In 1994, the Defense Advanced Research Projects Agency (DARPA), in conjunction with the Defense Airborne Reconnaissance Office (DARO), began the development of two unmanned aerial vehicles (UAVs). These systems were intended to provide surveillance information to the warfighter. They responded to the recommendations of the Defense Science Board and to the operational needs stated by DARO on behalf of military service users.¹

UAV and tactical surveillance/reconnaissance programs have a history of failure resulting from inadequate integration of sensor, platform, and ground elements, together with unit costs far exceeding what operators have been willing to pay. Such problems have contributed to a sense of frustration and to a realization that the DoD needs to explore ways to simplify and improve the acquisition process. To overcome these historical problems, DARPA, with congressional support, adopted an innovative acquisition strategy for the High-Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) program that differed from normal Department of Defense (DoD) acquisition procedures in several important ways. These innovations are embodied in seven specific elements of the strategy: designation as an Advanced Concept Technology Demonstrator (ACTD); use of

¹See also *Long Endurance Reconnaissance, Surveillance, and Target Acquisition (RSTA)* (JROCM-003-90, 1990), which documents a need to provide commanders in chief (CINCs) with responsive, long-endurance, near-real-time RSTA capability against defended areas; *Assured Receipt of Imagery for Tactical Forces* (JROCM-044-90, 1990), which documents a need for rapid, effective, and continuous dissemination of imagery; and *Broad Area Coverage Imaging* (JROCM-037-95, 1995), which documents a need for on-demand, near-real-time battlefield imagery.
Section 845 Other Transaction Authority (OTA); use of Integrated Product and Process Development (IPPD) and a management structure based on Integrated Product Teams (IPTs); contractor design and management authority; a small joint program office; user participation through early operational demonstrations; and a single unit price requirement with all other performance characteristics stated as goals.

The HAE UAV ACTD program consisted of two complementary system development efforts: the conventionally configured Tier II+ and the Tier III−, which incorporated low-observable (LO) technology into the design of the air vehicle. The program also included a common ground segment (CGS) that was intended to provide launch, recovery, and mission control for both air vehicles. The ACTD program was structured into three phases. Phase I was a design competition for the conventional Tier II+ system. Phase II included the development and test of both the Tier II+ (Global Hawk) and the LO Tier III− (DarkStar). Phase III involved the demonstration and evaluation (D&E) activity leading to a military utility assessment (MUA).

RAND has been analyzing the execution of the HAE UAV ACTD program’s innovative acquisition strategy since the program’s inception in 1994. Previous reports have documented the effects of that innovative acquisition strategy on Phase I and earlier portions of Phase II of the ACTD program. The current research addresses the completion of Phase II, the transition to Phase III, and the transition to post-ACTD activities.

As the HAE UAV ACTD program transitioned to Air Force management and subsequently into the D&E phase of the ACTD, we found it useful to distinguish among three broad sets of issues: transition management; the activity content of the program; and the flight test program. This report is one of three supporting documents resulting from the current research effort; it addresses transition management issues. The other two publications address activity content and re-

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lated program outcome issues and document the flight test program, respectively. A separate executive summary presents the main conclusions of our analysis and draws lessons regarding application of the elements of the innovative acquisition approach used in the HAE UAV ACTD program. Also provided are suggestions on ways in which the strategy can be enhanced.

OBJECTIVES

An important part of the process of improving acquisition management methods, policy, and supporting analysis lies in the accumulation of experience from ongoing or recently completed projects, especially those involving unusual situations or innovative acquisition strategies. The objective of this research was twofold: to understand how the innovative acquisition strategy used in the HAE UAV ACTD program affected the program’s execution and outcomes, and to identify lessons that might be applied to a wider variety of programs in order to improve DoD acquisition strategies.

The HAE UAV ACTD program included two challenging management transitions. The first lay in the transition of management responsibility from DARPA to the Air Force within the ACTD program. The second involved the transition from an ACTD to a Major Defense Acquisition Program (MDAP) under Air Force management. Both transitions affected and were affected by the program’s unique and innovative acquisition strategy. The ability to accomplish those transitions smoothly was critical to the program’s success. This report explores these two challenging transitions within the context of the innovative acquisition strategy used in the HAE UAV ACTD program. Our goal was to understand the impact of that strategy on transition and associated acquisition management issues.

RESEARCH APPROACH

This project was a multiyear research effort that tracked and documented the execution of the HAE UAV ACTD program through its completion. The current research effort followed the execution of the HAE UAV ACTD program in Phase III of the ACTD, with an emphasis on transition issues, adequacy of testing, and user involvement. The overall project was organized into three tasks.
**Task 1: HAE UAV ACTD Program Tracking**

The primary research task was to track and document the experience of both the program office and contractors as the HAE UAV ACTD program proceeded. This task involved periodic discussions with both the Global Hawk System Program Office (GHSPO) and contractors in efforts to understand current program status, key events and milestones, and how the innovative elements of the acquisition strategy were implemented. We performed a thorough review of program documentation, including solicitations, proposals, Agreements, memoranda, and program review briefings. Through discussions and reviews of documentation, we were able to assess whether the acquisition strategy was having the expected effect as well as to identify issues arising in the course of program execution that either affected or were affected by the acquisition strategy.

**Task 2: Comparisons to Other Programs**

In this portion of the research, we collected and analyzed historical cost, schedule, and performance data from comparable past programs. Relatively little detailed historical data has been preserved on past UAV programs. Past UAV development efforts have tended to be canceled prior to completion, highly classified, or simple systems that are inappropriate for comparison to HAE UAVs. These circumstances make past UAV programs a poor basis for comparison to the HAE UAV ACTD. Therefore, we assembled data on program outcomes from broader databases of historical experience to assess HAE UAV ACTD program outcomes in a historical context. We examined the transition experience and test activities of other programs to provide a perspective for the strategy employed in the HAE UAV ACTD program.

**Task 3: Analysis and Lessons Learned**

In this task, we drew together the information collected under Tasks 1 and 2 and developed two kinds of overall results. One focused on understanding the extent to which the HAE UAV ACTD program was implemented as planned and the degree to which the program achieved its expected outcomes. The other focused on the relative success of the HAE UAV ACTD program in comparison to other pro-
gram. Together, these results yielded an understanding of the strengths and weaknesses of the overall HAE UAV ACTD acquisition strategy. We then interpreted those results in terms of lessons that might be applied to future programs.

OVERVIEW OF THE HAE UAV ACTD PROGRAM UNDER AIR FORCE MANAGEMENT

The HAE UAV ACTD program transitioned from DARPA to Air Force management on October 1, 1998, approximately one year later than planned. At the time, Global Hawk air vehicle 1 had completed five airworthiness/functional checkout sorties; air vehicle 2 was still two months from its first flight. DarkStar had resumed flight testing with air vehicle 2 only five months earlier and had completed only three sorties.3 Phase III start was still nine months away and thus represented a substantial change from the original plan, in which the program was to have transitioned to Air Force management at the beginning of Phase III.4 Post-ACTD planning had not yet been approved, although some small related efforts were under way in connection with the transition activities just completed. The Australian demonstration was still in the early planning and feasibility stages. At the time the program transitioned to the Air Force, the ACTD program was planned for completion in June 2000, corresponding with the completion of the MUA.

DarkStar was canceled in January 1999 and did not take part in Phase III. Northrop Grumman acquired Teledyne Ryan Aeronautical (henceforth referred to as Ryan) in July 1999. This helped resolve several important industrial-base problems, including smoothing the activity gap between the ACTD and a follow-on program; replacing the wing fabrication vendor; and providing expertise in management under a more traditional acquisition approach. This change facilitated Global Hawk’s transition to an MDAP.

3See Jeffrey A. Drezner and Robert S. Leonard, Innovative Development: Global Hawk and DarkStar—Flight Test in the HAE UAV ACTD Program, MR-1475-AF, Santa Monica: RAND, 2001, for details on the events and accomplishments of the flight test effort.

4This desynchronization of management and phase transition had the effect of clouding the actual transition to Phase III activities. Phase III D&E planning took place throughout the year prior to the formal start of Phase III in June 1999.
By October 2000, the ACTD program was essentially complete and the Joint Forces Command (JFCOM) had issued a positive MUA report for Global Hawk. The program office was working toward a Milestone II/low-rate initial production (LRIP) decision scheduled for that month to approve entry into an initial one-year engineering and manufacturing development (EMD) program. Further work was to be based on a spiral development/evolutionary acquisition approach in which continuing nonrecurring engineering (NRE) activities resulted in scheduled block upgrades. The October 2000 Defense Acquisition Board (DAB) II was delayed until December 2000 as a result of continued disagreement regarding the specifics on the evolutionary approach (i.e., requirements and capabilities associated with each block, timing, and quantities). The December 2000 DAB II did not take place. Milestone II finally occurred on March 6, 2001.

Five Global Hawk air vehicles, three launch and recovery elements (LREs), and two mission control elements (MCEs) were fabricated and tested to varying degrees. Global Hawk air vehicle 2 was destroyed on March 29, 1999; it was carrying the only integrated sensor suite (ISS) acquired up to that time. Air vehicle 3 experienced a postflight taxi mishap on December 6, 1999, destroying the program’s only remaining electro-optical/infrared (EO/IR) sensor and delaying the flight test program by three months as flight test management was reorganized. Global Hawk participated in 11 formal exercises as part of the Phase III D&E program supporting the MUA.

Residual assets at the end of the ACTD included four Global Hawk air vehicles, two synthetic aperture radars (SARs), one ISS (purchased after the destruction of the first ISS), two MCEs, and three LREs. Two additional air vehicles (air vehicles 6 and 7) will be delivered in FY 2002; these will have a somewhat different configuration than previous air vehicles, requiring modifications to the ground segments.

Over the 30 months from October 1998 to March 2001, the Air Force program office was occupied with three simultaneous primary management tasks: conducting the flight test program; planning for a transition from ACTD to the traditional acquisition process; and re-
quirements generation and concept-of-operations (CONOPS) development, especially as it related to post-ACTD activities. In all these efforts, the innovative acquisition approach that characterized the program under DARPA management continued to have a significant effect on program management, events, and outcomes. In particular, the program’s designation as an ACTD, its use of Section 845 OTA, and the lack of firm performance requirements had the greatest influence on the two transitions.

ORGANIZATION OF THE REPORT

The remainder of this report presents information relating to the two management transitions—from DARPA to Air Force management and from ACTD to MDAP status—and the effect of the program’s innovative acquisition strategy on those transitions. In the course of this discussion, information on key acquisition management issues and program events is also presented, with an emphasis on the effect of the program acquisition strategy.

Chapter Two discusses the management transition from DARPA to the Air Force. Evidence suggests that this transition was remarkably smooth.

Chapter Three documents the key issues and events surrounding the transition of Global Hawk from an ACTD program to the formal acquisition process. Aside from managing the flight test program, much of the program office’s effort was focused on this more challenging and problematic transition. We give particular attention to how the post-ACTD program structure has evolved to date and the influence of the ACTD-era acquisition strategy on those plans.

Chapter Four summarizes the impact of the acquisition strategy on transition management; lists the key factors affecting the relative success of the two transitions; and suggests several improvements to the acquisition strategy which might help overcome the transition-related problems encountered in the HAE UAV ACTD program.