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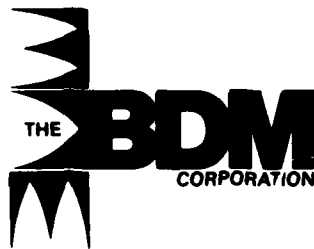
DARPA AIR VEHICLES TECHNOLOGY OFFICE
TECHNICAL TASK ORDER CONTRACT
FINAL TECHNICAL REPORT
AUGUST 31, 1983

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BDM/W-83-319-TR

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This report was prepared for the Defense Advanced Research Projects Agency, 1400 Wilson Boulevard, Arlington, Virginia 22209.

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DARPA AIR VEHICLES TECHNOLOGY OFFICE
TECHNICAL TASK ORDER CONTRACT
FINAL TECHNICAL REPORT

In January 1982, the Defense Advanced Research Projects Agency (DARPA) Air Vehicles Technology Office contracted with The BDM Corporation (BDM) for BDM to provide quick-reaction research in support of DARPA/AUTO programs. The nature of this effort was to be in the form of Technical Task Orders on various issues, as required. These tasks would have short response times of weeks or months, and could result in reports or briefings. This Final Technical Report summarizes the initiated and completed technical work that BDM and subcontractors to BDM performed under the original contract which ran from January 7, 1982 through December 31, 1982, as well as those tasks initiated and completed under the extended contract, which was extended to include additional support to the Tactical Technology Office until June 30, 1983. Summaries of the work performed under each Task Order are presented consecutively by TTO number.

RE: BDM/W-83-319-TR

The classified references on Pages TTO #1 and 10 do not compromise anything. Pages TTO #3, 4, 5, 8, and 9 were left out intentionally.

Per Mr. Palmer McGrew, BDM Corp.



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TTO #1 THIRD GENERATION CRUISE MISSILE

A. OBJECTIVE

→ This task entailed assessing the applicability of third generation cruise missile technology to future Naval weapons systems and identifying the potential payoff of selected technology programs. → cont. next page

B. APPROACH

The approach involved the following efforts:

- (1) Conduct a preliminary engineering analysis and technical assessment to determine the applicability of third generation cruise missile technology to future Naval weapon systems,
- (2) Compare results with the capabilities of the basic first generation TOMAHAWK weapon system and second generation systems, and
- (3) Prepare a quantitative analysis based on the engineering analysis and technical assessment.

C. FINDINGS

This task provided assessments on the status of this and selected DARPA programs on advanced cruise missile technology. In addition to the proposed assessment, the Autonomous Terminal Homing program was identified as a candidate system for inclusion in this study. The conclusions of this task were submitted in a classified version to Commander Finch which contains TEAL DAWN Program - Limited Distribution.

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TTO #2 AEROSTATS FOR AFSOUTH

A. OBJECTIVE

cont This task investigated the technical feasibility of employing aerostats as platforms for surveillance radars to detect low-flying aircraft for AFSOUTH. *→ cont next page*

B. APPROACH

The specific tasks that addressed the use of aerostats were to:

- (1) Evaluate the validity of the aerostat solution to the surveillance needs including the feasibility of achieving radar performance requirements;
- (2) Determine technical feasibility in terms of capabilities of existing aerostats and radar systems, and their compatibility; and,
- (3) Identify new technologies, if any, needed for a successful aerostat solution and DARPA's possible role against these technologies.

C. FINDINGS

The conclusions were that the aerostat concept for AFSOUTH is technically feasible and operationally sound. Since no new technologies were identified, BDM recommended that DARPA's role should be advisory in nature and thus should obtain armed service support. A final report was submitted to summarize the results of this study.

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TTO #6

SENSOR AND DISPLAY LITERATURE SEARCH

A. OBJECTIVE

This task assessed the state of ongoing programs relating to display and sensor technologies which might be applicable to close combat vehicles.

B. APPROACH

The approach to obtain the requested information involved conducting a literature search and identifying those new and emerging technologies currently a part of DOD programs and which may be applicable to the close combat initiatives.

C. FINDINGS

The results of the literature search were presented in a draft briefing format.

THE BDM CORPORATION

TTO #7 CRITICAL NODES MUNITIONS ASSESSMENT

A. OBJECTIVE

cont
This task continues work for the Critical Nodes Program, determining the appropriate munitions that are to be used against critical nodes. It emphasizes current, highest priority critical nodes. → *cont next page*

B. APPROACH

The following tasks were addressed:

- (1) Review current munitions effectiveness against known targets;
- (2) Analyze the mission function of Task 1 and determine the appropriate delivery method to be utilized; and,
- (3) As a result of Tasks 1 and 2, identify any deficiencies and assess the technology required to enhance critical nodes requirements.

C. FINDINGS

The spectrum of munitions potentially suitable for attacking critical nodes were identified and characterized. The sensitive data base material characterizing highest priority critical nodes was assembled and the method of analysis for identifying deficiencies and assessing the technologies to enhance critical nodes requirements are in place. Task results were submitted in an annotated briefing and include research methodology employed.

TTO #10
DETECTING AND TRACKING LOW-ALTITUDE, LOW-RADAR
CROSS SECTION TARGETS

A. OBJECTIVE

cont. In order to fully evaluate various candidate technologies for passively detecting and tracking low-altitude, low-radar cross-section targets using various classes of illumination, a comprehensive program plan is needed. This task involved preparing a plan to identify gaps and present alternatives for evaluating the tactical potential of the class of systems under consideration. *--- end of page*

B. APPROACH

The span of activities included:

- (1) Proof-of-principal experimental testing,
- (2) Development and evaluation of signal and data processing algorithms,
- (3) Verification and exploitation of simulations of such systems, and
- (4) Fundamental research into the limitations of such systems.

C. FINDINGS

Advice and assistance has been given to DARPA in structuring an R & D program for proof of principle testing of the most promising approaches. This task also provided assistance in supporting R & D in signal and data processing algorithms, system simulations and fundamental research into the capabilities of such systems. Some original analytic work has been done on doppler only tracking, resulting in a pocket computer program for generating target track and doppler histories and in a memo describing an approach to doppler tracking. This information has been incorporated into a classified briefing.

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TTO # 11

IDENTIFICATION OF ARMY-APPLICABLE TECHNOLOGIES

A. OBJECTIVE

This task encompassed identifying emerging technologies which are applicable to Army requirements to provide product improvements or enhancements with substantial payoffs in increased mission-related performance.

B. APPROACH

The required tasks to meet the objectives of this program were as follows:

- (1) Analyze Army requirements versus equipment.
- (2) Survey programs and information base, and
- (3) Identify applicable technological developments.

C. FINDINGS

BDM provided DARPA with a final briefing detailing advanced technologies with application to Army equipment upgrade. Among those technologies were long rod penetrators, fire control, advanced armors, terminal guidance, tubular rounds and advanced fuzes.

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TTO #12

INDEPENDENT ASSESSMENT OF AIR VEHICLE PROGRAMS

A. OBJECTIVE

There have been a number of major DARPA programs assessed prior to initiation to determine their worth. This task entails assessing the technical and related management risks of projected DARPA Air Vehicles programs.

B. APPROACH

This assessment included the following functions:

- (1) Determine the significant technical problems that can cause failure of reaching predicted performance levels in the current RSRA program;
- (2) Assess the above problem areas with regard to the likelihood of successful solutions and the impact of partial solutions on a follow-up operational vehicles; and,
- (3) Assess the unknowns that will remain after completion of the RSRA program and the degree to which these unknowns will mitigate against an operational vehicle development program. This assessment included factors relating to operational need and required performance levels that will be required by an X-wing type vehicle.

C. FINDINGS

The X-wing assessment resulted in the identification of a number of risk areas that could militate against the successful completion of the current RSRA X-wing program or that could impair the transition of the concept to an operation vehicle program. This assessment was limited to

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informal reviews and discussions with all government and contractor participants in the program -- Boeing Vertol, Sikorsky, NASA Ames, David Taylor Ship Research and Development Center, and DARPA.