PAUL J. WALTRUP

GUEST EDITOR'S INTRODUCTION

A portion of this issue of the *Johns Hopkins APL Technical Digest* is a tribute to the vision of a handful of dedicated engineers* who, in the mid-1980s, established the feasibility of, and marketed to government and industry, a dream first promoted in the early 1960s—a manned experimental aircraft with all of the characteristics of its modern commercial and military brethren, but with the capability to achieve low Earth orbit without staging. This concept, known as the National AeroSpace Plane (NASP), is indeed revolutionary. The reusable (several hours turnaround time) X-30 aircraft would be the first single-stage-to-orbit (SSTO) vehicle ever built and would be powered by airbreathing (jet) engines. Integration of all of the aircraft's systems to a degree never attempted before is also a key to its success. Also, unlike the space shuttle and existing or emerging foreign concepts,† which use evolving technology or a minimum of new technology, NASP will require the development of new technology in previously unexplored areas for almost all aspects of the aircraft. Thus, NASP represents one of the greater technological challenges of the last half of the twentieth century, and potentially one of its most rewarding. It offers one of the higher payoff potentials in economic space transport, as well as national prestige and pride, international leadership, and major commercial and military spin-offs.

Can it be done? Yes, but with the realization that all of the requisite technologies will not be fully developed at the beginning of the flight test program. Rather, they will continue to mature in parallel with the knowledge gained in flight. Consequently, the risks associated with this program are somewhat higher than evolutionary programs, but the payoffs and rewards are also higher. A comprehensive overview of these aspects of the program, along with the challenges, goals, payoffs, and management structure, is presented by Robert R. Barthelemy, Director of the Joint Program Office, in the first article of the NASP section of this issue.

The Laboratory's role in the NASP program is a natural evolution of the pioneering work it has contributed to supersonic combustion over the past thirty-five years.‡ (The primary propulsion system for NASP from Mach 3 to nearly orbital speeds is a supersonic-combustion ramjet [or Scramjet] engine.) Harold E. Gilreath, in the second article of the NASP section, gives a detailed review of APL's early years and its contributions to the development of Scramjet engines. As a result of continuous funding over the years and, most importantly, the quality and dedication of the people and facilities, APL continues to be one of the premier research and development centers for hypersonic airbreathing engines in the United States and abroad.

The other two articles in the NASP section present a brief glimpse of some of APL's contributions to the NASP program.§ The first of these articles describes the vehicle and engine requirements to achieve SSTO. The second addresses issues associated with the design and testing of air inlets (used to decrease the Mach number and increase the pressure of the ingested air), and presents data establishing the veracity of newly developed instrumentation for measuring inlet performance in very short duration (1–10 ms of steady-state test time) ground tests.

In closing, the development of the requisite technology to ensure the success of the NASP program has been, and continues to be, an extremely challenging and professionally rewarding experience for all involved. Personally, it is a privilege to work with all of the very talented people at APL and other institutions who are contributing to its success.

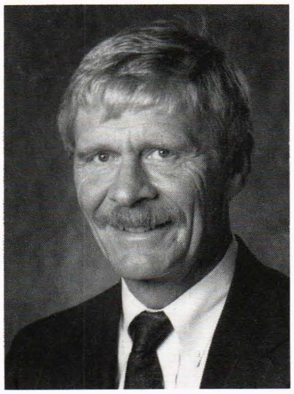
*Frederick S. Billig (APL), Anthony Dupont (Dupont Aerospace), Robert Jones (NASA/Langley Reserach Center), and Robert Williams (Defense Advanced Research Projects Agency).

†USSR—Energia; Federal Republic of Germany—Sanger; Great Britain—HOTOL; France—Hermes; Japan—not specifically defined.

‡See "Hypersonic Airbreathing Propulsion: Evolution and Opportunities" by P. J. Waltrup, in *Proc. AGARD Conf.*, AGARD-CP-428, Apr 1987, pp. 12.1–12.29, for a historical review.

§See the *APL Technical Review* (limited distribution), Volume 2, Issue 1 (in press), for a more in-depth overview.

THE AUTHOR



PAUL J. WALTRUP received a Ph.D. in aerospace engineering in 1971 from the Virginia Polytechnic Institute and State University. He joined APL that same year as a Postdoctoral Research Fellow and became a member of the Senior Professional Staff in 1972. He has served on numerous APL and professional society committees, and he has also consulted for the Navy and Air Force. He was appointed to the Principal Professional Staff in 1978 and is currently Supervisor of the Propulsion Group. He also teaches at the University of Maryland and at Virginia Polytech. Dr. Waltrup's interests include high-speed airbreathing propulsion and the associated difficulties in ground testing hypersonic engines. He has presented or published more than seventy-five articles on these subjects.