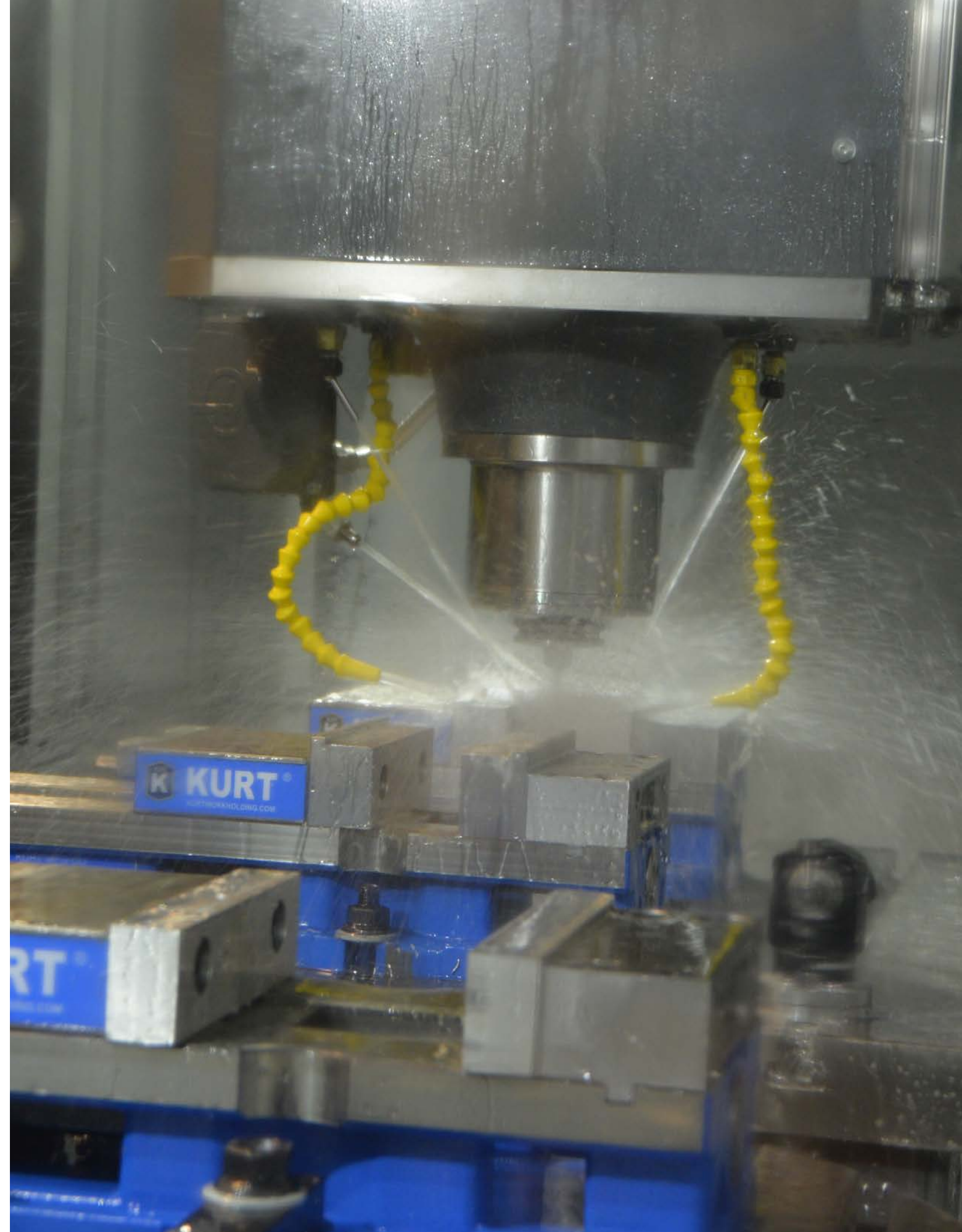
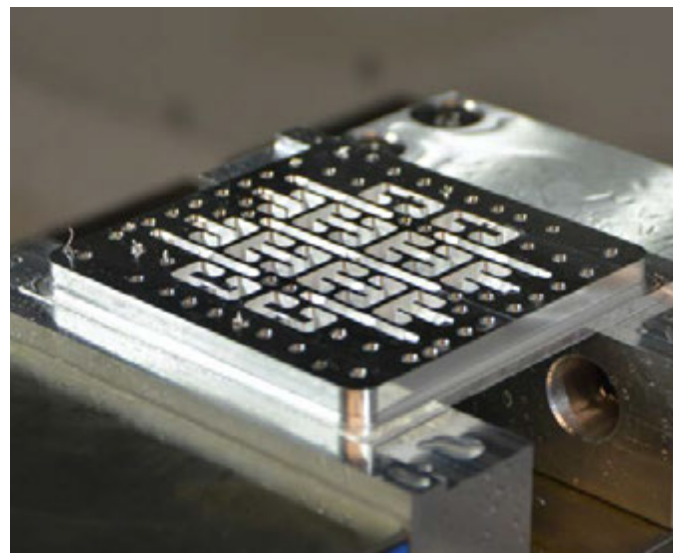


MANUFACTURING CAPABILITIES

All Haigh-Farr hardware is manufactured in house in our 67,500 sq. foot facility. Our manufacturing facility follows stringent quality control systems working to military standards, AS9100D and customer certification requirements.

Our state of the art manufacturing equipment include:

- HAAS Machine
- Laser Reflow Soldering
- Plating
- CNC Turning Centers
- Drilling Machines
- Curing Ovens
- High Capacity Fusion Bonding
- Vertical Machining Centers
- 3D Printer



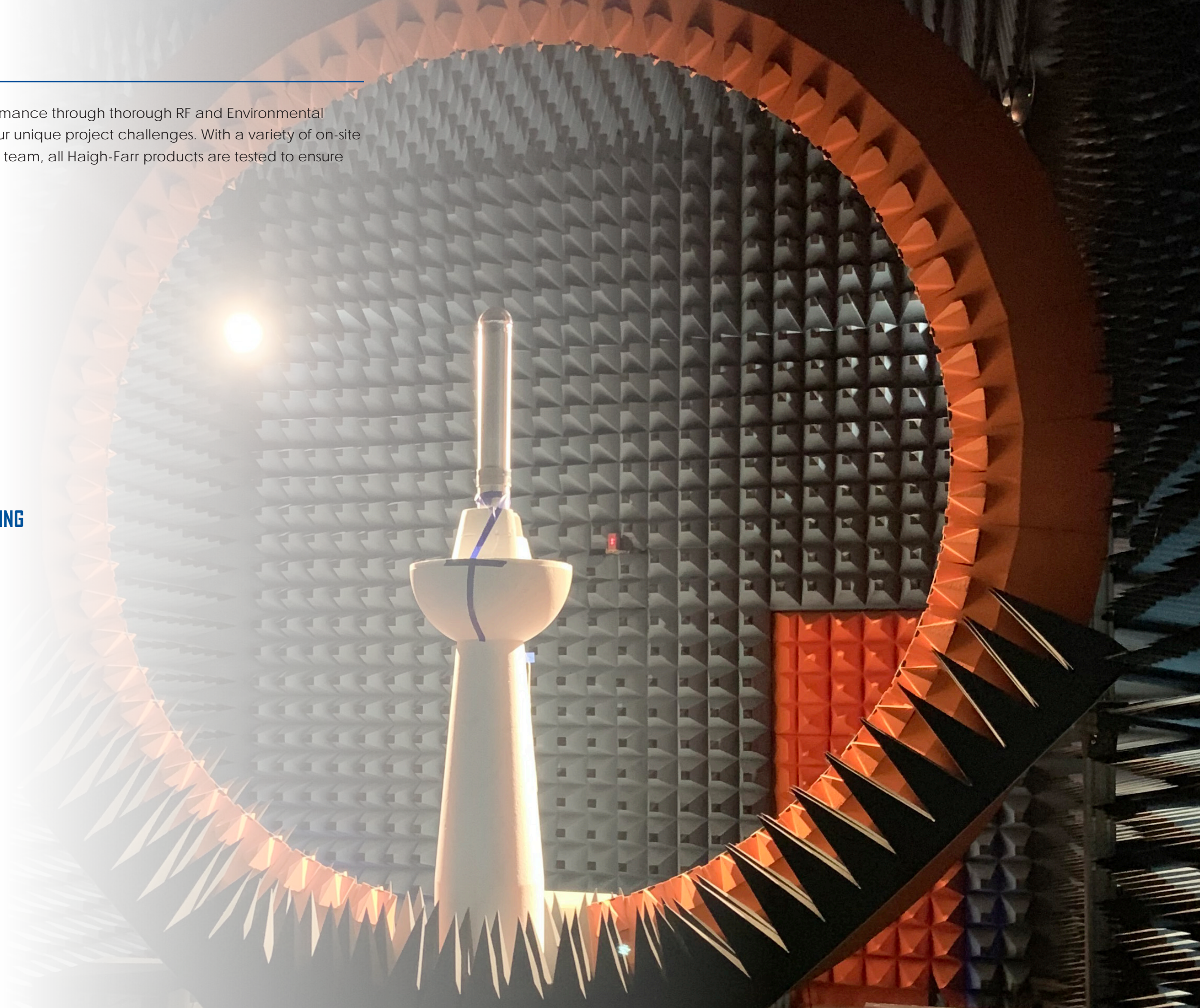
OUR TESTING CAPABILITIES

We ensure our hardware's survival and performance through thorough RF and Environmental testing, which can be customized to meet your unique project challenges. With a variety of on-site testing and a dedicated and talented testing team, all Haigh-Farr products are tested to ensure hardware success.

ENVIRONMENTAL TESTING

RF TESTING

FULL SIZE AND SCALE MODELING



ENVIRONMENTAL TESTING

Haigh-Farr offers a robust test program to ensure hardware will survive and perform in many extreme environments.

THERMAL CHAMBERS

Eight Thermal Chambers with temperature range -184 to +350°C.

HUMIDITY CHAMBERS

Two Humidity Chambers

VIBRATION / SHAKER

Two UD T2000 shakers with 480 KVA power supplies and extended displacement (3"). 25000 lbf sine vibe. 24000 lbf random vibe. Capable of 200g sine vibe (may be limited to lower values depending on test article size and test frequency) and 200 gRMS random vibration (may be limited to lower values depending on test article size and vibration spectrum). Custom thermal shrouds designed specifically for antenna vibration testing at hot and cold temperatures.

THERMAL VACUUM

Thermal Vacuum chamber custom designed and built specifically for antenna testing (Chamber is anechoic). Temperature range -185 to >+250°C. Minimum Pressure <10⁻⁵ Torr. Used primarily for high power testing in vacuum environment.

SHOCK

MGA Pneumatic impact resonant beam shock machine. Max shock level dependent on test article size. Capable of 100,000 g SRS shock to bare beam.

ULTRALOW TEMPERATURE

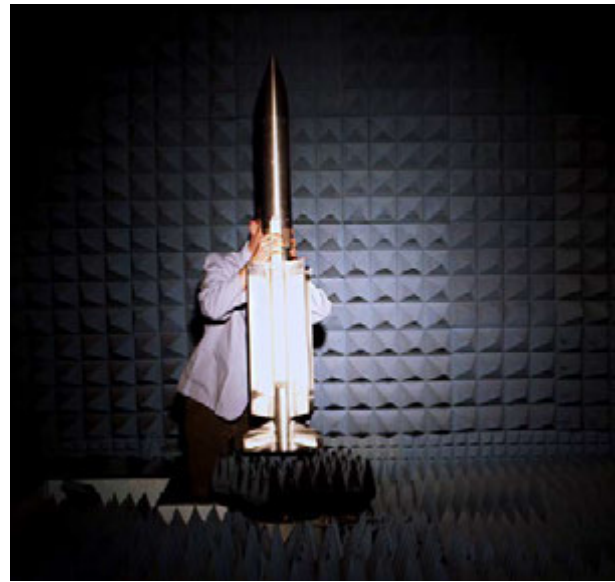
Liquid helium based cryostat designed specifically for antenna testing. Capable of temperatures down to -273 C.



RF TESTING

Haigh-Farr has four anechoic test chambers in-house:

- One for low frequency work between 300 MHz to 13.5 GHz applications
- One for higher frequency work between 1.5 GHz to 26.5 GHz requirements
- MVG Stargate Spherical Nearfield Antenna Measurement System, 200 MHz to 18 GHz. Max test article size ten feet long and six feet in diameter, larger test articles are possible with appropriate fixturing.
- NSI-MI Spherical Nearfield Antenna Measurement System, 200 MHz to 18 GHz. Max test article size six feet long and six feet in diameter.



FULL SIZE AND SCALE MODELING

Haigh-Farr's RF testing capabilities allow us to simulate the RF characteristics of our antennas on the intended vehicle through full size and scale modeling. This testing is particularly appropriate and important when complex vehicle shapes, fins, stabilizers, wings, raceways, or blades are part of the final system architecture. These external influences can cause perturbations or parasitic effects on antenna radiation performance. Knowing if and where there are issues early in the process is the best way to mitigate the situation when possible.

Haigh-Farr's RF testing capabilities can encompass full-sized, reduced but scaled, and/or simple ground plane modeling in one or more of our four anechoic chambers.





Photo Credit: ULA

PRODUCT HARDWARE SELECTION

Haigh-Farr offers a variety of customizable and off-the-shelf antennas designed for specific applications. Antennas from UHF through Ka Band.

- PASSIVE ANTENNAS -

WRAPAROUND™ ANTENNAS



- Omnidirectional: full spherical coverage
- 300 MHz to 13 GHz
- Multi-channel designs
- Single point feed
- No external dividers and cables required
- Conformal - flush or external mounting
- Fastened and/or bonded to the vehicle
- OEM or retro-fit applications
- High aero-heating protection available
- Rugged construction - designed for high G, high radial G (spinup), and extreme vibration environments
- Applications: flight termination, GPS, telemetry, & transponder

FLEXISLOT™ ANTENNAS



- Omnidirectional: full spherical coverage
- 300 MHz to 13 GHz
- Multi-channel designs
- Single point feed
- No external dividers and cables required
- Thin aerodynamic shape
- Conformal - flush or external mounting
- Fastened and/or bonded to the vehicle
- OEM or retro-fit applications
- High aero-heating protection available
- Rugged construction - designed for high G, high radial G (spinup), and extreme vibration environments
- Platforms: launch vehicles, rockets, missiles, drones, spacecrafts, and other unique applications

OMNISLOT™ ANTENNAS

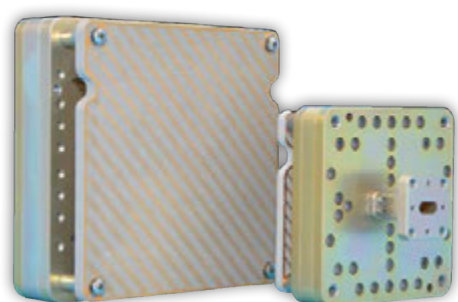


- Omnidirectional in Azimuth
- Designs from 300 MHz to 13 GHz
- Conformal - flush or external mounting
- Fastened and/or bonded to the vehicle
- Thin Fabrication .085" to .300"
- High aero-heating protection available
- Rugged construction - designed for harsh elements
- Platforms: missiles, drones, aircrafts, & missed distance targets
- Applications: data links, telemetry, & transponder



PATCH ANTENNAS

- Coverage -Omni-spherical, Hemispherical, Directional, Beam
- Designs from 150 MHz to 26 GHz
- Conformal - flush or external mounting
- Fastened and/or bonded to the vehicle
- Thin Fabrication - as thin as 0.03"
- High-aero heating protection available
- Rugged construction - designed for harsh environments
- Applications including data links, telemetry, & transponder
- Platforms: aircrafts, helicopter, drones, imaging down, missed distance targets, & missiles



WAVEGUIDE ANTENNAS

- Often replace coaxial cables because of small wave lengths
- Waveguides both Internal to assembly plus adaptors/ connectors for mating to customer interfaces
- No kinking or bending of RF path w/ guides over cables
- Particularly applicable to Ku and Ka Band applications
- Polarizers can often be added to waveguide antenna designs



BUTTON ANTENNAS

- Omnidirectional coverage
- Overhead null filled in (model 2107, 13215)
- Frequencies from 350 MHz to 9.6 GHz
- Ultra small footprint
- High impact radome material
- Built to withstand extreme shock and vibration environments
- Applications: data links, telemetry, & transponder
- Platforms: micro aircrafts, missiles, aircrafts, & helicopters, drones, tactical missiles, & small footprint applications



BLADE ANTENNAS

- Omnidirectional coverage
- High-power options available
- Overhead null filled in
- Frequencies from 300 MHz to 8 GHz
- Broadband coverage
- Small, compact footprint
- Aerodynamic shape
- Common footprint among all models
- Built to withstand extreme shock and vibration
- Applications: data links, telemetry, & transponder
- Platforms: atmospheric rockets, tactical missiles, helicopters, drones, ships, & ground-based vehicles



- ARRAYED ANTENNAS -

ELECTRONICALLY STEERABLE ARRAY (ESA)

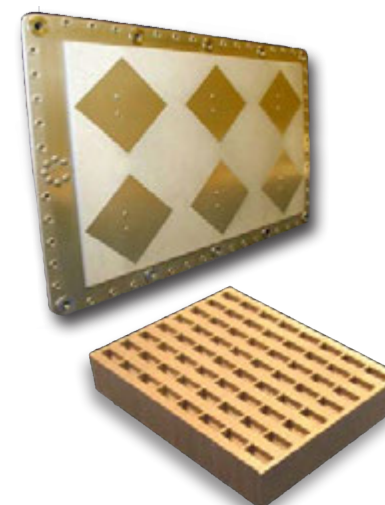
Ideal for applications where multiple, simultaneous, independent beams are necessary or for applications that require one or more highly agile beams.

- Multiple, Simultaneous Beams
- MIMO Compatible
- Fast Target Acquisition
- Modular & Customizable Design
- Digital Beamforming
- Platform/Location Flexible – Ground, Air, Sea



FRPA / CRPA

- GPS - GNSS Frequencies
- RHCP
- SMA or TNC Connectors
- Number of elements can be tailored to individual customer needs
- Element spatial arrangement can be tailored to individual customer needs
- Advanced TPS Material



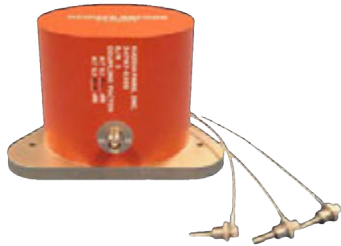
MULTI-ELEMENT FIXED BEAM ARRAY

Fixed beam arrays are simple but powerful extensions of single-element patch designs. By taking individual radiators and arranging them in particular geometries with accompanying directivity, gain can be greatly increased, beams can be shaped and pointed, and radiation coverage can be customized for specific applications.

- Provide multitude of gain and pattern shape
- Wide variety of element spacing
- Multi-channel options
- Benefits of high frequency antennas (namely Ku-Band and up) include wide bandwidth, high gain, and small size

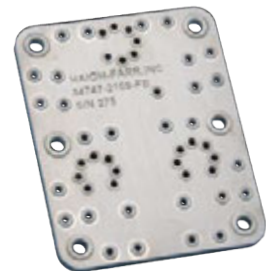
- SUPPORT HARDWARE -

TEST HATS



- Tight EMI seal; leakage typically -80 dB or lower
- Frequencies from UHF to X-Band, Ku and up
- Single or multi-band designs
- Precision fit enables repeatable electrical characteristics when mating/demating
- Secure fastening. Flange designed to naturally mate to cylindrical, conical and other curved surfaces
- SMA, TNC, and other connector options available
- Low outgassing materials available
- Applications: contain RF energy, ground and lab testing, reduced EMI environments, system verification, & late stage testing

POWER DIVIDERS/QUADRATURE HYBRIDS

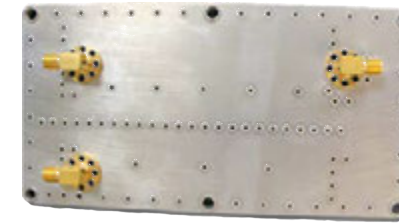


- Frequency from UHF to X-Band
- 2, 3, 4, or 6-way designs
- Equal amplitude distributions, phase progression and quadrature hybrid models available
- Small compact footprint
- Conformal and custom footprints available
- Built for extreme shock and vibration
- Platforms: launch vehicle, atmospheric rockets, spaceship, aircraft, helicopters, UAVs, & multi-element system

POLARIZERS

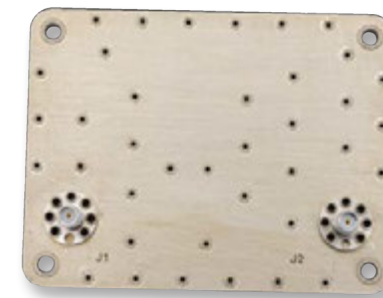


- Designed to change polarization of signal external to antenna
- Highly customizable
- Highly efficient



DIPLEXERS

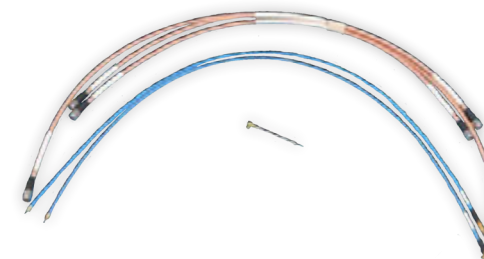
- Multiplexes RF signals at different frequencies onto one coaxial line in one direction or splits out already multiplexed signal into separate RF signals at unique frequencies in the other direction
- Simple geometry and compact size make our style of diplexers appealing for many applications.
- Filtering is possible even though resonating cavities are not part of our designs
- A variety of connectors and hardening of assemblies/casings are possible to meet specified environmental requirements



FILTERS

- Simple but effective passive designs
- No active components with infant mortality or EMI/EMC issues to address
- No external power needed for designs to function
- Good isolation possible at many different frequency bands
- Contact Haigh-Farr to discuss specific applications and requirements

CABLES



- Often not considered critical but usually are when it comes to RF system design
- Haigh-Farr cables take into account the criticality of design matching application—more severe environments call for ruggedized cables
- Phase matching for multi-cable applications is standard unless specified otherwise by the customer
- A variety of cable materials can be used to accommodate for different bending radius needs, insertion loss requirements, dimensioning limitations, and mass restrictions
- Contact Haigh-Farr for details as cables are completely customized products



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