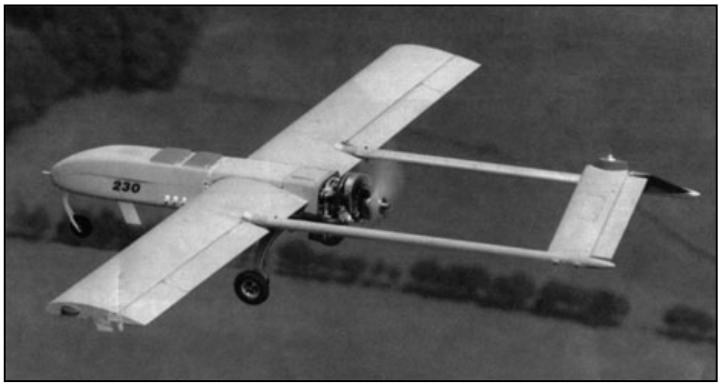
RQ-7 SHADOW 200 TACTICAL UNMANNED AERIAL VEHICLE (TUAV) SYSTEM



The Tactical Unmanned Aerial Vehicle (TUAV) system is designed as a ground maneuver commander's primary day/night reconnaissance, surveillance, target acquisition, and battle damage assessment system.

The Shadow 200 is a small, lightweight, tactical UAV system. The system is comprised of air vehicles, modular mission payloads, ground control stations, launch and recovery equipment, and communications equipment. It will carry enough supplies and spares for an initial 72 hours of operation. It will be transportable in two high mobility multi-purpose wheeled vehicles (HMMWVs) with shelters, and two additional HMMWVs with trailers as troop carriers.

A single TUAV system includes three Shadow 200 air vehicles with a fourth air vehicle as part of the issued equipment of the maintenance section. The air vehicle is constructed of composite materials, with a wingspan of 12.3 feet, and length of 11.2 feet. Power is provided by a commercial 38-horsepower rotary engine that uses motor gasoline (MOGAS). The payload has a commercially available electro-optic and infrared camera, and communications equipment for command and control and imagery dissemination. Onboard global positioning system instrumentation provides navigation information.

The air vehicle is intended to provide coverage of a brigade area of interest for up to four hours, at 50 kilometers from the launch and recovery site. The maximum range is 125 kilometers (limited by data link capability), and operations are generally conducted from 8,000 to 10,000 feet above ground level during the day and 6,000 to 8,000 feet above ground level at night. The air vehicle uses a pneumatic launcher and is recovered by a tactical automatic landing system without pilot intervention on the runway. The air vehicle is stopped using an arresting hook and cable system.

The TUAV system must provide 12 hours of continuous operations within a 24-hour period. It must be able to surge to 18 hours within a 24-hour period, for up to three consecutive days. The system must be able to keep pace with a brigade's movement, with rapid emplacement/displacement times. An air vehicle may be passed between control stations or launch and recovery stations to facilitate these requirements.

BACKGROUND INFORMATION

In March 1999, the JROC directed the Army and the Navy to pursue separate air vehicle solutions to satisfy their tactical UAV requirements. The JROC subsequently validated the Army's TUAV ORD and three Key Performance Parameters: MOGAS fuel for the air vehicle and generators; day/night passive imagery payload; and C4I interoperability with the Army's Joint Tactical Architecture, Battle Command System, and JSTARS Common Ground Station.

The Army conducted a systems capability demonstration (SCD) in October and November 1999 to establish the baseline for system technical and operational performance and provide input to the TUAV source selection. In December 1999, a low rate initial production (LRIP) contract was awarded to AAI Corporation for four Block I Shadow 200 TUAV systems. In March 2001, a second LRIP contract was awarded to AAI for four more Block I systems. Block I systems do not meet many ORD requirements and the program office has planned for a Block II upgrade, to come closer to meeting TUAV threshold requirements. The JROC-required interoperability with the tactical control system will be integrated as a block upgrade at a later time.

The TEMP was approved prior to Milestone II and the initial contract award. An updated TEMP is currently being drafted for coordination no later than February 2002.

A Milestone III full-rate production decision for the Block I and Block II systems was planned for September 2001. However, due to problems during IOT&E the full-rate production decision is delayed by at least one year. The program will award a third LRIP contract for six more Block I systems. This total LRIP of Block I systems will be 14 of the total 44 required, and the systems would not meet the threshold ORD requirements.

TEST & EVALUATION ACTIVITY

In February 2001, a test event took place at Fort Huachuca, AZ. It was a key risk reduction event to demonstrate a rigorous OP TEMPO similar to that planned for the April 2001 IOT&E. During this OP TEMPO test, the TUAV was to demonstrate the Operational Mode Summary/Mission Profile (OMS/MP). This included five days with on-station times of 12, 18, 18, 18, and 8 hours per day, respectively. The system was operated by a combination of soldiers and contractors. The test was to last for five days and 74 hours of flight. However, a combination of poor weather, an air vehicle crash, and limited air traffic control support extended the length of the test to 21 days.

The Joint Interoperability Test Command (JITC) has periodically assessed the C4I interoperability of the TUAV system with prototype versions of the TUAV ground control station and developmental software. In all, JITC conducted six assessments prior to IOT&E, culminating with the Tactical Operations Center Assessment from February to March 2001, at Fort Hood, TX. The purpose of this test was to assess the interface of the TUAV ground control station with the test unit's (1st Brigade of the 4th Infantry Division) tactical operations center, through the KPP-required C4I connectivity with Army's Joint Tactical Architecture, Battle Command System, and JSTARS Common Ground Station.

The TUAV system entered IOT&E on April 29, 2001. IOT&E was planned for two phases, each lasting five days. The test scenario portrayed a Kosovo-like peacekeeping environment. The first phase was to measure the capabilities of the system in a more controlled environment to ensure the requisite measures of performance could be collected. Additionally, one subtest was planned to assess the capability of the system to support adjustment of artillery fires. The second phase was more of a free-

play, field training exercise environment in which the Brigade commander could employ the TUAV as required to support his mission. This phase was to provide an opportunity to assess the contribution of the system to the reconnaissance, surveillance, and target acquisition efforts of the brigade. DOT&E approved the TEMP and test plan, and observed the testing.

After two crashes during the first two days of flight, the test was halted pending accident investigations. The test resumed the next week, but was down-scoped to a limited user test (LUT). After two more crashes, the LUT was terminated and all flight operations of the Shadow 200 stopped. Of the more than 150 hours of proposed flight time for the test, 35 hours were executed.

TEST & EVALUATION ASSESSMENT

During the OP TEMPO test, approximately 24 flight hours were completed the first three days. However, the test was interrupted for 11 days. The system flew approximately 66 hours during the last four days with one period of more than 16 hours continuous on-station time. Problems with the air vehicle alternator and fuel bladders were discovered, which ultimately resulted in restrictions on the endurance (less than four hours) and altitudes (less than 10,000 feet) that the air vehicle could fly.

The TUAV system was clearly not ready for IOT&E. Concerns were raised about system reliability throughout the operational test readiness review process, and the certification of system readiness was premature. The program urgently went from contract award to IOT&E in 15 months, having already awarded two LRIP contracts for a total of eight Block I systems.

The OT was not adequately conducted. The brigade did not task the TUAV against instrumented targets as set out by the tester. Additionally, the white cell (simulated division headquarters) did not adequately focus the brigade on the test scenario.

Testing revealed significant system capability problems. The PM imposed landing site constraints on the TUAV platoon regarding width, slope, and amount of debris allowed. Therefore, the landing areas used during the test did not test the ORD requirements or intent of an unprepared, soccer field-sized area, 100 meters by 50 meters. The primary landing area was a hard surface runway. The alternate landing site had to be prepared with corps-level engineering assets. Both landing strips were considerably larger than required. Requirements for optimized landing sites could negatively impact a maneuver commander's employment of this system.

Other deficiencies included target location errors in excess of 200 meters (the threshold requirement is 80 meters), inadequate procedures to support artillery adjustment, and poor reliability (less than three hours mean time between system aborts while the requirement is 20 hours). Additionally, air vehicle susceptibility to detection was high. It was seen and heard within effective ranges of threat systems such as the ZSU-23-4, SA-7, and SA-9. It was also detected by threat radar systems (SA-8 and Giraffe).

The JITC interoperability test report stated that the Block I TUAV ground control station did not demonstrate interoperability with the Army Battle Command System (ABCS), particularly the All Source Analysis Remote Work Station (V 4.3.5) and the Advanced Field Artillery Tactical Data System (98), or the JSTARS Common Ground Station (V 2). By the next IOT&E, the test unit will be using more advanced versions of this ABCS software. This makes achieving interoperability with the TUAV high-risk since the TUAV has yet to interoperate with currently fielded versions of ABCS. Further, JITC cannot certify the TUAV with the advanced versions of ABCS until they are operational and fielded.

The Army established entrance criteria for the next IOT&E that included successful completion of another OPTEMPO test event. To that end, the PM recently conducted a three-phase OPTEMPO demonstration between October and December 2001. The first phase was conducted from October 1-5. While not under operational conditions, the system demonstrated the capability to remain on-station for 12 hours per day for three consecutive days. The second phase took place from November 4-8 to demonstrate system reliability by flying the five-day operational mode summary/mission profile under more operationally realistic conditions. Four air vehicles flew over 112 hours during 28 flights. The mean time between system aborts was 21.3 hours. This is a major improvement over the last IOT&E, lowering risk for the next IOT&E. The third phase, intended as an important data collection and system performance event, was severely curtailed due to inclement weather. Therefore, the results from the November OP TEMPO event were used to support the third LRIP decision.