

# Industry/Interagency Collaboration

## Clementine—A Prototype

by Stewart Nozette

Dr. Stewart Nozette was manager for the Clementine Follow-On in the Space Experiments Directorate for the U.S. Air Force at Phillips Laboratory. Since 1991, when the Clementine effort began, he had been deputy for sensor integration, and had worked for the Space Defense Initiative Organization (SDIO) and Department of Energy.

Interagency collaboration among NASA, the Ballistic Missile Defense Organization (the later SDIO), the Naval Research Lab and the Naval Center for Space Technology plus others resulted in a deep space mission in less than half the development time and less than half the typical costs. Clementine saved so much time and money by adapting available commercial and military technol-

ogy, using small companies with lower overhead costs, streamlining management controls, and reducing spacecraft size and weight to pursue a focused mission. Clementine's frozen batteries and lightweight solar arrays become spin-offs for the next direct broadcast satellite (DBS) spacecraft. Non-explosive catches and lightweight (300g) cameras for remote sensing can be twice-used technology for the Clementine Follow-On.

Nozette acknowledged that Clementine was not a complete success because of a software glitch and spent fuel, but the team learned that new DoD technology reduced costs considerably and that interagency collaboration requires leadership and support at the "highest levels."

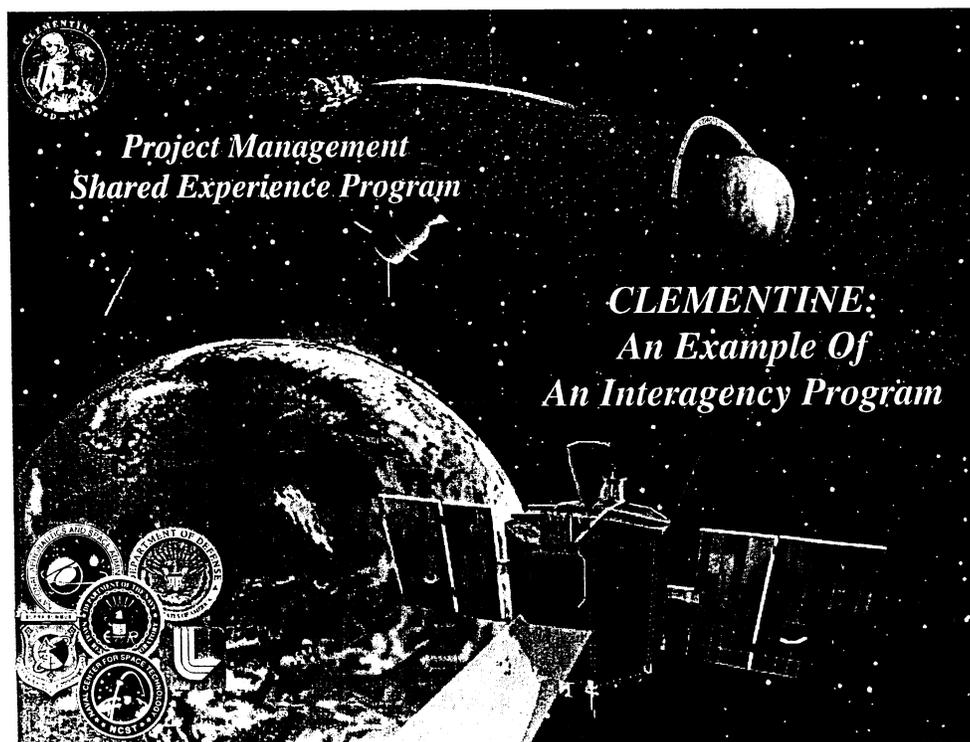


Figure 18. Clementine and Partners.

---

# ARPA's Innovative Awards

by Tim Arnold

---

R. Timothy Arnold since 1990 has served as director of the contracts management office of the Advanced Research Projects Agency (ARPA), DoD's primary science and technology office. Best known as the developer of ARPA-Net 20 years ago, precursor of the Internet, ARPA has engaged in dual-use technology since 1993.

Arnold focused on Broad Agency Agreements (BAAs) between ARPA and consortia, partnerships or individual high tech companies like Cray, Intel and Hewlett-Packard that normally shun DoD business. The BAA is not subject to much of the red tape and reviews common in other government/industry contracts. Instead, an ARPA BAA begins with "an assessment of a problem we want solved" in high-

risk, high-payoff science or technology. The company or consortium submits a five- to ten-page abstract or white paper to ARPA and, only if promising, a full and more expensive bid and proposal. A technical person, not a contracting officer, decides who wins.

The effects on program management of this new way of doing business are many. The award is more like an investment than an obligation, creating a new sense of trust and spirit of cooperation with industry. Tax dollars are leveraged with a strong incentive to commercialize technology. Of course, the new approach is, experimental, but with a clear vision statement up front and review milestones, the initial kickoff meeting represents a new beginning in government/industry collaboration.

---

# Intelligent Highway Systems

by John MacGowan

---

C. John MacGowan, Chief of the Intelligent Highway Systems division in the Federal Highway Administration, described government/industry collaboration in technology application in terms of an intersection of three streets. Public/private partnership (PPPs) depend upon the convergence of Madison Avenue (the marketplace), Wall Street (investment) and Main Street (the public interest).

Highway congestion, for example, costs about \$100 billion a year in lost efficiency and 40,000 lives, by far the major nonmedical killer in America. Yet, public/private partnerships to solve or at least alleviate congestion face three interrelated levels of resistance. The strategic or institutional barriers consist of political differences (Republican and Democrat, for example) as well as basic cultural differences between government and industry. The private sector is far more

concerned with investment, competition and profit seeking while government agencies are more concerned with standard procedures, cooperation and the public trust. Programmatic or legal barriers include existing laws, regulations and restrictive practices that inhibit public/private partnerships. Finally, project agreement barriers include the multiple layers of government scrutiny set against private market uncertainty and financial and technological risk-taking.

Removing or lowering such barriers will enable government and industry to share both risks and rewards, especially in highway safety and efficiency. Meanwhile, he noted, the traffic information on the Internet is requested 30,000 times a day in just San Diego and Seattle alone as commuters seek faster ways to get to work and back home safely again.

# Rapid Prototyping—SSTO

by Bill Gaubatz

Dr. William A. Gaubatz is director of program development at McDonnell Douglas Aerospace's Reusable Launch Vehicle Program in Huntington Beach, California. He focused on the Delta Clipper Experimental (DC-X) single-stage-to-orbit (SSTO) rapid prototyping as an example of innovative government/industry collaboration.

The DC-X was the first of the "X-flight" systems to demonstrate SSTO technologies and low-cost operations. A three-person crew would be able to take off and land vertically, operate the spacecraft like an aircraft, and be ready to fly again in just seven days turnaround. Rapid prototyping called for a limited

budget and a quick schedule, 24 months from start to flight. It first flew on August 18, 1993, with Pete Conrad as the flight manager.

The rapid prototyping system maximized the use of off-the-shelf hardware and software, commercial parts, processes, and existing embedded facilities. Project managers used "work arounds" in lieu of schedule slips and saved an estimated 28% in time over "business as usual." Software savings of 33% in time and 80% in cost were even more spectacular. Among the "hard to quantify" factors for the DC-X success were daily meetings at both the program level and shop floor.

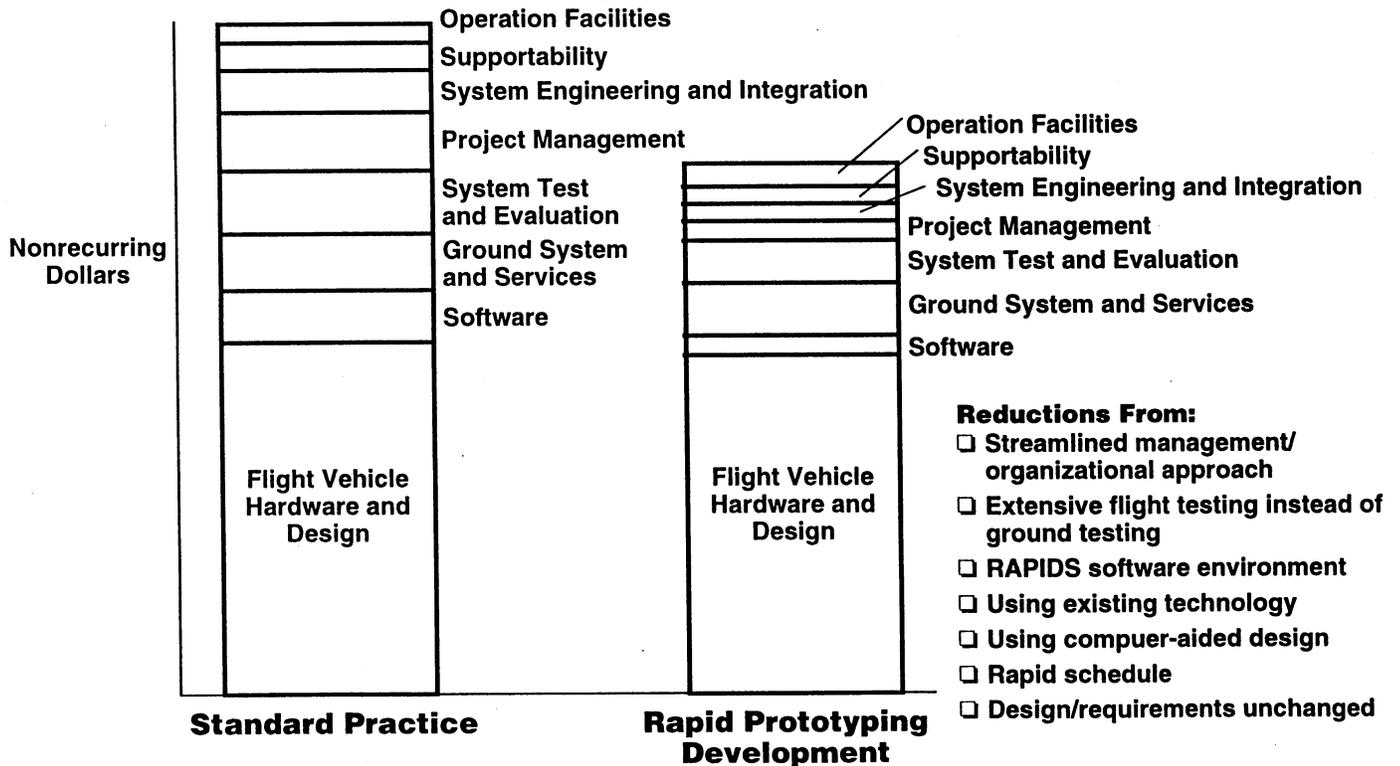


Figure 19. Cost Reductions Through Rapid Prototyping.