Appendix E

Recent Accomplishments of the NASP Program— An Abbreviated List Supplied By The NASP Interagency Office

The earlier discussion of NASP Technologies naturally focused on the technical challenges for the NASP program. This list, provided to OTA by NASP program officials, is provided to complement that discussion.

Detailed SSTO Vehicle designs from three aerospace companies:

. Polar orbit, fuel for powered landing with go-around.
- Design payload and 4X payload.
. Reusable air frame without refurbishment.
. Wind tunnel verification of subscale models to Mach 20.
. CFD verification of full scale design.

Detailed propulsion system designs from 2 engine companies:

- Mach 0-20 (airbreathing and rocket).
- Wind tunnel test of sub scale engines to Mach 7.
- Wind tunnel test of large combustor models to Mach 12.
- Mixing and over 95 percent combustion with wall injectors in 2-inch combustor.
- Wind tunnel tests of inlets to Mach 14 to 16.
- Demonstration of hydrogen film cooling for friction reduction and heat transfer reduction in combustor.

A completely new family of Full Navier-Stokes (FNS) and Parabolized Navier-Stokes (PNS) computer codes that calculate airflow and reactions from nose to tail over complex geometries:

. Integrated into these analysis tools are: air reactions, combustion reactions, boundary layer characteristics, shock wave characteristics, flow interactions, and algorithms to expedite conversions of solutions.
- A fast solving PNS code that can calculate the flow characteristics from the nose, through the engine with combustion, and out the nozzle, including free-stream air interactions.

Greatly expanded hypersonic test capabilities:

- Low turbulence wind tunnels for prediction of boundary layer transition: Mach 6, Mach 20.
- GASL/NASA free piston expansion tube pilot operating with velocity to 25,000 feet per second.
- Rocketdyne large free piston shock tube (RHYFL) under construction for 1990 completion.
- Large engine test facilities (ETF) for test of large engine models have been constructed at Marquardt and Aerojet.

Active thermal control:

. Heat pipe cooling of nose and engine struts,
. Hydrogen cooling of inlet combustor and nozzle.

Structure:

- Integrated structure using fuel tank integrated with vehicle skin,
. Fuel storage and handling systems,
. Integrated thermal control systems.

Materials Development Consortium:

Ž Titanium-aluminide sheet fabrication and advanced carbon-carbon with new coating systems.
. Joints and fasteners of carbon-carbon and titanium-aluminide.