During the last several years, however, the distinction between basic and applied research has become blurred as program managers have come under increased pressure to demonstrate results—or in our terminology, transitions. Further, the definition of "transition" has become increasingly restricted to ensure that claimed transitions, which are published yearly, are real.

Philosophy

For the program manager, the challenge is not only to find interesting research that has the potential for application or transition, but to find mechanisms that ensure successful transition. Of course, the easiest method is to require the proposer or principal investigator to specify a transition path in the proposal—that is to require that he make the connection with the Air Force or industry beforehand. This is a difficult requirement for many university researchers, but the specification of such a mechanism definitely is a positive factor in proposal evaluation.

Another successful mechanism involves our close connection to the Air Force laboratories. Many of our topical thrusts are centered at laboratories, with a laboratory researcher doing basic research as part of a larger effort. Then, other research performed by universities or industry can be undertaken with the laboratory as a centerpiece. Because the Air Force laboratories are intimately involved with Air Force applications, securing the cooperation of laboratory scientists and their approval through the proposal review process almost assures an eventual successful transition.

Brokerage

Of course, as a program manager, one task is to broker research. That is, if I receive a theoretical proposal that I want to fund, I can search through the Air Force or industry to find a potential application and take a chance that my insight will prove to be correct. On the other hand, when I come across an interesting applied problem, I can formally or informally solicit proposals related to it. As a result of all of these techniques, and probably some others that I have neglected to mention, I have had several recent successes in the transition game. Let me mention a few of them:

1. Over the years, I have worked fairly closely with the Air Mobility Command. AFOSR provided the command with consulting support when they leased the original KORBX machine, and has helped the command develop models and optimization algorithms to rationalize their transshipment networks. AFOSR is now supporting research on optimization under uncertainty, so-called robust optimization, and I hope to ultimately transition to these models.

2. I have been able to form a consortium of Rice University, IBM, and Boeing that applies nonlinear optimization to a number of problems faced by Boeing. The current one of interest is in the design of helicopter wings to minimize vibration.

3. Although not directly related, research that AFOSR has supported has resulted in new algorithms for multitarget tracking. It improves the performance of Air Force radars by 3dB, without any changes in hardware, and is now being considered for inclusion in new Air Force systems.

In conclusion, the rapid transitioning of results is of crucial importance to the military research community and we are constantly seeking improved transitioning methods.

Technology Transfer from an Airport Operator's Perspective (G.W. Blomme)

An informed environment in which all relevant civilian and military knowledge can be identified, accessed, and shared will effectively facilitate civilian airport safety, security and operations worldwide. This process is the domain of technology transfer—a process that must be improved so that information sharing can be more effectively used to facilitate airport-critical development at minimum cost. Minimizing the costs of security programs, for example, can in turn expedite additional development and generate additional benefits to airport customers.

Let me cite examples. During the past year I have been involved in several safety and security projects that most likely could have been expedited if airport and information systems colleagues and I had ready access to information generated by noncommercial sources such as the FAA's recently established Centers of Excellence and other research institutions as well as declassified military documents. In all likelihood improved airport perimeter security systems and other matters of airside and landside security could directly benefit from knowledge databases already developed by noncommercial sources. Further, time-intensive standard procurement policies of airport operators can be offset to some extent by making more relevant information more readily available. These benefits will only increase in the future as FAA's Centers of Excellence generate more studies, more findings, and more recommendations. The same conceptual thinking that applies to security systems, in regard to facilitated review of research done to date, also applies to control systems and other types of operating support systems.

Some more examples: The entire civilian transport field including the air transport system, is quickly moving into the area of Intelligent Transportation Systems, including "smart vehicles," electronically monitored vehicle tracking systems, and "smart cards" to facilitate customer processing. This is another area where easy retrieval of noncommercial knowledge databases can facilitate airport systems development.

The feasibility of conversion and public use of future military base closings can be more quickly assessed with "prepackaged" knowledge databases relating to environmental conditions and other local and/or topical situations being provided in advance by the military. Further, it is possible that even the schedules for decommissioning military equipment, including ground vehicles, might be useful to civilian transportation authorities if information databases were readily available to transport operators. The importance of technology transfer from military and noncommercial research centers to the public domain is evidenced by the advance bulletin for the 1998 International Air Transportation Conference, where military-to-civilian airfield conversion, the military's role in assisting civilian airport sponsors, and university centers for airport research are prominent among the suggested topics.

The knowledge databases that I am describing can be disseminated and shared through conventional conferences such as the University of California Institute of Transportation Studies' Technology Transfer Program, "1997 Noise Program," in San Diego; interactive CD-ROMs such as the CD-ROM that the Volpe Transportation Center is planning to use for distribution of airport layout plans; satellite transmission such as that currently used by the American Association of Airport Executives' (AAAE) Airport Training & Safety Institute for its Airport News & Technology Network (ANTN) programming; and the Internet, making full use of 24-hour bulletin boards monitored at regular intervals, rescheduled chat room sessions, and "push" technologies wherein information changes at specific Web sites automatically trigger E-mail notifications to interested parties.

Technology Transfer from the Air Force (D. Merrill)

General Ronald Fogleman, then Air Force Chief of Staff, stated his views in his *Global Engagement* report published in November 1996. Based on the Joint Chief of Staff Chairman's *Joint Vision 2010,* a roadmap was drawn for DOD military operations into the 21st century. The Air Force defines global engagement as four areas of importance and six core competencies.

Four Areas of Importance

The four emphases from the Air Force leadership are

- To take care of people within the community (first priority);
- To enhance reliability and modernize Air Force equipment;
- To recognize and plan for global infrastructure need; and
- To focus internal Air Force operations on mission and core competencies.

Six Core Competencies

The strength of the U.S. Air Force resides in the following:

- Preservation of air and space superiority through control of air and space;
- A capacity for global attack and power projection that gives adversaries anywhere on earth reason to reconsider hostile actions against U.S. allies;
- Precision engagement to minimize damage and lives lost and maximize effectiveness;
- Information superiority: the United States always knows more than its adversary and knows it faster;
- Agile combat support: the United States is prepared to operate anywhere in the world; and
- Rapid global mobility—gets forces to the fight quickly and reliably.

Air Mobility Command (AMC) plays a key role in all six core competencies, but rapid mobility is AMC's "bread and butter."

General Walter Kross, commander of Air Mobility Command and commander-in-chief of the U.S. Transportation Command, outlined four AMC objectives and seven key acquisition programs and program initiatives.

Four Major Themes and Goals of Air Mobility Command

- The United States is ready to perform global missions through several means:
  - Strategic Airlift, allowing the United States to carry heavy combat equipment to an austere environment at a great distance;
  - Theater Airlift, supporting theater warfighting commanders with rapid air movement;
  - Aerial Refueling, projecting global power nonstop from the Continental United States;