

Request for Information (RFI): Mass-Producible Radio Frequency (RF) Radome Solutions for Hypersonic Weapon Systems

1.0 Purpose and Introduction

The Air Force Research Laboratory is seeking to identify sources and gather information on state-of-the-art and emerging materials and technologies for the design, development, and manufacturing of mass-producible Radio Frequency (RF) transparent radomes for air-breathing and boost-glide hypersonic weapon systems.

AFRL seeks to understand industry's capability to provide solutions for three-dimensional RF radome nose cones that address the extreme environmental challenges of hypersonic weapon flight while enabling scalable production. The objective is to identify materials and processes currently under development that can provide emerging solutions for large-scale production.

THIS IS A REQUEST FOR INFORMATION ONLY. This is not a solicitation for proposals, a request for quotation, or a promise to issue a solicitation in the future. This RFI does not commit the Government to contract for any supply or service whatsoever. Respondents are advised that the Government will not pay for any information or administrative costs incurred in response to this RFI.

2.0 Background: The Operational Challenge

Hypersonic systems operating at speeds greater than Mach 5 subject all external components to an exceptionally severe thermo-mechanical environment. The radome, which houses the mission-critical RF seeker and associated antennas, is uniquely challenged. It must not only survive this environment but also maintain stable electromagnetic performance throughout the mission profile to ensure terminal guidance accuracy.

This RFI is focused on addressing the technical barriers that currently limit the affordable, high-volume production of radomes capable of meeting these conflicting performance demands.

3.0 Key Performance Requirements & Areas of Interest

The Government is seeking information on integrated solutions that address the following critical performance attributes. Respondents should detail their proposed material systems, manufacturing processes, and testing methodologies as they relate to each area.

Technical Challenge	Information Requested
Extreme Thermal Management	We seek information on material systems capable of maintaining structural and electromagnetic integrity at temperatures exceeding 900°C (~1600°F). Please describe proposed solutions' resistance to thermal shock during rapid temperature changes and ability to maintain stable electromagnetic properties across a broad range of temperatures.
Stable Electromagnetic (EM) Performance	Respondents should detail proposed solutions for achieving stable dielectric constants and loss tangents across a wide frequency band and the full range of operational temperatures. Please provide available data on dielectric properties as a function of temperature.
Structural Integrity & Aerodynamic Shape Stability	We request information on materials and manufacturing processes that can produce and maintain complex aerodynamic shapes (e.g., ogive, tangent ogive) with a build volume larger than 200 in ³ under severe aerodynamic pressure and vibroacoustic loads without degradation.
Environmental Durability	Please describe the proposed solution's resistance to erosion from rain, ice, dust, and other particulates. Detail any specialized coatings or surface treatments used to enhance durability.

4.0 Manufacturing and Producibility

A primary objective of this RFI is to identify solutions that are viable for mass production. Responses should explicitly detail how the proposed approach enables scalability, affordability, and high-yield manufacturing.

We request specific information on the following manufacturing and inspection topics:

- **Scalable Manufacturing Techniques:** Information on large-article, high-volume manufacturing techniques, including but not limited to:

- Near-net-shape ceramic processing (e.g., slip casting, injection molding, gel casting)
 - Advanced ceramic forming and densification (e.g., hot isostatic pressing, spark plasma sintering, reaction bonding).
 - High-volume production of novel, enabling constituent materials (e.g., ceramic powders, precursors, fibers)
 - Automated composite fabrication and polymer-derived ceramic processes.
 - Additive manufacturing (e.g., binder jetting, stereolithography, direct ink writing) for ceramics and composites, with the demonstrated ability to produce large-scale components.
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- Supply Chain and Material Availability: An assessment of the maturity and availability of the proposed raw materials and the overall supply chain readiness.
 - Cost Models: Information regarding cost drivers, potential cost-reduction strategies, and estimated costs at low-rate initial production (LRIP) and full-rate production (FRP) quantities.
 - Non-Destructive Evaluation (NDE): Details on proposed NDE and inspection techniques (e.g., high-resolution CT, air-coupled ultrasonics) that can be implemented in a production environment to certify part quality and reliability.
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5.0 Response Submission

Interested parties are requested to submit a response of no more than 5 pages addressing the topics outlined in Sections 3.0 and 4.0. Responses should include company information, relevant past performance, and technical point(s) of contact. Please provide data, models, and technical descriptions to the maximum extent possible in a publicly releasable format.