SELECTION STATEMENT

SELECTION OF CONTRACTOR (S)

FOR

FLIGHT CRITICAL SYSTEMS RESEARCH

On October 25, 1999, I met with the Source Evaluation Team (SET) appointed to evaluate proposals to provide NASA Langley Research Center with basic support for Flight Critical Systems Research. The SET's presentation included the procurement background information, the evaluation procedures, and the results of its initial evaluation of the proposals received.

PROCUREMENT DESCRIPTION

The resultant contract (s) will support basic and applied research and development in flight critical systems. Emphasis is on the safety and design integrity of these systems, which are critical to safe and efficient flight management, guidance and control in adverse conditions, vehicle health management, and situation awareness. Such systems include communications, navigation and surveillance; guidance and control; fault tolerant avionics; primary and multifunctional displays; and crew station. Research and technology innovation in flight critical systems includes the performance of systems engineering and analysis in support of experimental systems development through simulation and test to flight validation. The research and technology requirements support appropriate goals that lie within the scope of the three "pillars" of the AeroSpace Technology Enterprise, (1) Global Aviation, (2) Revolutionary Technology Leaps and (3) Access to Space. This is a cost plus incentive fee contract with a period of performance of five years. The Government intends to award multiple contracts under which performance based task orders can be competed among the firms selected for award. In addition, the Contractor(s) selected for award will be incentivised with a fee arrangement that will be based on their ability to meet performance, schedule, and cost metrics. A brief listing of historical events as they relate to this procurement are as follows:

CCI Posting	June 11, 1998
Draft RFP	July 30, 1999
Final RFP	August 30, 1999
Proposals	October 15, 1999

The following firms submitted proposals in response to the RFP:

Applied Research Lab.
Arinc Inc.
The Boeing Company

Honeywell Technology Center
Irvin Aerospace Inc.
M. R. Research
Smith Industries
Rannoch Corp.
Systems Resources
Venis Technologies Inc.

EVALUATION PROCEDURES

Prior to the issuance of the RFP, a SET was organized to conduct an evaluation of proposals received in response to the RFP. The SET developed an evaluation plan including a numerical and adjectival scoring system for the Mission Suitability Subfactors. The numerical weights assigned to the subfactors are indicative of the relative importance of those evaluation areas. The weights were utilized only as a guide. The possible adjectival ratings that could be assigned were excellent, very good, good, fair and poor. In addition, the Plan stated that the SET would evaluate but not score Cost and Past Performance. There were no late proposals. The RFP set forth the following evaluation factors:

Mission Suitability
Cost
Past Performance

The RFP stated that in the overall selection, Mission Suitability and Past Performance when combined would be significantly more important than cost.

The SET initially met on October 22, 1999 for an Evaluation Kick-off Meeting. On October 25, 1999, each member then proceeded to review each mission suitability proposal (Volume 1) and the contract specialist accompanied by the Contracting Officer (CO) reviewed each business proposal (Volume 11) in sufficient depth, to identify proposals which were unacceptable as defined in NASA FAR Supplement 1815.305-70. The SET met to discuss the proposals that were unacceptable. The SET then reached a consensus that the following proposals were unacceptable:

Applied Research Lab.
M. R. Research
Smith Industries
Irvin Aerospace Inc.
Venis Technologies Inc.

The results of this meeting were presented to the CO, who concurred in the findings of the SET. Letters were sent to the unacceptable proposers via regular mail indicating that their proposals could not be considered for contract award.

After the initial review, five companies remained in consideration for contract award:

Arinc Inc.
The Boeing Company
Honeywell Technology Center
Rannoch Corporation
Systems Resources Corporation

I have carefully reviewed the facts presented in the evaluation report and discussed with the SET the technical merits and deficiencies of each proposal. The evaluation findings are summarized below:

EVALUATION FINDINGS

Factor 1 – Mission Suitability: Under this factor, Arinc, Boeing, Honeywell and Rannoch were all rated "Very Good", while SRC was rated "Good".

Subfactor a – Understanding the Requirement and Approach

Under this subfactor, each offeror is required to describe the approach they will use in meeting the technical requirements of each of five technical areas: 1) guidance and control in adverse conditions, 2) flight critical systems design and analysis, 3) flight critical systems health management, 4) situation awareness, and 5) systems engineering and analysis. The approach shall consider problems likely to be encountered in meeting the technical requirements, proposed solutions, implementation of the solutions, and discussions of problems likely to occur in applying the solutions to technology demonstration in actual experimental conditions. In addition, each offeror is required to describe in detail how they would accomplish each of the three representative tasks. For each task, the proposers shall discuss technical approach to meet the task requirement(s), subcontractor effort if applicable, schedule including key milestones, staffing, proposed budget, risk mitigation, and task specific facilities.

Technical Areas

Boeing's proposal discussed each of the technical areas in accordance with the evaluation plan. Their proposal demonstrated sufficient capability in all areas with particular strengths in controls, flight critical systems design, health management, and systems engineering. Other strengths included strong linkage to the OAT goals, the capability to support all vehicle classes cited in the SOW, unique position to obtain historical data and modeling data relative to aircraft, strong position to transfer technology, and extensive, state-of-the-art analysis tools. Boeing adequately discussed each technical area in accordance with the relevant paragraphs of Subfactor (a).

Honeywell's proposal addressed each of the technical areas adequately . In addition, they identified the problems associated with each technical area, the proposed solutions, and the practical implementation approaches. Honeywell demonstrates extensive experience and technical capability in flight critical systems design and analysis. Their

proposal included controls, health management, systems engineering, and broad corporate knowledge of systems across all vehicle classes. Honeywell is dependent on subcontractors for situation awareness expertise. However, the subcontractor provide the comunications/navigation/surveillance (CNS) capability to complement Honeywell's human factors and display capabilities. Honeywell adequately discussed each technical area in accordance with the relevant paragraphs of Subfactor (a).

SRC's proposal addressed each of the technical areas in accordance with the evaluation plan. SRC demonstrated a major strength in systems analysis and engineering and a minor strength in situation awareness. Their extensive experience as a FAA support contractor coupled with subcontractor expertise in display and surveillance technologies gives them in-depth understanding of the requirements and solution approaches to situation awareness problems. The SRC team has weaknesses in controls and health management. In flight critical systems design and analysis, the discussed approach is based on a single tool, which is yet to be developed. For other than systems engineering and situation awareness, the approaches for each technical area lacked coherence and did not flow logically to address the area requirements. SRC adequately discussed each technical area in accordance with the relevant paragraphs of Subfactor (a).

ARINC's proposal discussed each of the technical areas in accordance with the evaluation plan. The ARINC team demonstrated a clear understanding in flight critical systems design and analysis, health management, situation analysis, and systems engineering. The team was assembled to benefit from complementary and interrelated capabilities in these areas. Their proposal demonstrated and included strict adherence to the evaluation plan in developing their response, strong involvement with airlines and RTCA, and a good understanding of development and insertion of key technologies. ARINC adequately discussed each technical area in accordance with the relevant paragraphs of Subfactor (a).

Rannoch's proposal discussed each of the technical areas in accordance with the evaluation plan. Their proposal demonstrated a good understanding across all technical areas. Rannoch placed particular emphasis to the task areas up front which includes strong guidance and control expertise, good product-based certification approach versus process-based approach, strong ties to NTSB and Flight Safety Foundation. They acknowledge a good depth of understanding of problems in each technical area with a good mix of logical solutions to address them. Rannoch adequately discussed each technical area in accordance with the relevant paragraphs of Subfactor (a).

<u>Representative Task Orders (RTO's 1, 2, 3)</u>

RTO (1) Runway Incursion Prevention Technology Experimental System Development and Testing

Purpose: To develop experimental systems that enable simulation and flight testing of technologies that enhance situational awareness to prevent runway incursion (RI)

incidents. The objective of the Task is to provide the capability to evaluate and validate RI prevention technologies

RTO (2) – Data Management System Design

Purpose: To develop the detailed design of a Data Management System (DMS) in support of the Smart Spoiler Control flight test. The objective of the Task is to provide the design of the DMS that will acquire the necessary data to evaluate the operability, reliability, and performance of an electrically actuated spoiler driven by a triply redundant digital control system.

RTO (3) – Health Management (HM) and Control Upset Management (CUM) Technolgoy Evaluation and Validation

Purpose: To design, develop, and execute simulator and laboratory evaluation and validation of Health Management and Control Upset Management technologies. The objective of the Task is to provide an end-to-end validation of HM&CUM technologies in an operational context

Boeing's technical approach to each RTO adequately addressed the specific requirement. The technical solutions stressed the systems engineering aspects of the approach rather than the technology or methodology applied to the problem. For example, in the response to RTO(1), no specific solutions to runway incursions were offered. Boeing did not indicate where subcontractor efforts were to be directed in accomplishing RTO's even where subcontractors had been identified as having expertise. The schedule, budget, and facilities plans to accomplish the task were adequate. The staffing plan showed skill hours by quarter. The plan would have been better if it also identified number of skill hours per subtask. Boeing explicitly addressed risk areas and mitigation strategies for each RTO. Boeing made logical use of facilities in their approaches. Overall, Boeing proposed technical approaches that emphasized systems driven approaches using known solutions rather than innovative technology driven approaches.

Honeywell's technical approach to each RTO adequately addressed the specific requirement. The technical approaches for RTO(2) and RTO (3) were innovative and logically constructed. For RTO(2) detailed functional concepts of both the spoiler system to be evaluated and the experiment's data management system were developed. For RTO(2), two specific problem areas (gust-induced false alarms and HIRF/EMI upset) and a technology solution (recoverable computer system) were discussed. The RTO(1) proposal provided a good description of the necessary CNS infrastructure but was weak in specificity on how it would be used to meet the requirement. The schedule and resource allocation plans were weak for all RTO's. There was no or vague identification of skill categories, no allocation of skills against subtasks, allocation of resources was identified at team member level (too high), and detailed budget information was not presented in the Technical Volume. Risk identification and mitigation approaches were only addressed for RTO(3). Honeywell made logical use of facilities in their approaches.

Overall, Honeywell demonstrated the capability for innovative technical solutions but provided weak task management plans.

The SRC technical approaches to RTO(1) and RTO(3) did not demonstrate a sufficient understanding of the requirements, did not identify logical objectives to satisfy the requirement, and did not present a consistent and logical sequence of technology/methodology solutions to accomplish the objective. Specific weaknesses in the RTO(1) response were 1) did not address the development of a test plan, 2) did not identify facilities to be used in performing the experiment, and 3) did not demonstrate real understanding of situational awareness issues which were cited in the requirement. This was unusual given the subcontractor expertise in the situational awareness area. Their response over-emphasized a sensor-based solution that was minimally appropriate for the requirement. The response to RTO (2) was adequate. Specific weaknesses in the RTO(3) response were 1) dependence on a tool that has not been developed, 2) heavy dependence on external facilities, 3) inadequate internal facility availability to meet the requirement, 4) dependence on NASA to provide support activities, 5) unclear methodology for developing out-of-the-envelop and upset models, and 6) over-emphasis on supply technologies than on the requirement to develop experimental design for assessment. The presentation of the task plan was well done. The schedule was acceptable. The staffing plan addressed labor hours by month and skill category, but did not show allocation of skill hours across subtasks. Risks and mitigation strategies were addressed. The proposed budget for RTO(3) was significantly higher than the other offerors. The SET could find no justification for the cost.

The ARINC technical approach to each RTO adequately addressed the specific requirement. ARINC demonstrated understanding of the RTO requirements, developed relevant objectives, and developed logical approaches to accomplish the objectives. Their RTO proposals demonstrated sufficient understanding of the requirements and adequate capability to innovate solutions. ARINC's specific strengths were 1) for RTO(1), a recognition that situational awareness among flight management subsystems is just as important as situational awareness for the crew; 2) the use of complex system modeling and simulation techniques to develop situation awareness solutions; 3) for RTO(2), proposed additional requirements based on knowledge of the system under evaluation; 4) developed Aviation Safety Review Board (ASRB) approval approaches for flight test tasks; and 5) demonstrated effective use of subcontractor expertise. Additional strengths were a clear and logical schedule for accomplishing the task, very effective use of facilities, and a staffing plan that identified skills and labor hours by substask. Specific weaknesses were 1) for RTO(1), the use of EMI testing where there was no requirement; 2) for RTO(1), too dependent on documentation provided with the RTO for response rather than on externally acquired information; 3) for RTO(3), did not give major role to the subcontractor identified as having the primary expertise for the RTO; and 5) for all RTO's, did not address risk/risk mitigation explicitly.

The Rannoch technical approach to each RTO adequately addressed the specific requirement. For each RTO, Rannoch identified related requirements of standards and regulatory organizations, clearly stated assumptions, stated the major obstacles to

meeting the requirements, and developed the approach to solve the obstacles. For each subtask of the RTO, they identified the specific issues, developed a subtask specific approach, and explicitly stated the deliverable. For RTO(1), which required an experimental evaluation, Rannoch identified the parameters that would yield the most valuable information, and the most appropriate test facilities and methods to be applied. For RTO(2), which required system analysis, they developed detailed diagrams showing logical function decomposition and relational dependence. For RTO(3), which required modeling of physical phenomena, Rannoch proposed specific techniques that were technically credible. The proposed solutions demonstrated the sufficiency of Rannoch's understanding of the requirement and of the relevant technologies. Rannoch's project plan included a clear and comprehensive schedule; a staffing plan that addresses skill categories, number of hours of each skill allocated to each subtask, use of subcontractors, proposed budget, risk identification and mitigation, and efficient scheduling of facilities.

Subfactor b – Facilities/Equipment

Each offeror owns or has some access to adequate facilities to perform the tasks anticipated to be awarded under this contract. The facilities required to perform adequately are, listed in descending order of importance, 1) adequate computational capability to develop and assess guidance and control algorithms, real-time avionics systems, human-machine interactive systems, reliability and safety analysis tools, ommunication/navigation/control systems, and fault-tolerant computing systems; 2) flight-critical systems modeling and simulation equipment; 3) Component and system prototyping capability; 4) pilot-in-the-loop simulation equipment; and 5) experimental aircraft. Both Boeing and the Honeywell team have ownership of and/or strong access to all required facilities. In addition to a general facility capability for covering generic vehicles, they can provide custom facilities for a large segment of operational vehicles. Rannoch and ARINC also have ownership/access of the required facilities. The Rannoch and ARINC facilities provide the generic capability but do not provide the same breadth of specific vehicle facilities that Boeing and Honeywell do. Although SRC demonstrated coverage of all the facility types, they indicate a heavy reliance on Government facilities (e.g. the FAA's William Hughes Technical Center) for generic air transport simulations. There was also weak facility support for tasks required in the controls, upset management, and health management technical areas. In general, SRC is heavily dependent on external facilities and their internal facilities provide poor coverage of the required research.

Subfactor c Management

This Subfactor includes six areas for evaluation. All offerors were asked to address how they would handle contract start-up, task initiation, staffing plan, use of subcontractors, technical and business status reporting, and management of resources among the active tasks. SRC and Rannoch addressed each area in detail, providing more than sufficient evidence of their ability to manage the contract effectively. SRC was especially aggressive in their response to this subfactor, citing evidence of their strong ability to

manage large heterogeneous contracts. Boeing, Honeywell, and ARINC submitted proposals that adequately addressed each of the six areas.

Subfactor d – SDB Participation

All offerors identified team members that are Small Disadvantaged Businesses (SDB). All offerors provided evidence that they will meet the Small Business (SB) participation goal of 10% of the contract price inclusive of an SDB goal of 5%. The evidence includes SB's and SDB's and their expected roles in the defined technical areas. All offerors showed substantial participation of SDB's in their responses to the Representative Task Orders (RTO). ARINC shows the highest SDB participation at 13%.

Subfactor e – Cost Realism

The Source Evaluation Team (SET) for the subject solicitation completed the evaluation of Subfactor e, Cost Realism. A Pricing Analyst evaluated each offer's cost proposal for realism, reasonableness and acceptability pursuant to RFP Paragraph M.2, Sections A.5 and B. The evaluation resulted in adjustments to each offer's proposed price of less than +/- 5%.

The SET found no reason to adjust the Mission Suitability score of any offeror due to lack of cost realism.

Factor 2 – Cost

The Source Evaluation Team (SET) for the subject solicitation completed the evaluation of Factor II, Cost. A complete analysis of the costs proposed by the five prime offerors including major subcontractors was conducted. The rank order from lowest to highest cost was identical for both proposed and probable cost, and was as follows: Rannoch (Low), Arinc, SRC, Boeing and Honeywell (High). The difference between the lowest and highest proposed costs was 133%.

Factor 3 – Past Performance

Boeing provided detailed summaries of 12 previous and on-going contracts that are comparable and relevant to the scope and objectives of this solicitation. The summaries contained more than adequate information to assess Boeing's technical, financial, and SDB performance on the contracts. The contracts were awarded by NASA, DARPA, and the Air Force. Three of the contracts related to flight controls were awarded by LaRC (NAS1-20220, NAS1-20341, and NAS1-20342). The past performance checks completed by Boeing customers were for the most part "Good". Overall, Boeing's rating for this Factor is "Meets." A performance rating of "Meets" means the Contractor demonstrated effective performance which is fully responsive to contract and/or customer requirements; and any identified deficiencies do not affect overall performance.

Honeywell provided a list of five previous and on-going contracts that are comparable and relevant to the scope and objectives of this solicitation. In addition, contracts held by Honeywell's two significant subcontractors were also listed, three for Sensis Corporation and three for Acme Worldwide Enterprise, Inc. The listed contracts provide evidence to support the Honeywell Team's ability to adequately perform the work required in the solicitation. The contracts were awarded by NASA, FAA, Air Force, Navy, Marine Corps, and Lockheed Martin. Relevant LaRC contracts/cooperative agreements were NCC-1-291 and NAS1-20219. All the past performance checks completed by customers responding to work performed by Honeywell and their significant subcontractors were for the most part "Very Good" to "Excellent". Overall, Honeywell's rating for this Factor is "Exceeds". A performance rating of "Exceeds" means the Contractor/Subcontractor demonstrated performance, which, in addition to fully satisfying contract, and/or customer requirements, features above-average innovation and efficiency and rare or nonexistent deficiencies.

SRC provided detailed summaries of 11 previous and on-going contracts that are show strong relevance to the Systems Engineering technical area requirements, and demonstrate experience with managing a contract of the solicitation's scope. Relevance to the other technical areas is demonstrated by 25 detailed summaries of contracts from eight subcontractors. Nine of SRC's contracts are with the FAA, one with the Air Force, and one with NASA/Ames. Four subcontractors were awarded contracts by LaRC, Wyle NAS1-98100, Systems Technology NAS1-18669, Seagull Technology NCA1-134, and Safeware Engineering NAS1-98127. All the past performance checks completed by customers responding to work performed by SRC and their significant subcontractors were for the most part "Very Good" to "Excellent". Overall, SRC's rating for this Factor is "Exceeds." A performance rating of "Exceeds" means the Contractor/Subcontractor demonstrated performance, which, in addition to fully satisfying contract, and/or customer requirements, features above-average innovation and efficiency and rare or nonexistent deficiencies.

ARINC provided descriptive summaries of over 40 previous and on-going contracts that are comparable and relevant to the scope and objectives of this solicitation.
In addition, seven subcontractors provided descriptions of 29 contracts technically comparable to this solicitation. LaRC manages or managed contracts with ASRC Aerospace (NAS1-99124) and RTI (NAS1-99074 and NAS1-19214). All the past performance checks completed by customers responding to work performed by ARINC and their significant subcontractors were for the most part "Very Good" to "Excellent". Overall, ARINC's rating for this Factor is "Exceeds". A performance rating of "Exceeds" means the Contractor/Subcontractor demonstrated performance, which, in addition to fully satisfying contract, and/or customer requirements, features above-average innovation and efficiency and rare or nonexistent deficiencies.

Rannoch provided descriptions on three contracts that are comparable and relevant to the objectives and scope of this solicitation. Their subcontractors provided the same detail on 39 contracts. LaRC contracts/cooperative agreements awarded to members of this team include NAS1-99003, NCC-1-278, NCC-1-224, NAS1-19704, NCC-1-289, NCC-1-

290, and NAS1-20334. All the past performance checks completed by customers responding to work performed by Rannoch and their significant subcontractors were for the most part "Very Good" to "Excellent". Overall, Rannoch's rating for this Factor is "Exceeds". A performance rating of "Exceeds" means the Contractor/Subcontractor demonstrated performance, which, in addition to fully satisfying contract, and/or customer requirements, features above-average innovation and efficiency and rare or nonexistent deficiencies.

SELECTION DECISION

After reviewing the SET's findings, I considered the following in making the selection decision:

First, I verified that the SET proceeded with the evaluation procedures contained in Section (M) evaluation plan and clauses in the RFP. I also took into consideration unique capabilities and facilities that enhanced each offeror's ability to perform the complete scope of the Contract requirements. The fact that Mission Suitability and Past Performance when combined are significantly more important than cost (as was stated in the solicitation) was critical in my selection decision. Arinc, Boeing , Honeywell and Rannoch all had strong technical proposals and solid past performance.

SRC on the other hand, had multiple significant weaknesses that would be difficult to correct under both Subfactor a – Understanding the Requirement and Approach and Subfactor b – Facilities and Equipment. Their technical approach to two of the Representative Task Orders did not demonstrate a sufficient understanding of the requirement. They did not identify logical objectives to satisfy the requirement and they did not present a consistent and logical sequence of technology/methodology solutions to accomplish the objective. In addition, they did not have internal facilities to provide coverage for the required research. For factor 1, SRC was rated overall at the low end of good. The SET found sufficient weaknesses that were not offset by strengths in SRC's proposal, which convinced me that SRC should not be selected for contract award. While Boeing and Honeywell were significantly more costly than the other three offerors, the additional cost was more than offset by the unique technical capabilities that each demonstrated in their proposal. Additionally, the competitive nature of the task placement process will help to ensure that reasonable prices are paid for services rendered under each task.

In my judgment, it is in the best interest of the Government to select the following firms for contract award:

ARINC Inc.
The Boeing Company
Honeywell Technology Center
Rannoch Corp.

I am convinced that the SET conducted a thorough, fair, and objective evaluation of all Proposals in accordance with the established Evaluation Plan and guidance provided in the RFP.

Sandra S. Ray
Deputy Procurement Officer,
Source Selection Authority

4/20/00
Date