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TECHNICAL SUPPORT FOR THE TANK BREAKER PROGRAM

FINAL TECHNICAL REPORT

October 1981

James Meni

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ABSTRACT

This report summarizes work performed in support of the Tank Breaker Program for the Defense Advanced Research Projects Agency, Tactical Technology Office (DARPA/TTO), under contract MDA903-81-C-0064 from October 1980 through October 1981.

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TECHNICAL SUPPORT FOR THE TANK BREAKER PROGRAM

A. PURPOSE

This report summarizes the work performed by System Planning Corporation (SPC) for the Defense Advanced Research Projects Agency, Tactical Technology Office (DARPA/TTO), under contract MDA903-81-C-0064, issued by Department of the Army, Defense Supply Service-Washington, from 20 October 1980 through 31 October 1981. A series of tasks was performed for the Tank Breaker Program Manager (PM). This document addresses those efforts.

B. BACKGROUND AND SCOPE

The Tank Breaker antitank missile concept was developed in FY 79. This fire-and-forget, manportable missile system is based on a staring focal plane array seeker and employs advanced guidance and control concepts that result in impacts against the top armor of tanks. This missile is also effective against other battlefield targets, such as bunkers, and offers high operational flexibility.

The potential operational utility and technical feasibility of Tank Breaker were established after extensive exposure to the user community and to industry. This led to the initiation of a joint DARPA/Army Missile Command (MICOM) program in FY 80. The program has two phases. Phase I, a 1-year effort, consists of demonstrations of critical technologies and development of detailed designs. Phase II is a 3-year hardware effort that culminates in full-scale system demonstrations. Under this contract, SPC has supported the DARPA PM in the areas of program analyses, warhead evaluations, and cost analyses during implementation of the Phase I hardware efforts and the Phase II seeker efforts.

C. SUMMARY

The major efforts that SPC performed under this contract are summarized in this section.

1. Program Analyses

This task provided a broad range of quick-response project analysis support in: (1) monitoring performance of the four Phase I hardware contractors (Hughes Aircraft, McDonnell Douglas, Rockwell International, and Texas Instruments) and the Phase II contractors (Hughes Aircraft and Texas Instruments); (2) tracking cost expenditures of the hardware programs; (3) coordinating hardware component tests with Government laboratories (MICOM and Night Vision and Electro-Optical Laboratory (NVEOL)); (4) assessing program risks; and (5) evaluating results of component tests. Recommendations for program changes were made to the PM; SPC also coordinated efforts with the Army Infantry Manportable Antiarmor Assault Weapons System (IMAAWS) PM at MICOM to ensure compatibility of technical and schedule requirements.

SPC participated in the Phase I program review held at the contractors' facilities and at DARPA and in the Phase II initiation meetings held at SPC and at the contractors' facilities in September 1981. For this part of the task, SPC assisted in coordinating the contractors' efforts with the user community (Infantry Center and the Marine Corps), the IMAAWS project office, the MICOM Guidance and Control Laboratory, the Army NVEOL, the Army Human Engineering Laboratory, and Firestone and Physics International (the Tank Breaker warhead contractors). In addition, the draft technical requirements (TR) document for Phase II was reviewed in detail, and recommendations were transmitted to the DARPA PM. SPC reviewed the Flight Test Plan prepared by the IMAAWS project office and transmitted recommendations for changes to DARPA and the IMAAWS project office. SPC also represented the

DARPA PM in the Test Integration Working Group (TIWG) meeting held at MICOM.

Papers and presentation materials were prepared for the AIAA Tactical Missile meeting held at Redstone Arsenal in February 1981, and for the JANNAF Propulsion Conference held at New Orleans, Louisiana, in May 1981. In addition, SPC prepared other presentations for the DARPA PM throughout the performance period of this contract.

2. Technical Evaluation

Under this task, SPC provided technical analyses to assist the DARPA Tank Breaker PM in evaluating the Phase II proposal. The task was performed on a quick-response basis to support the Phase II schedule requirement.

3. System Effectiveness

A comprehensive lethality analysis of alternative warhead concepts for the Tank Breaker missile was performed. The objectives of the study were to compare the effectiveness of 3- and 4-inch warheads; determine the optimum impact angles for the Tank Breaker missile against present and future threat targets; and compare a shaped charge warhead optimized for enhanced behind-armor-debris with one optimized for penetration performance. A series of computer codes was employed to simulate a large sample of individual warhead impacts on the target, to estimate the resulting degradation of vehicle combat capabilities due to each individual impact, and to calculate the probability of kill given a hit. First, the Ballistic Research Laboratory (BRL) GIFT code was used to generate a large sample of potential warhead trajectories through the target. Second, the BRL VAST-QD code was used to evaluate the performance of the warhead along each trajectory and to estimate the degradation in tank firepower and mobility and the probability of catastrophic kill (irreparable damage) for each impact. Third, the BRL HITDIST code was used to calculate the probabilities of firepower kill (F-kill), mobility kill (M-kill), mobility of firepower kill (M-or-F-kill), and catastrophic kill (K-kill) given a hit with a selected aimpoint and dispersion.

SPC Report 653, Lethality Evaluation of Conceptual Tank Breaker War-heads, was published and distributed in February 1981. The results were used to support the Phase II proposal evaluations.

4. Cost Analyses

Under this task, the relative production costs of the four Tank Breaker designs were estimated based on the relative complexities of the systems. Phase II development costs were estimated based on the efforts remaining and the relative status and complexity of subsystem developments. The results were presented to the DARPA PM.

5. Human Factors

SPC interfaced with the Human Engineering Laboratory and the Infantry Center to ensure that the Tank Breaker configurations meet the Army's requirements. Emphasis was placed on system weight, diameter, and length; the search and lock-on operations and switchology; the displays; and the launch signature.

6. Test Activities

SPC assisted in formulating the Phase I test plan and evaluating Phase I component results. SPC staff members attended component test demonstrations and presented independent assessments to the DARPA PM. These activities were performed on a quick-response basis to facilitate the contractor schedule and selection evaluations for Phase II.