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SPACE

Component

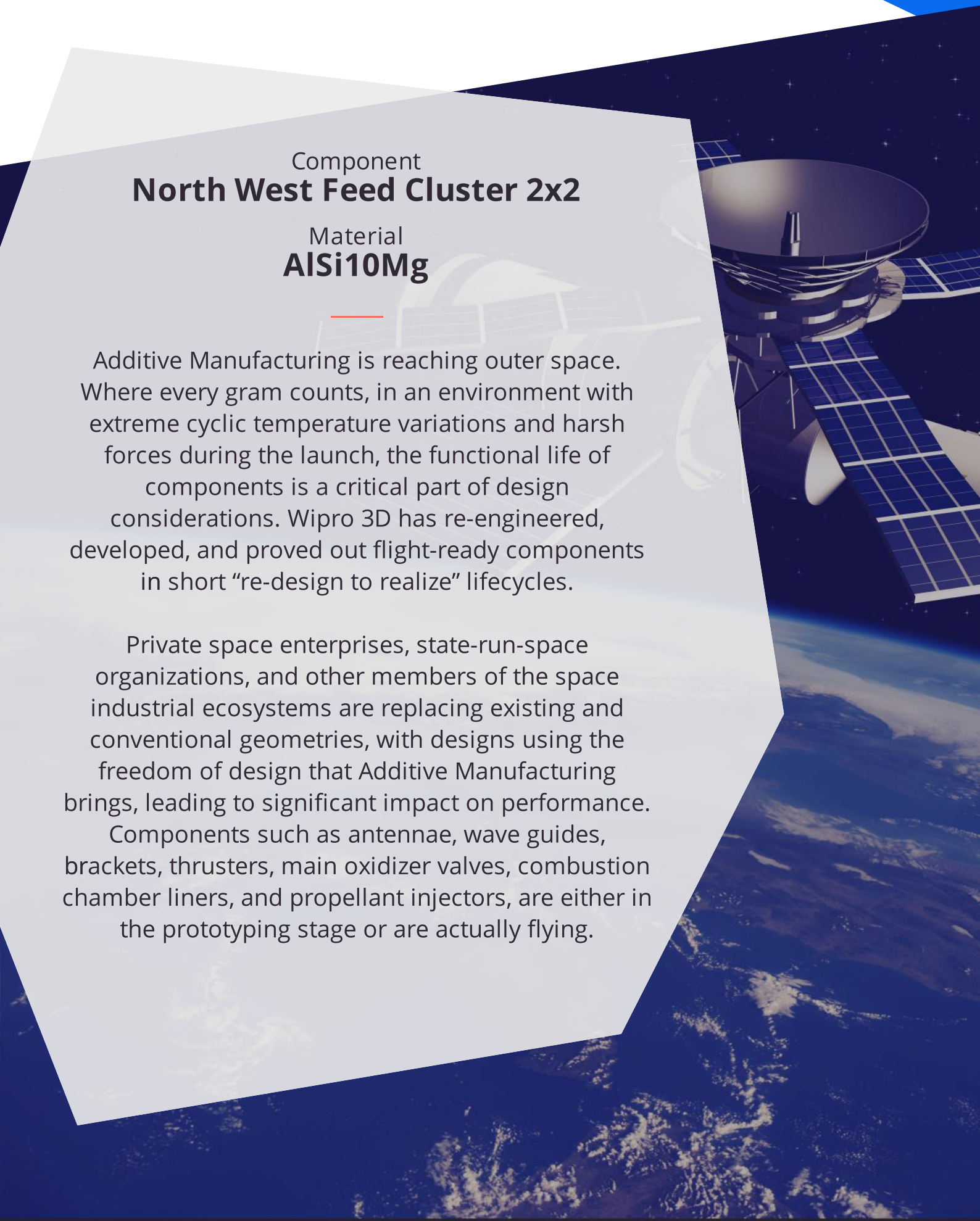
North West Feed Cluster 2x2

Material

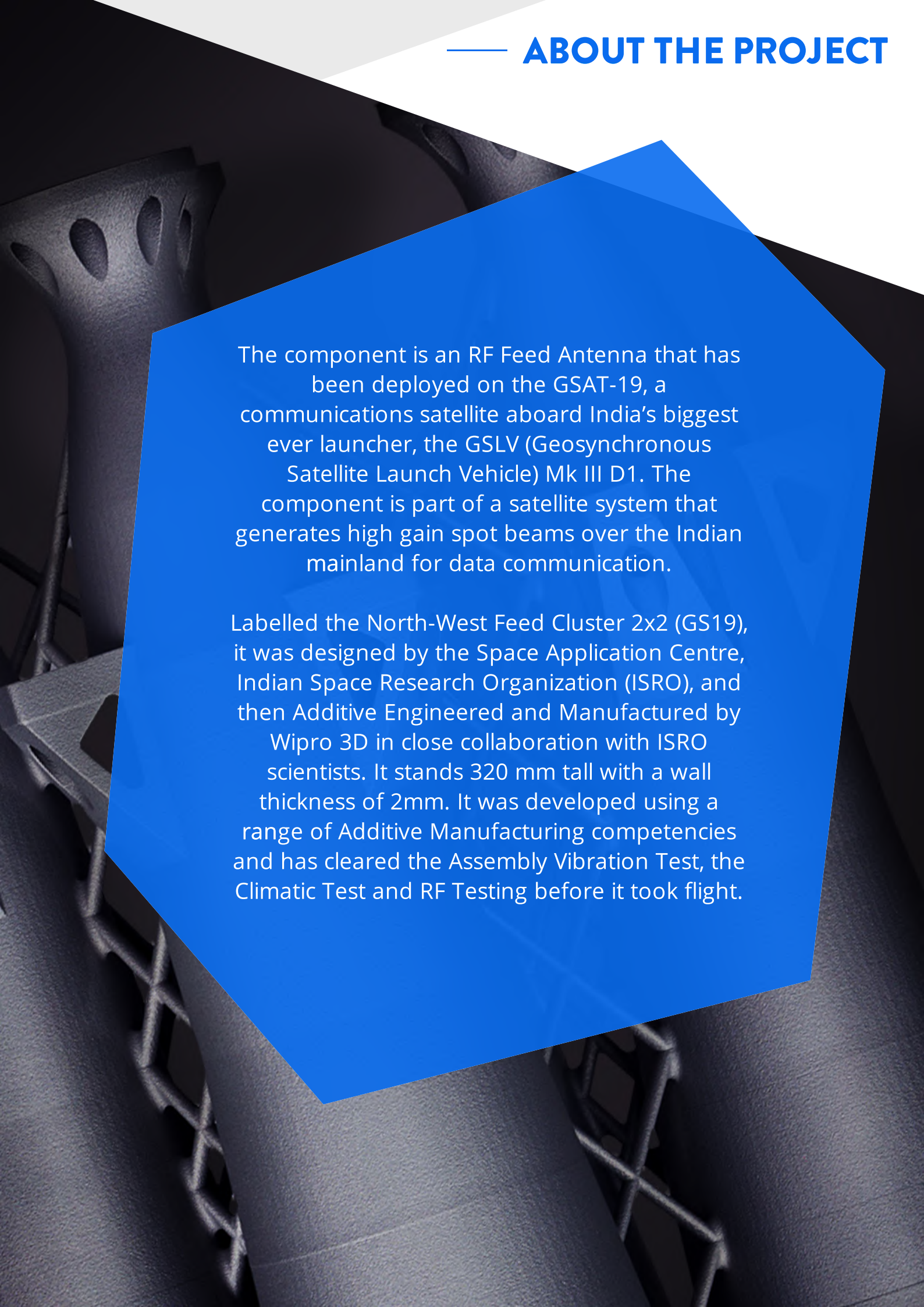
AlSi10Mg

Additive Manufacturing is reaching outer space. Where every gram counts, in an environment with extreme cyclic temperature variations and harsh forces during the launch, the functional life of components is a critical part of design considerations. Wipro 3D has re-engineered, developed, and proved out flight-ready components in short “re-design to realize” lifecycles.

Private space enterprises, state-run-space organizations, and other members of the space industrial ecosystems are replacing existing and conventional geometries, with designs using the freedom of design that Additive Manufacturing brings, leading to significant impact on performance. Components such as antennae, wave guides, brackets, thrusters, main oxidizer valves, combustion chamber liners, and propellant injectors, are either in the prototyping stage or are actually flying.



ABOUT THE PROJECT



The component is an RF Feed Antenna that has been deployed on the GSAT-19, a communications satellite aboard India's biggest ever launcher, the GSLV (Geosynchronous Satellite Launch Vehicle) Mk III D1. The component is part of a satellite system that generates high gain spot beams over the Indian mainland for data communication.

Labelled the North-West Feed Cluster 2x2 (GS19), it was designed by the Space Application Centre, Indian Space Research Organization (ISRO), and then Additive Engineered and Manufactured by Wipro 3D in close collaboration with ISRO scientists. It stands 320 mm tall with a wall thickness of 2mm. It was developed using a range of Additive Manufacturing competencies and has cleared the Assembly Vibration Test, the Climatic Test and RF Testing before it took flight.

AM COMPETENCIES USED

Wipro 3D used its extensive experience in Additive Design of various structural elements, reduction of joints, and feature optimization to derive maximum value from the Additive Engineering principles.

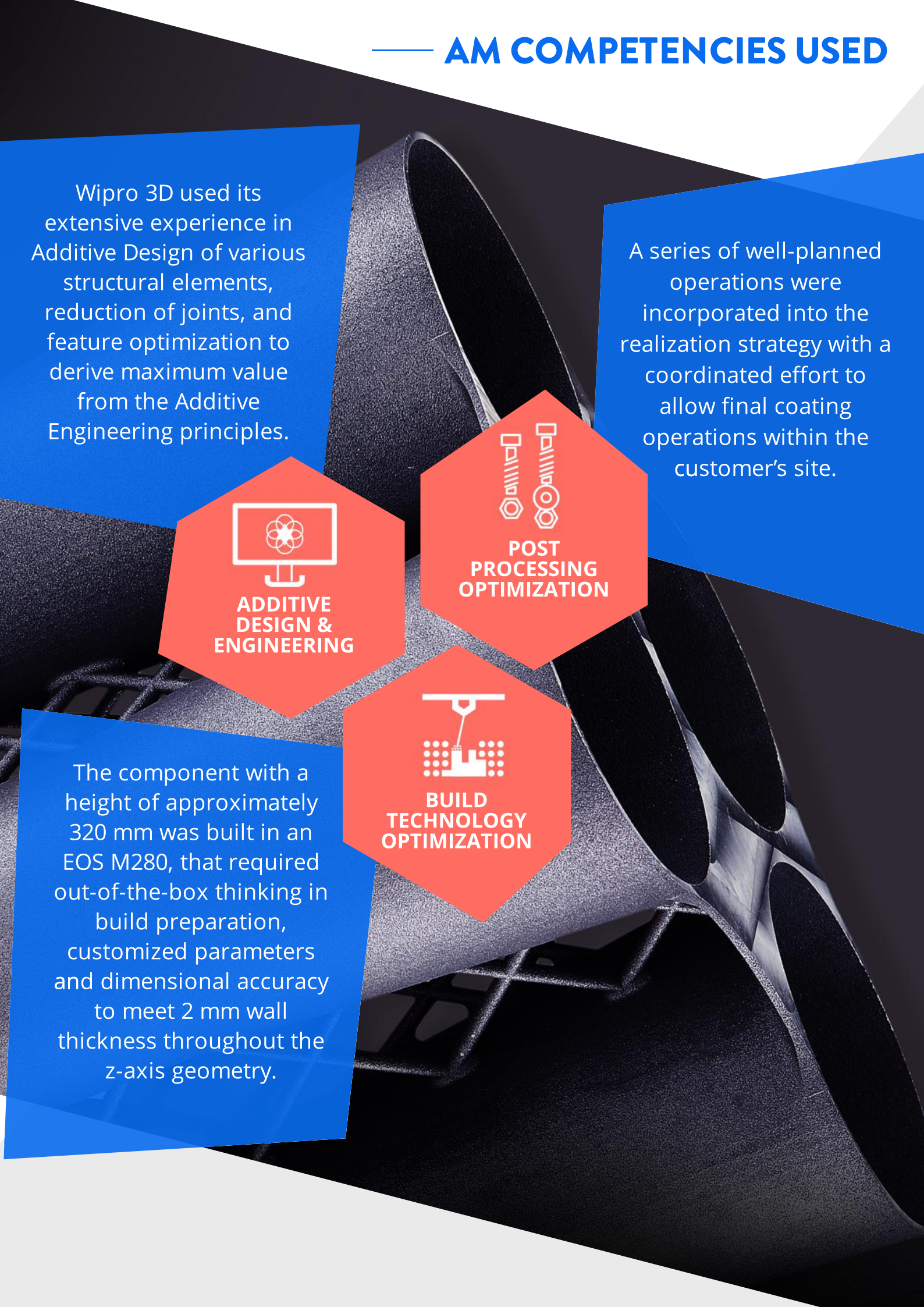
A series of well-planned operations were incorporated into the realization strategy with a coordinated effort to allow final coating operations within the customer's site.

ADDITIVE DESIGN & ENGINEERING

POST PROCESSING OPTIMIZATION

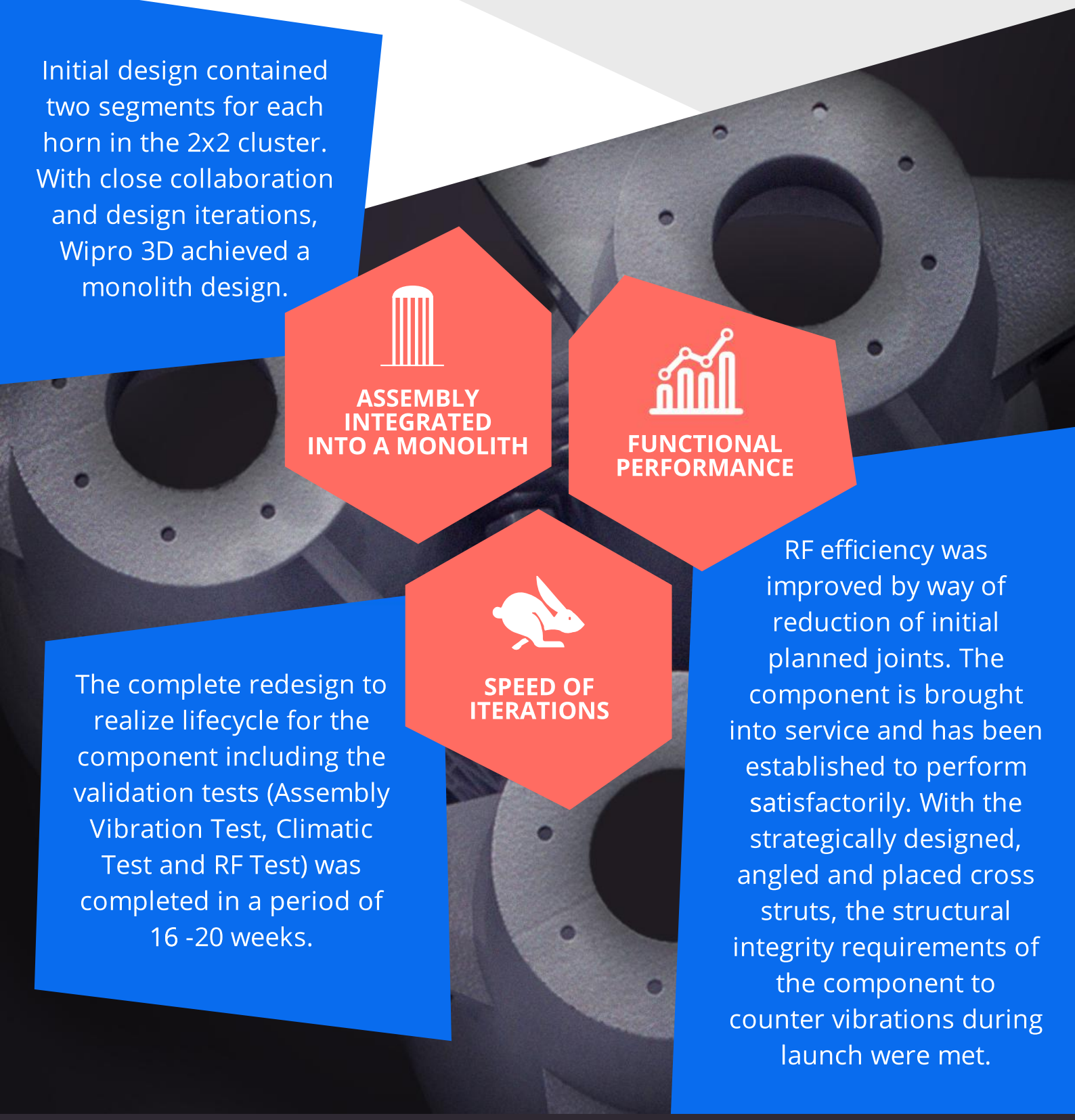
BUILD TECHNOLOGY OPTIMIZATION

The component with a height of approximately 320 mm was built in an EOS M280, that required out-of-the-box thinking in build preparation, customized parameters and dimensional accuracy to meet 2 mm wall thickness throughout the z-axis geometry.



AM VALUE ADDITION

Initial design contained two segments for each horn in the 2x2 cluster. With close collaboration and design iterations, Wipro 3D achieved a monolith design.



ASSEMBLY INTEGRATED INTO A MONOLITH

FUNCTIONAL PERFORMANCE

SPEED OF ITERATIONS

The complete redesign to realize lifecycle for the component including the validation tests (Assembly Vibration Test, Climatic Test and RF Test) was completed in a period of 16 -20 weeks.

RF efficiency was improved by way of reduction of initial planned joints. The component is brought into service and has been established to perform satisfactorily. With the strategically designed, angled and placed cross struts, the structural integrity requirements of the component to counter vibrations during launch were met.

About Wipro 3D

Wipro 3D is an AS9100 Certified metal AM solutions and services provider, serving Aerospace, Space, Defense, Industrial, Heavy Engineering, Automotive, Energy, Nuclear & Healthcare sectors. Our solutions include AM Consulting, Additive Engineering & Design Offerings, Manufacturing Services, Research & Development based solutions right unto Design - Deployment and Operation of captive metal AM centers.

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