ORI

AERONAUTICS SYSTEMS TECHNOLOGY STUDIES

FINAL REPORT

JAMES S. DAHLSTEDT

OCTOBER 1983

PREPARED UNDER CONTRACT NAS1-17504
FOR
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

ORI
Silver Spring, Maryland 20910

AERONAUTICS SYSTEMS TECHNOLOGY STUDIES

FINAL REPORT

JAMES S. BAUCHSPIES

OCTOBER 1983

PREPARED UNDER CONTRACT NASW 3554
FOR
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20305

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd.)

I. INTRODUCTION

This report summarizes ORI, Inc.'s support to the Aeronautics Systems Division, Office of Aeronautics and Space Technology, National Aeronautics and Space Administration, under Contract NASW-3554 -- Aeronautics Systems Technology Studies. The period of performance covered by this report is from 1 November 1981 to 30 September 1983.

Contract NASW-3554 is a task order/level of effort contract to provide support to technology related studies being conducted by the Aeronautics Directorate, Office of Aeronautics and Space Technology, NASA. Under this contract, ORI provided the personnel and resources necessary to support the Aeronautics Systems Division in the following eight areas:

- Data collection and analysis in the areas of air transportation, aircraft manufacturing and sales, airline operations, market projections, international trade, and energy consumption.

- Analyses of developments in and impacts of legislation and regulations related to air transportation.

- Preliminary studies of technology needs and opportunities for various classes of future civil and military aircraft, and analysis of results of relevant NASA in-house and contracted studies.

- Assistance to in-house R&T Assessment or program planning teams or to NASA-related technical committees in arranging seminars and conferences, data collection and analysis, report compilation and editing, and presentation material preparation.

- Surveys and analyses of industry efforts in advanced technology studies and development, government-industry interactions, decision-making processes related to new technology application, etc.

- Special studies such as advanced technology cost-benefit or cost-effectiveness, and multiple application of fundamental technologies.

- Case studies of technology transfer processes and results.

- Selection or development of methods for accomplishing the activities outlined above, including analysis, synthesis, and economic models.

TASKS

Eleven specific tasks were issued during the course of the contract. These tasks were:

- 002: Propfan Technology Trade-offs with Variations in Cruise Mach Number

- 003: Project Forecast

- 004: Office Automation Data Base and Design

- 005: Economic Analysis of 30-passenger Mach 0.84 Transports

- 006: Effects of Technical Advancements on the Air Transport Fleet

- 007: Heat Engine Technology Transfer
- 009: Update of R&T Program Perspectives for General Aviation and Commuter Aircraft
- 010: NASA/DoD/FAA Rotorcraft Research and Development (Technology) Data Base
- 011: Generic Fault Tolerant Avionics Peer Review Meetings
- 012: Technical Information Support and Documentation for the Low and High Altitude Emissions Programs
- 013: Independent Analysis of the Public Service Helicopter Technology Programs.

Task number 008 was never issued. Task 001 is a miscellaneous task to respond promptly to urgent, unanticipated requirements and to prepare monthly progress and cost reports.

SCOPE

This report consists of three sections in addition to this introduction. Section II is an overview of the miscellaneous subtasks performed under Task 001. Section III is a summary of each of the specific tasks performed. Included is the objective, approach, analysis, findings and/or status. The final section is an overview of the contract as a whole with recommendations to improve support to the Aeronautics Systems Division in the future.

Because of the volume of work accomplished under this contract, the material has been incorporated by reference rather than as appendices attached hereto. In addition, since this report is being written one month prior to termination of the contract, several tasks are reported as on-going and the status, rather than the findings, reported.

II. MISCELLANEOUS TASKS

Task 001 was issued in order to obtain support to respond promptly to urgent unanticipated requirements and to prepare monthly progress and cost reports. These priority requests would normally fall into the categories of requests for information, briefing materials, literature searches, etc. Each subtask was to be accomplished within 72 hours, was not to exceed 32 hours of professional labor, and was not to exceed $1,000 in cost. The contractor's technical representative had the authority to grant verbal approval for these subtasks.

It soon became obvious that the formal approval procedure for tasks exceeding $1000 was such that more flexibility was needed to meet the needs of the Aeronautics Systems Division. As a result, task 001 underwent two modifications -- task 001A extended the time from 72 to 96 hours, increased the level of effort from 32 to 40 professional hours and increased the cost for each subtask from $1,000 to $3,000. A ceiling of $24,000 was placed on this task.

Task 001B was issued to remove the time and manpower limitations. The cost for each subtask was increased to $5,000 and the ceiling for this task was removed. A summary of the effort provided by ORI under Task 001 is described in the following paragraphs.

ADMINISTRATION SUPPORT

Effort required for the administration of contract NASW-3554 was covered under Task 001. In addition to the items specified in the task order, i.e., monthly progress reports and cost reports, contract management efforts included periodic liaison with the NASA technical officers and responding to queries regarding the status of the contract or individual tasks.

Also under this task, ORI was requested to scope and provide preliminary findings to subjects which might warrant more in-depth analysis. Two such areas which evolved into separate tasks were Automation of NASA/OAST Office Procedures (Task 004) and The 30-Passenger, 0.84 Mach Transport (Task 005).

SUPPORT SERVICES

The majority of the effort performed by ORI under Task 001 was in providing assistance to in-house R&T assessment or program planning teams or to NASA-related technical committees in arranging seminars and conferences, data collection and analysis, report compilation and editing, and presentation material preparation. Since the level of effort for these support requirements could not be identified in advance, and because the effort was required in a quick response manner, support for some of these study teams continued over many months and consisted of a variety of subtasks. Two such study groups are worthy of especial mention -- the OSTP Study Group on Aeronautical Research and Technology Policy and the U.S. Trade Representative Study Group on Foreign Aircraft Trade Practices.

OSTP Study Group

Under a series of subtasks, ORI provided support to the OSTP Study Group on Aeronautical Research and Technology Policy over a nine month period. Support was provided in the following areas:

- Preparation of presentation materials for use by the various area managers of the Aeronautics Systems Division in support of their briefings to the OSTP study group.

- Collection of data pertaining to the foreign aeronautical industries

- Preparation of draft chapters on the history of the U.S. and foreign aeronautical Industries

- A rewrite of the section on the civil aircraft market perspective

- An independent review of the entire report for consistency of information contained therein

- Support to ANSER Corporation during finalization of the report.

U.S. Trade Representative Study Group

Under a series of subtasks, ORI provided support to the U.S. Trade Representative Study Group on Foreign Aeronautical Trade Practices over a four month period. Support was provided in the following areas:

- Collection of data on the sales and deliveries of U.S. and foreign transport aircraft.

- Preparation of presentation materials in support of briefings to the study panel.

- Analysis of the potential market penetration of the A 320 Airbus by geographic area and carrier.

- Support in the area of editing, layout, typing and production of many drafts as well as the final report.

NAC Mission Task Force

Under this subtask, ORI prepared presentation materials in support of NASA presentation to the NAC Mission Task Force on NASA's role in aeronautics.

SAE Aerospace Controls and Guidance Systems Committee

Under this subtask, ORI prepared and delivered a presentation on the historical perspective and technical impact of aerospace controls and guidance at the fall 1982 meeting of the SAE Aerospace Controls and Guidance Systems Committee.

NASA Advisory Council/Aeronautics Advisory Committee on High Performance Aircraft

Under this subtask ORI provided administrative support to the manager of the high speed aircraft programs in preparation of the 19 May 1983 meeting of the NASA Advisory Council/Aeronautics Advisory Committee on High Performance Aircraft. Support was provided in the following areas:

- Review of material from previous meetings
- Update of the subcommittee list
- Preparation of the meeting agenda
- Preparation of proposed questions for discussion during the meeting
- Preparation of the announcement of the meeting for the Federal Register
- Preparation of letters of invitation to the members and invited participants.

Emergency Medical Service - Rotorcraft Technology Workshop

Under a series of subtasks, ORI prepared a draft executive summary of the results of the Emergency Medical Service - Rotorcraft Technology Workshop which was held in Washington, D.C. in October 1982, coordinated and revised the final report and produced the final report.

Large Composite Primary Aircraft Structures

Under this subtask, ORI prepared presentation materials for a briefing on the large composite primary aircraft structures program.

Integrated Digital/Electric Aircraft Technology Program

Under this subtask, ORI reviewed previous briefings pertaining to the Integrated Digital Electric Aircraft (IDEA) program, consolidated the briefings and prepared supplementary briefing materials.

Wake Vortex

Under this subtask, ORI compiled a listing of all NASA wake vortex research which had been accomplished to date and prepared a paper which discussed the various approaches available for delineating the respective NASA and FAA responsibilities for wake vortex research.

Electric Helicopter

Under two subtasks, ORI through its subcontractor, Orlando Helicopters, prepared two reports:

- An approach for the design of an electric powerpack to replace the conventional powerplant in a Sikorsky S-52 helicopter.

- An approach for the design of a controller to vary the voltage of an electric powerpack for the Sikorsky S-52 helicopter.

Aeronautics R&T Policy Studies

Under this subtask, ORI compiled a bibliography of government policy studies pertaining to aeronautical R&T which had been performed since 1976.

British Government Support to Early Transport Programs

Under this subtask, ORI researched and prepared a memorandum which described the support provided by the British Government during the development of the Comet, Trident and BAC 1-11 Aircraft. Also discussed were the factors which led to the U.S. industry's success in competing with these aircraft systems.

Response to the OSTP Study Panel Recommendation Regarding Collection and Dissemination of Unclassified Foreign Aeronautical R&T Information.

Under this subtask, ORI collected information and prepared a report which addressed the existing U.S. agencies which collect and disseminate unclassified foreign aeronautical R&T information. The report also discussed a proposed approach to enable NASA to comply with the OSTP study panel's recommendation regarding this subject.

Electric Flight Systems Workshop

Under this subtask, ORI made final corrections to the proceedings of the Electric Flight Systems Workshop which was held at Langley Research Center in May, 1981.

NASA Aeronautics Funding Growth

Under this subtask, ORI examined the NASA aeronautics funding history to determine whether the increase in the cost of development justifies the increase in aeronautics funding from $200 million in 1953 to $600 million in 1980 (in 1980 dollars).

Support to Briefing to Representatives of the Southeastern States Departments of Transportation

Under this subtask ORI prepared presentation materials in support of two NASA presentations before members of the Southeastern states Departments of Transportation at a conference held in Tampa, Florida, September 1983.

Support to Proposed Briefing to the RTCA

Under this subtask, ORI provided support during the preparation of a proposed speech to be given at the November 1983 meeting of the RTCA.

Cost Benefit Analysis of the Aircraft Energy Efficiency (ACEE) Program Briefing for Presentation at the January 1982 Meeting of the Transportation Research Board

Under this subtask, ORI prepared a briefing for presentation at the January 1982 meeting of the Transportation Research Board. Effort included preparation and TRB approval of the briefing slides and publication of the briefing for distribution at the meeting.

Attendance at the January 1982 Meeting of the Transportation Research Board

Under this subtask, ORI's subcontractor SRI attended the January 1982 meeting of the TRB preparatory to preparing a report to NASA/OAST. As a result of a severe snow storm, which prevented the NASA representative from attending, the SRI representative presented the ACEE cost benefit report briefing.

Insights into the January 1982 Meeting of the TRB of Interest to NASA/OAST

ORI's subcontractor, SRI, prepared a report on their insights of the January 1982 meeting of the TRB considered of interest to NASA/OAST.

Analysis of the ACEE Program-Phase 1

In response to a request for support to the NASA congressional testimony, ORI provided an analysis which identified the loss in potential fuel savings which would occur if the ACEE program were terminated at the end of FY 1982.

Government R&D Support to Agriculture and the Aerospace Industry and Their Impact on the U.S. Balance of Trade

Under this subtask ORI, through its subcontractor SRI, developed statistics pertaining to governmental R&D support to agriculture and the aerospace industry and its impact on the U.S. Balance of Trade.

Update of General Aviation Study

Under this subtask, ORI met with the NASA technical officer several times to obtain comments/corrections to the ORI draft report "Research and Technology Perspectives for General Aviation and Computer Aircraft" prepared under NASA Contract NASW-2961.

Wide-Body Jet Transport Developments

Under this subtask, ORI prepared a paper which presented an overview of the development of wide-body commercial jet transports and identified some of the major factors which influenced their development.

Executive Summary for the Research and Technology Program Perspectives for General Aviation and Commuter Aircraft

Under this subtask, ORI prepared a draft executive summary of the "Research and Technology Program Perspectives for General Aviation and Commuter Aircraft".

ACEE Cost Benefit Analysis-Phase II

Three additional scenarios were initiated under this subtask to examine the impact on the ACEE program assuming industry would complete a portion of the program using their own funds but with a delay in the technology readiness date, a scenario which assumed foreign manufacturers (Airbus Industries) would complete their companion ACEE type programs, and a revised ACEE.

ACEE Cost Benefit Analysis-Phase III

Under this subtask, ORI examined the impact on fuel savings and balance of payments assuming selected elements of the ACEE program were funded to completion.

ALEA Perspectives on Past, Present and Future Use of Public Service Helicopters

Under this subtask, ORI's subcontractor, WESPAC, prepared and presented a report on ALEA's Perspectives on the Past, Present and Future Use of Public Service Helicopters at the 38th Annual AHS Forum and Technical Display.

Update and Automate DoD/NASA/FAA Rotorcraft R&T Data Base

Under this subtask, ORI scoped the effort to update the DoD/NASA/FAA Data Base developed by ORI under Contract NASW 2961 and the effort to automate the data base to make it compatible with the OAST Office Automation System.

Office Automation

Under this subtask, ORI prepared a briefing for the Deputy Associate Administrator, OAST of a proposed Office Automation System for OAST. In addition, ORI personnel met several times with NASA/OAST and PRC representatives to scope the level of effort to accomplish the desired work.

RTOP Data Base Interface

Under this subtask, ORI scoped the effort for the design, development and verification of an RTOP Data Base interface for use by Code RT.

III. SPECIFIC TASKS

This section presents an overview of the specific tasks performed by ORI under Contract NASW-3554. Because of the nature of these tasks, the scope, level of effort and documentation, a more detailed treatment is provided.

TASK 002 -- PROPFAN TECHNOLOGY TRADE-OFFS WITH VARIATIONS IN CRUISE MACH NUMBER

Objective

The objective of this task was to assess the impact that variations in cruise mach number would have on airline acceptance of an advanced turboprop aircraft.

Approach

Through its subcontractor, Eastern Airlines, and input from Pratt and Whitney Aircraft, ORI developed realistic cost and operating data with which to exercise the NAPES model and develop fuel curves for a sensitivity analysis of the fuel consumed using advanced turboprop aircraft flying at 0.65, 0.70, 0.75 and 0.80 Mach over four stage lengths representative of passenger and cargo service. In addition, ORI conducted an examination of the demand for turboprop service relative to a turbofan at alternative stage lengths and speeds using assumed ROI levels.

Upon NASA's approval of the results, a workshop will be convened consisting of representatives from the major airframe and engine manufacturers and airlines, to review the findings.

Status

The ORI findings from this effort are nearing completion as of this writing. Data has been received from Pratt and Whitney Aircraft and reviewed by Eastern Airlines who have supplied route segment data. The NAPES model is being modified and the output will be analyzed and placed in the proper format for presentation. As of this writing, the time and place of the proposed NASA/industry workshop has not been confirmed.

TASK 003 -- PROJECT FORECAST

Objective

The objective of this task was to develop a strawman strategy for conducting a long-range study on military needs pertaining to aeronautics. The proposed study would be performed under the purview of the Aeronautics Panel of the Aeronautics and Astronautics Coordinating Board (AACB) to assist NASA in planning support to DoD in aeronautical research.

Approach

The proposed strategy was to be based upon a review and critique of previous forecast studies, e.g., Beyond the Horizon and Project Forecast.

As a first step ORI obtained copies of previously executed technology forecast studies to determine their purpose and scope, assumptions, schedule and participants. After review of the studies was completed, participants were contacted to determine "lessons learned" as a result of the study experience (e.g., how the study could have been improved, pitfalls that should be avoided, and reception and implementation of the study results).

Study Results

The output of ORI's efforts was contained in several study reports prepared for the Deputy Director of the Aeronautics Systems Division. Among these reports were a paper on ORI's proposed approach and strawman presentation, a paper on the charter and scope of Project Forecast, and a final report which summarized ORI's effort on the task. The final report included previously submitted papers as attachments as well as briefing charts for the Long Term Military Needs for Aeronautical Technology presentation and a composite of ORI's findings during the review of methods and attributes of previous aeronautical forecast studies.

TASK 004 -- OFFICE AUTOMATION DATA BASE DESIGN

The objective of this task was to collect, analyze, and document the information sources, information flow and existing methods and procedures related to current planning and management of the OAST Aeronautics R&T Program.

Approach

Under this task, ORI personnel interviewed those personnel in Code RJ and Code RT with responsibilities for some aspect of the OAST Aeronautics R&T program. During the course of this effort the scope was enlarged to include responsibility for interviewing personnel in the Office of the Associate Administrator, Code RP and Code RM.

Upon completion of the interview process, ORI consolidated the data, analyzed the identifiable trends and prepared flow diagrams which illustrated the information flow using the methods and procedures in use at the time this task was initiated.

Status

As of this writing, ORI's final report has been submitted for approval. It is anticipated the results will be integrated into the overall NASA Action Information Management System (AIMS) Technology Program which is being implemented by several of the headquarters program offices.

TASK 005 -- ECONOMIC ANALYSIS OF 30-PASSENGER MACH 0.84 TRANSPORTS

Objective

The objective of this task was to conduct a comparative economic feasibility analysis of the use of 30-passenger Mach 0.84 turbofan transport aircraft as compared to other transport aircraft during the period 1990 to 2010.

Approach

The overall approach used by ORI consisted of three steps: First ORI conducted an investigation of forecasted aircraft to determine the one which most nearly met the size and range requirements. Minor modifications were then made to assure the aircraft incorporated similar ACEE developed technology which would also be available to aircraft entering the air transport fleet during the 1990-2010 timeframe. ORI then conducted an analysis using the NAPES model to determine the time saved by direct flight versus the spoke-hub method. Specifically ORI examined the potential benefits empirically by (1) determining the size of the potential market, (2) estimating the fares for a 30-passenger and standard size commercial transport, (3) estimating the additional fares a passenger may be willing to pay for reduced flying time and (4) ascertaining whether the potential market will generate sufficient demand for a 30-passenger aircraft to encourage its development by the aircraft industry.

Findings

ORI's analysis concluded that under the constraints suggested, a 30-passenger aircraft flying direct flights could not compete successfully with the current system using spoke-hub and new technology transports. Recommendations were made to conduct further investigations in such areas as optimal size aircraft for alternative size markets, consumer resistance to small aircraft, the aviation industry's response toward a restructuring of the route system the associated ATC workload resulting from increased flights resulting from the use of smaller sized aircraft, and comparing the economic viability with a fleet of transport aircraft which incorporate less ACEE technology.

This effort is reported in the ORI report, Analysis of the Economic Feasibility of a Thirty-Passenger High Mach, Long Distance Passenger Transport, June 1982.

TASK 006 -- EFFECTS OF TECHNICAL ADVANCEMENTS ON THE AIR TRANSPORT FLEET

Objective

The objective of this task was to provide analysis of different scenarios based upon variation of the magnitude and timing of the introduction of specified aeronautical technological advances into transport aircraft.

Approach

The analysis was carried out using the NAPES model. To facilitate the development of scenarios results, enhancements were made to the NAPES model in the following areas:

- o Development of an automated subroutine to create graphics formulations of the NAPES output.

- o Development of a post processor subroutine to enable:

  - writing NAPES output to permanent storage
  - reading NAPES output from permanent storage
  - conducting differential analysis of two NAPES output files

- o Development of a subroutine to calculate the Balance of Payments Impacts of the Technology Scenarios.

Upon completion of these enhancements, ORI exercised the NAPES model to investigate three scenarios:

- o The impact on fuel savings and aircraft IOC assuming all ACEE technology programs terminated at the end of FY 1983.

- The impact on fuel savings and aircraft IOC assuming NASA funding for all ACEE technology programs terminated at the end of FY 1983 and the U.S. industry completed the programs using their own funds.

- The impact on fuel savings and aircraft IOC assuming all ACEE technology programs terminated at the end of FY 1983 but foreign manufacturers continued to aggressively continue ACEE type technology development.

Findings

The findings for each of these scenarios were presented to the NASA technical representative Revised Potential Fuel Savings Experienced from ACEE Developed Technology which included, as a minimum, a discussion of the input assumptions as well as a comparative analysis between the baseline program and the alternative scenarios.

Modifications to the NAPES model are included in the ORI report, Users Guide, NASA Aeronautical Project Evaluation System (NAPES).

TASK 007/A -- HEAT ENGINE TECHNOLOGY TRANSFER

Objective

As a result of the DOE advanced heat engine systems work being redirected such that it now more closely resembles the traditional NASA R&T programs, ORI was requested to investigate and assess the opportunities for technology transfer between DOE and related OAST programs.

Approach

ORI's approach consisted of an investigation and assessment for applicability of DOE heat engine technology to the NASA OAST programs. Areas where long range R&D requirements were compatible were highlighted and recommendations made to DOE for program modifications, integration, or new technology action plans. Reports were prepared which showed relevant NASA/DOE in-house and contracted efforts, multiple applications potential, and recommended actions to improve communications or interactions.

Special studies and analysis of advanced technology multiple applications were conducted and cost benefit analyses and long-range impact assessments prepared.

In addition, ORI also provided assistance in information dissemination activities to include data collection and analysis, report compilation and editing, presentation material preparation, and the arrangement and conduct of seminars, meetings and conferences.

Findings

The results of this effort were reported in Quarterly Progress Reports, a letter report, Survey of Existing Vehicular Gas Turbine Engine Models, June 28, 1982, and ORI Technical Report 2109, Technology Transfer Opportunities between DOE Advanced Heat Engine Programs and NASA Aeronautics Research and Technology, October 7, 1982.

Follow-on

A follow-on task to task 007 (007A) has been issued to expand the opportunities for technology transfer and cooperative efforts to include DoD and industry groups. In addition, the format for future government meetings will be developed and program information to be discussed will be collected and analyzed to identify opportunities for technology transfer and cooperative efforts among the government agencies. This follow-on work is on-going and will be completed during FY 1984.

TASK 009 -- UPDATE OF R&T PROGRAM PERSPECTIVES FOR GENERAL AVIATION AND COMMUTER AIRCRAFT

Objective

The objective of this task was to update and expand upon the information presented in a report prepared by ORI under a previous contract, NASW 2961, which examined the current factors influencing the outlook for general aviation and commuter aircraft as well as related research and technology program perspectives.

Approach

Under this task ORI researched and updated all data contained in the preliminary report to include the latest figures available from the FAA, GAMA, RAA, etc. Additional data, especially in the area of foreign competition was added as well as an executive summary.

Findings

ORI's findings as a result of this effort are contained in the ORI Technical Report 2101, Research and Technology Program Perspectives for General Aviation and Commuter Aircraft, September 1982.

TASK 010/A -- UPDATE DoD/NASA/FAA ROTORCRAFT R&T DATA BASE

Objective

The objectives of these two tasks were to perform an update of a previous ORI effort which compared on-going and planned NASA rotorcraft R&T effort with that rotorcraft R&T effort on-going or planned by the DoD and FAA.

Approach

ORI envisioned using the same procedures for the updated report as had been used for the previous effort with the exception that there would be no travel for face to face discussions with the various program managers. It was soon learned that the Army Annual Narrative Programs were no longer being written and the FAA Helicopter Program did not distinguish between those programs which were funded and those the FAA would like to fund. Task 010A was issued to provide additional funds for the analysis required to overcome the lack of these valuable data sources.

The data collected was analyzed to identify technology interest areas and the type of activity currently on-going or planned. A comparative analysis of rotorcraft projects was then conducted to assess the complementary or overlapping aspects of related program activities.

Findings

ORI's findings for this effort are contained in ORI Technical Report 2207, Rotorcraft Research and Technology Program Integration - 1983, July 1983.

TASK 011 -- GENERIC FAULT TOLERANT AVIONICS PEER REVIEW MEETINGS

Objective

The objective of this task was to provide professional and administrative support for four Generic Fault Tolerant Avionics Peer Review Meetings to be sponsored by NASA/OAST. The scope of this effort has since been reduced to three meetings.

Approach

Under this task, ORI, through its subcontractor, Dynatrend, Inc., is providing the following support: an executive secretary to take notes and prepare the official minutes of each meeting, meeting arrangements to include notifying the proposed attendees of the time, date and place as well as information on local lodging ground transportation and reimbursement procedures, and travel arrangements to include hotel and airline reservations.

Status

The first of the three meetings was held at LRC in April 1983. The remaining meetings have been rescheduled. The second from August to November 1983 and the third from February to May 1984. The second meeting has also been tentatively relocated from JSL to the Boston area.

TASK 012 -- TECHNICAL INFORMATION SUPPORT AND DOCUMENTATION FOR THE LOW AND HIGH ALTITUDE EMISSIONS PROGRAMS

Objective

The objective of this task was to provide technical information, documentation, dissemination and review in support of the following NASA/FAA subprograms:

- o Atmospheric modeling
- o Engine exhaust emissions
- o Atmospheric laboratory measurements
- o Atmospheric field measurements
- o Analysis, assessment and regulation
- o Cabin environment.

Approach

ORI's effort under this task consisted of work in four areas: collection and documentation of Technical Information, update and maintenance of the researcher's list, preparation of the Bulletin and Special Bulletin, and conference support.

Under the first subtask, ORI reviewed published material in scientific, technical and academic journals, reports and periodicals, and extracted information of timely interest to specialists in the areas of low and high altitude emissions. Those articles considered appropriate were abstracted and prepared for publication in the bimonthly Bulletin.

In addition, ORI also updated and maintained the Researchers Lists which are used by NASA and FAA for distributing the Bulletin and other information of interest to the low and high altitude emissions community.

Status

The Bulletin (issue 83-1) was completed and disseminated in September 1983. Work is continuing on the collection and documentation of technical information. This effort will be completed in October 1983.

TASK 013 -- INDEPENDENT ANALYSIS OF THE PUBLIC SERVICE HELICOPTER TECHNOLOGY PROGRAM

Objective

The objective of this task was to conduct an independent analysis of the public service helicopter technology needs which were developed at a workshop held at NASA Ames during July 1980.

Approach

The difficulty with the technology needs generated at the July workshop centered in two areas: the needs were described in non-definitive terms, i.e., low, lightweight, increased, etc., and several needs were in direct conflict with other needs, i.e., rotor diameter vs. gross weight, HIGE, HOGE, downwash, etc.

As a first step, ORI examined the needs stated by the workshop and disaggregated them into three separate groups -- those that were clearly design problems and did not fall within the scope of NASA rotorcraft R&T programs, those that were technology problems and did fall within the scope of NASA rotorcraft R&T programs, and those that were either ill defined or could fall within the scope of NASA rotorcraft R&T programs. This later group was augmented during the investigation as a result of analyzing various approaches to meet some of the needs requiring tradeoffs.

To better define some of the terms and obtain an understanding of the importance of the needs, ORI personnel met with some of the personnel who participated in the workshop. Following this meeting, ORI personnel began formatting the data for use in a helicopter performance model to identify those needs in which a more in-depth tradeoff analysis is required.

Status

ORI is in the process of conducting a performance analysis of the major technology needs which will be completed in October 1983. A major

output of this effort will be preliminary analysis of conflicting needs and recommendations for a more in-depth analysis or cost-benefit analysis of the stated technology needs.

IV. CONTRACT OVERVIEW

This section reviews the contract as a whole with a view towards improving support to the Aeronautics Systems Division in the future. It consists of three subsections -- an overview of the scope of the contract, current procedures for authorizing effort under the contract, and recommendations for improving the approval process.

SCOPE

The scope of work to be provided by ORI under the terms of Contract NASW 3554 was highlighted in Section I. In addition to the specific types of support, the scope includes all of the aeronautical disciplines and vehicle systems of interest to the aeronautics systems division and the aerospace technology division. (The contract, although managed by the Aeronautics Systems Division, was intended to provide a contract vehicle by which the Aerospace Technology Division could obtain support when needed. Examples of this support are Task 011 and several quick response miscellaneous subtasks under Task 001). The contract has also been used to support NASA's commitments under interagency agreements with DOE and the FAA (examples are Tasks 007/A and 013) and has been used to provide support to the NASA centers and other offices within NASA Headquarters.

The common denominator for all of the requested support performed by ORI is that the work be accomplished in a timely manner. Contract procedures, discussed below, currently inhibit ORI's ability to provide this support expeditiously. Recommendations for improving the approval process are discussed at the end of this section.

CONTRACT PROCEDURES

Two types of tasks, based upon the level of effort, are performed under this contract -- quick response and specific. The approval process for a quick response task is informal, normally accomplished by telephone, with approval given by the Technical Representative and the Technical Monitor informed that the work is being accomplished. In the Technical Representative's absence, the Technical Monitor has the authority to approve the quick response tasks.

The specific tasks follow a much more formal procedure involving two approval processes. First a task order is issued which requests ORI to respond with a task plan. The task plan must then be approved before the contractor is authorized to begin work. Each step requires approval by the Technical Monitor, the Technical Representative, and NASA Contracts. Under the previous contract (NASW 2961), only a task plan was issued. The current procedure was instituted to enable NASA Contracts to be involved in the approval process to assure the effort was within the scope of the contract and that sufficient funds were available for the requested work.

NASW 3554 is a level of effort contract which, in FY 1983 was incrementally funded. The level of support provided under this contract is based upon the sponsoring division's perceived needs. Incrementally funding the contract provides assurance to the government that funds will not be unnecessarily obligated should it become evident that the estimated needs were too high. However, the opposite has proven to be the rule rather than the exception. This has necessitated work in support of the Aerospace Technology

Division and the Associates Administrator's Office being accomplished with no increase to the Aeronautics Systems Division level of effort. The Technical Representative reasoned that to increase his level of effort would take longer than the time remaining in the contract. This, of course, reduced the work the Technical Representative had anticipated.

Delays have also occurred as a result of the policy of incremental funding. ORI was able to use allocated but unspent funds to accomplish the quick response tasks requested; however, a more expeditious method of adding incremental funds to the contract is necessary.

RECOMMENDED CHANGES TO CURRENT PROCEDURES

Lessons learned as a result of operating under both the procedures in effect under NASW 2961 and NASW 3554 reveals there are advantages to the government using either procedure but greater advantages to be gained by combining the best features of each. The principal advantage of the former procedures was the timeliness with which ORI could initiate work in support of OAST. This procedure did not provide for NASA contracts to monitor the contract except on an after-the-fact basis.

The current procedure has as its objective close management of the contract but sacrifices the timeliness factor. (The process currently takes at least one month when expedited and has taken as much as four months for approval).

ORI suggests that the task order process be eliminated or at best be handled informally. A task order could still be prepared and submitted to NASA contracts. Under the current contract ORI has five days to submit a task plan. A similar time limit could be imposed on the task order and if a disapproval is not received, a task plan submitted. This would reduce the time required for task order approvals and still enable NASA contracts the opportunity to be involved in the approval process.

Since funds are not obligated until the task plan has been approved, NASA contracts would still have final approval authority before any funds are spent.

The problem with incremental funding may have been caused by two factors -- personnel changes due to retirements and reassignments and unfamiliarity with the forms and supporting data required to add funds to the contract.

Discussions with the current technical monitor reveals his eagerness to expedite the approval process.