



Northrop Grumman  
2980 Fairview Park Drive  
Falls Church, Virginia 22042-4511

[northropgrumman.com](http://northropgrumman.com)

August 16, 2022

Applied Science & Technology Research  
Organization of America (ASTRO America)  
6701 Democracy Blvd., Suite 300  
Bethesda, Maryland 20817

Subject: AM Forward

Northrop Grumman Systems Corporation (NGSC) is pleased to join ASTRO America and the federal government in implementing AM Forward, a voluntary initiative aimed at strengthening U.S.-based suppliers' adoption and deployment of additive manufacturing (AM) capabilities.

Additive manufacturing (AM) has the potential to improve the agility of aerospace manufacturers where legacy casting and forging processes are often resource and time intensive; it is a leading-edge production technology that is foundational to U.S. global competitiveness and manufacturing resiliency. AM has many benefits, including forming reduced weight geometries unattainable through other manufacturing processes and significant consolidation of parts, resulting in reduced part counts. If appropriately scaled, qualified, and applied, additive manufacturing can reduce part lead-times and costs, especially under current supply chain conditions where legacy casting and forgings are available through a diminishing number of domestic suppliers. High performance AM has potential applications across many platform types, ranging from aerospace structures, RF sensors, printed electronics, hypersonic weapons, and engines. In addition, additive manufacturing provides a unique capability that supports continued sustainment of warfighter readiness throughout the entire life cycle of our military products that frequently outlast conventional supply chains.

Investment is needed to support manufacturing development and qualification of this capability along with increased capacity in the supply chain, particularly for small and medium sized enterprises. Through AM Forward, NGSC will take action in the next 12-24 months to support multiple U.S.-based suppliers, increasing their ability to additively produce flight qualified parts, thus enhancing their competitiveness, agility, and productivity. The intent is to demonstrate clear, consistent, and growing demand for additively produced parts, provide workforce training, engage in standards development, accelerate testing and qualification, and offer technical assistance. We appreciate the Biden Administration's proposed support of these efforts through U.S. Government financing programs, capacity building, and workforce development initiatives.

We know that the competitiveness of the U.S. defense industrial base relies on the capability of thousands of small to medium size manufacturers (SMM) producing and post-processing critical

aerospace parts. Through AM Forward, government and industry can work together to adopt additive manufacturing at scale, increasing the agility, capacity, and resiliency of U.S. supply chains and supporting and sustaining jobs across the United States. NGSC will also support efforts by suppliers within our sourcing network to take part in key U.S. government programs associated with AM Forward. Various federal agencies can play an important role in accelerating AM supplier access to necessary capital, workforce training, technical assistance, and technology transition support. For this reason, we will work with relevant federal government agencies as well as nonprofit organizer ASTRO America to encourage participation in AM Forward workshops and, as appropriate, support proposals for assistance associated with government programs.

Specifically, NGSC will support the goals of AM Forward by committing to:

- Targeting 50% of RFQ packages sent out for products, machinery, manufacturing tooling, and/or manufacturing process development utilizing additive or related technologies to be competed by US-based SMM suppliers.
- Targeting the external sourcing of additively manufactured processes and parts from a SMM supplier.
- Refining the framework to identify and prioritize approval of AM approved suppliers to simplify future procurement.
- Providing support for qualifying and development of SMM suppliers and training to meet NGSC qualification and quality requirements.
- Working with our SMM suppliers in research and development, as required, to optimize, define, validate, and qualify additive manufacturing materials, processes, and machinery.
- Providing technical assistance in part design, data generation, machine operation, post-processing, and part inspection/quality management to introduce AM parts and processes for manufacture during development and production program phases.
- Increasing our leadership in critical AM standards development through leadership of and participation in Standard Development Organizations (SDOs) including SAE AMS, ASTM F42, ANSI, CMH-17 AM, and AWS with the goal of increasing the adoption of AM in the supply chain.
- Exploring establishment of an AM material consortium with other AM Forward OEMs and U.S. Government agencies to develop and share AM material properties and design data.
- Through AM Forward and ASTRO America, we will explore external national entities (e.g., NIST MEP) to facilitate geographic-driven supplier consortia to collaborate with national networks to activate access to AM training and technology solutions.

NGSC already collaborates with more than 15 universities and colleges in the development of additive manufacturing technology and research. These universities are geographically dispersed and include academic institutions in Alabama, Arizona, Colorado, Iowa, Maryland, Massachusetts, Michigan, Minnesota, New Mexico, Pennsylvania, Tennessee, Texas, Utah, and Virginia. NGSC will endeavor to expand our engagement with universities and colleges to enhance their additive manufacturing capabilities, which will positively impact the inclusion of additive manufacturing into their curriculum.

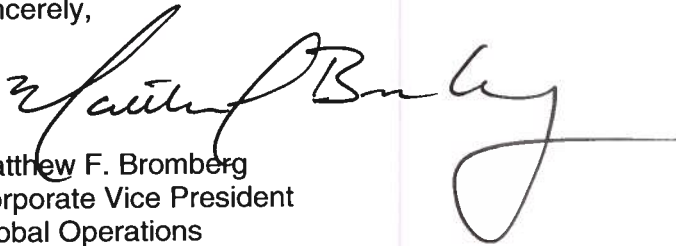
To achieve the foregoing objectives, NGSC is committed to working with the other participants in AM Forward and in concert with U.S. Government agencies to improve the capability, agility, and competitiveness of our supply base. We understand as an AM Forward participant, we will be supported with staff coordination from 501(c)(3) nonprofit organizations including the Applied

Science & Technology Research Organization of America (ASTRO America) and Gettysburg College's Eisenhower Institute.

NGSC commends proposed US government efforts, including, but not limited to, access to capital, workforce training, qualification, technical assistance, and technology transition support. We know that the competitiveness of the U.S. industrial base, including NGSC, relies on the capability of tens of thousands of SMMs producing and post-processing critical aerospace parts. Through AM Forward, we believe we can work with you to accelerate AM adoption at scale, increasing the agility, capacity, and resiliency of U.S. supply chains and supporting and sustaining good-paying jobs across the United States.

Thank you for your leadership on this important initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "Matthew F. Bromberg". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Matthew F. Bromberg  
Corporate Vice President  
Global Operations  
Northrop Grumman Corporation