

Hypersonic Air Breathing Propulsion Test Methodology/Techniques and Facility Capability

Introduction:

There are national programs involving hypersonic wind tunnel testing requirements that either cannot be met with current facility and test methodology capabilities or push the limits of existing capabilities. Specifically, the Air Force HyTech Program recognized that there was no existing facility in the United States that could meet the maximum continuous test time/Mach number/size requirements associated with that program. The proposal has been made that the Arnold Engineering and Development Center's (AEDC) Aerodynamic and Propulsion Test Unit (APTU) facility could be modified within the resources available to HyTech to meet much of that program's test requirements.

Currently, there is significant pressure from outside on both NASA and DoD for integrated facility investment plans which optimize the use of scarce resources, and in fact progress to accomplish this goal is being monitored by agencies such as the NASA Office of the Inspector General (IG) and the United States General Accounting Office (GAO). To encourage the integrated planning and investments for wind tunnel and aeropropulsion facilities, two specific initiatives are taking place: (1) six alliances, two of which are the National Wind Tunnel Alliance and the Air Breathing Propulsion Test Alliance, have been recently signed by both agencies to formally provide a mechanism for cooperative activities; and (2) the National Aeronautics Testing Alliance (NATA) is being chartered to create a NASA/DoD staffed office to carry out integrated strategic planning for major U.S. government owned wind tunnel and aeropropulsion facilities.

In response to these environmental factors, the Air Force and NASA are initiating an activity to review currently projected hypersonic air breathing propulsion test requirements, available test facilities that have the potential of satisfying or being modified to satisfy these requirements, and current test methodology with the goal of developing a hypersonic air breathing propulsion test facility investment plan. To provide the best technical basis for this investment plan, a small team (Hypersonic Air Breathing Propulsion Evaluation Team, HABPET) of facility experts and program personnel are being asked to carry out the following phased activity. Each phase of the activity should be accomplished and agreement reached on the next phase before its initiation. An inter-agency team (NATA like) will act as the sponsors for this activity. Sponsors team will include: (1) NATA personnel, Keith Kushman and Blair Gloss; (2) USAF personnel, Larry Wingfield and Lee Bain; and (3) NASA personnel, Lana Couch and Ajay Kumar; and (4) LeRC personnel, John Schaefer and Frank Berkopec.

Sponsors will make available known program requirements for hypersonic air breathing propulsion testing to HABPET.

HABPET Deliverables, listed in phased order:

1. Define and document the process for presenting the results of this study.
2. Develop consistent comparison of test capabilities (Mach number, run time, test article length, etc) for AEDC APTU, Lewis Research Center (LeRC) Hypersonic Test Facility (HTF), Langley Research Center (LaRC) 8-Ft. High Temperature Tunnel (8-Ft. HTT), the Navy T-Range Aeroheat Facility (as appropriate since it is a much smaller facility), and other facilities as defined by the team.
3. In view of program requirements, assess current test methodology and test techniques for hypersonic air breathing propulsion testing and flight certification. (Can the content of discussions related to "test methodology and test techniques" be better (more narrowly) defined? This title implies a broader range of subject areas than I suspect is intended for this activity. We also want to be able to include the appropriate people to discuss the specific issues.)

4. Focus on the HyTech program and carry out a gap analysis between available test capabilities and requirements. Make a recommendation on which facility is the best choice for upgrade to fill the gap and meet the HyTech requirements
5. Carry out a gap analysis considering all program requirements versus available capability and in that context make a recommendation on which facility(ies) is(are) the best choice for upgrade to meet the national requirements
6. Develop a nationally integrated investment plan for hypersonic air breathing propulsion testing, include not only facilities but also test methodology and test techniques.
7. Final results will be reviewed by industry advisors and delivered to the NASA AA and USAF/TE for final approval, if appropriate.
 - Note: Recommendation is to complete HBPET activities by mid-April 1998.