



# Design Engineering, Analyses & Verification

*Spaceflight, Ground and Commercial  
Market Applications*



KBR space, engineering and operations professionals bring a proven track record and more than 30 years of design engineering and subject matter expert (SME) experience. KBR offers complete design lifecycle services, including requirements development, concept creation, detail engineering design, computer-aided design (CAD) models and drawings, fabrication, analysis packages, and verification and validation (V&V) for product and infrastructure needs.

## AREAS OF EXPERTISE

KBR experts have extensive knowledge in engineering disciplines of fluids, thermal, structural, electrical and systems engineering as well as aerospace ground system development for both government and commercial launch service providers. We support suborbital, orbital and point-to-point systems.

### Systems Engineering:

- Requirements, Specifications, Test Procedures, MBSE, Risk Management
- Product Lifecycle, Concept of Operations, V&V

### Design Engineering:

- Electrical, Wire Harnesses, Power Systems
- Mechanical/Structure CAD Design, PTC CREO, Finite Element Analysis
- Unique Mechanisms, Launch Mast Structures, Umbilical, Handling Equipment
- Thermal/Fluids, Computational Fluid Dynamics, Heat Transfer
- Propulsion, Aerodynamics Loads, Pressures, Exhaust Plumes, Sound Suppression

### Systems Analyses:

- Advanced High Temperature Gas Turbine Blade Cooling
- Advanced Cooling Techniques for Electronics Packaging, etc.
- Structural and Mechanical Systems Analysis (Fatigue, Kinematics, Dynamic, Thermal and Fluids)
- Fluid Process Analysis (Computational Fluid Dynamics), Cryogenics (Propellants and Fuel Cells), Hydraulic, Pneumatics and Thermal Systems

### Manufacturing, Integration & Test:

- Rapid Prototyping, Test Fixtures, Integration
- Friction Stir Welding

## PAST PERFORMANCE – PROVEN RESULTS

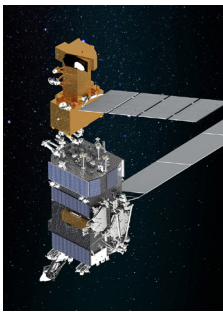
KBR offers innovative design and analysis expertise designing, building and delivering critical propellant transfer systems and ground support equipment subsystems for the aerospace industries. Examples of work includes:

- Engineering, analyses and manufacturing/production support to SLS Core Stage and Exploration Upper Stage spacecraft programs.
- Engineering, Procurement and Construction (EPC) for a large transport erector mast primary structure, including joint design and development of approved for construction (AFC) drawing package.
- Engineering, procurement and con-ops development, including line sizing and analysis for LNG, LN2, vent lines and pressure vessel code calculations for rocket engine test stand modifications.



## PAST PERFORMANCE – PROVEN RESULTS *cont.*

- Propulsion systems: development of an engineering tool to simulate the propellant storage, transfer and thruster system characteristics to identify and mitigate undesired inefficiencies and optimize system efficiency. Con-Ops development defining operational scenarios to predict fuel and oxidizer usages and storage requirements.
- Providing overall engineering, systems engineering and MBSE support for the Space Nuclear Propulsion Technology Evolution.
- Providing engineering, analysis and testing services for on-orbit Propellant Transfer Subsystem (PTS) including a Hose Management Assembly (HMA) and zero-g rated fluid components.
- Supporting the development of design and procurement specifications for a large-scale cryogenic hydrogen liquefaction plant.
- Developing Con-Ops and providing design, analysis and AFC drawing package for a flame diverter assembly.



## WHY KBR?

KBR specializes in proof-of-concept technology development, AFC design packages, and engineering support for fabrication, assembly, integration, test and analysis to ensure mission success at all stages of the design lifecycle. KBR also implements engineering and analysis services early in the design phase to identify potential failure points to reduce project risks. As part of this process, KBR engineers assist with materials selection, constructability and maintainability with a focus on minimizing costs while ensuring products meet all code and performance requirements. KBR is committed to hardware integrity and personal safety. This experience affords KBR's customers an advantage in resolving and completing engineering tasks on schedule and at a competitive cost.

## NEXT STEPS

Let's talk about your engineering design projects and how KBR can help you achieve them. Contact us to learn more and schedule a consultation on Launch & Processing Infrastructure with Don Jennings at [Donald.Jennings@us.kbr.com](mailto:Donald.Jennings@us.kbr.com) or Vehicle Design Engineering & Verification with Tim Smith at [Timothy.Smith2@us.kbr.com](mailto:Timothy.Smith2@us.kbr.com).

## ABOUT US

We deliver science, technology and engineering solutions to governments and companies around the world. KBR employs approximately 30,000 people performing diverse, complex and mission critical roles in 34 countries.

KBR is proud to work with its customers across the globe to provide technology, value-added services, and long-term operations and maintenance services to ensure consistent delivery with predictable results. At KBR, We are the Team Behind the Mission<sup>SM</sup>.