Industry Day

Request for Project Proposals

Agenda

- **1:00 - Welcome and Opening Remarks - Mr. Tony Melita, DD, LW&M and DoD Chair, JGRE SSC**
- **1:15 - Overview**
- **1:45 - Request for Project Proposal**
- **2:15 - Training for Proposal Submissions**
- **3:00 - Break**
- **3:30 - Individual Project Requests**
  - **Non-Line of Sight (NLOS) Tele-operation**
  - **Improved Depth Perception to Aid Tel-Operation**
  - **Architecture for Rapid Structure Characterization**
  - **Unmanned Sniper Detection**
  - **Force and Tactile Sensing Based Manipulation**
  - **Mapping in Complex Urban Terrains**
- **5:00 - Adjourn**

FY09 TAB Schedule

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct

8 Oct – TAB Process Kick Off/Training

15 Oct -5 Nov– Electronic Submission of Technologies

13 Nov – Convene TAB

6 Feb – Tech. submitted to JS

5 Mar – FY09 O-6 Council

20 Mar – Determine contracting approach/
ID appropriate TM

May – TMs submit draft Project Plans

14 May – Coordinate Eval Plan/Factors

15 May-12 Jun – Proposal Request Prep

21 May – SSC/SSG

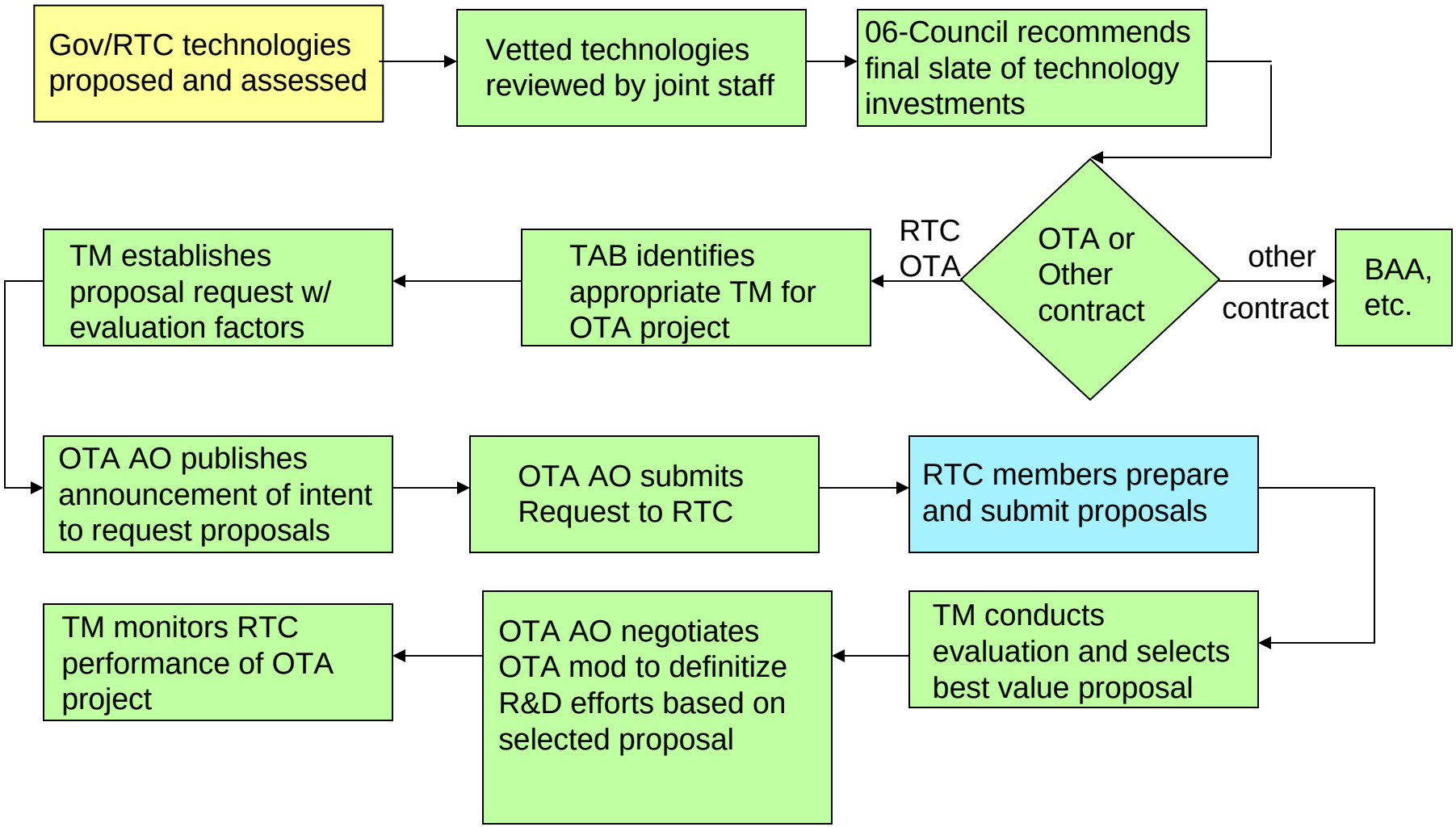
1 Jul – Announce Intent

15 Jul – Formal Request/Industry Day

14 Aug – Proposal Submission

15 Sept – Proposal Selection

Process Example



Proposal Evaluation and Selection

9

RTC members prepare and submit proposals

Proposals from RTC Members submitted by NCMS & vetted for responsiveness by OTA AO

10

TM conducts evaluation and selects best value proposal

Proposal evaluations & selection decision submitted to OTA AO

11

TM modifies final Project Plan based on selected proposal

FY09 Timeline:
9) Proposal Submit – 14 Aug
10) Proposal Selection – 15 Sept

FY08 Timeline

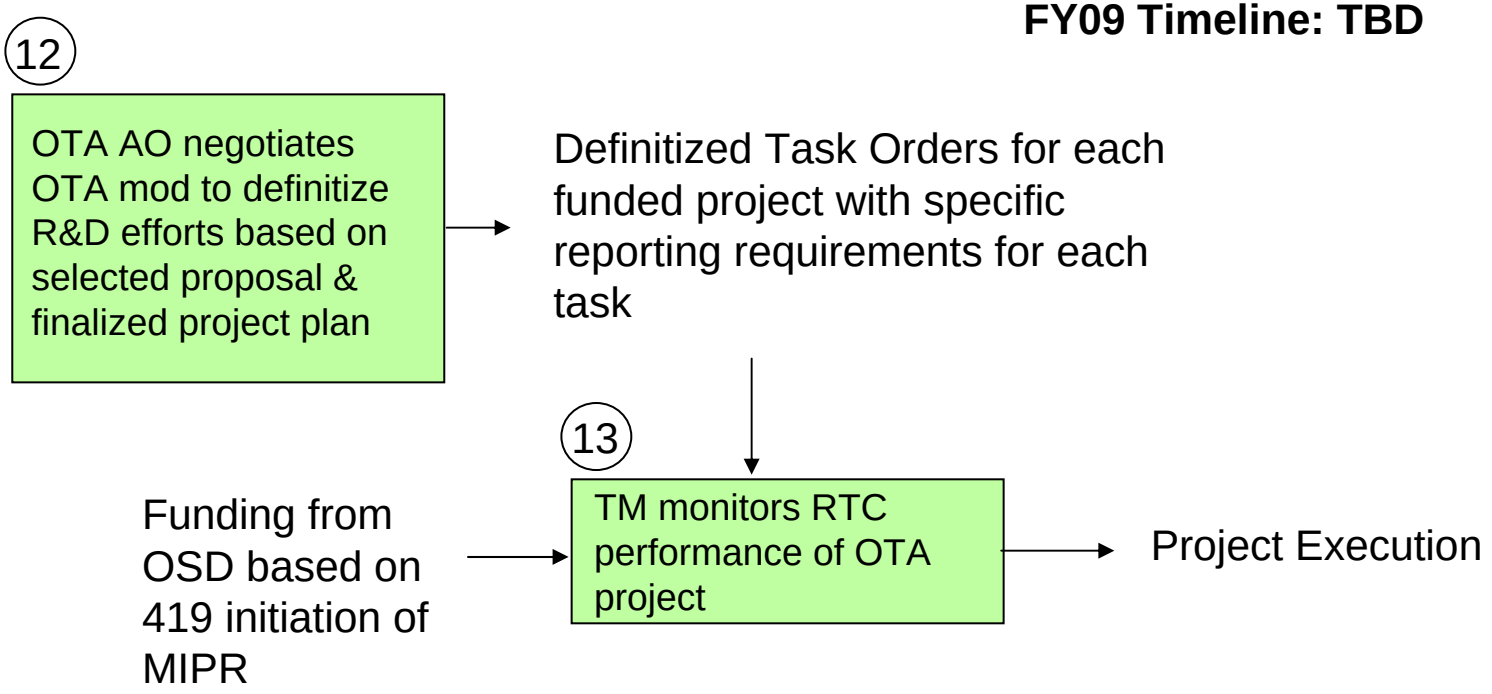
9) Proposal Submission – 18 Dec

10) Proposal Selection – 5 Feb

11) Project Plan refinement – 27 Feb

OTA Modification and Project Kickoff

FY09 Timeline: TBD



FY08 Timeline
12) OTA Mod – 16 Feb
13) Execution starts 27 Feb

Request For Project Proposal

- Statement of Work (SOW)…not to exceed 10 pages
  - based on technical requirements
  - SOW will be provided IAW the RPP Proposal Preparation Instructions
- Significant Contribution… not to exceed 1 page
  - **Significant technology, significant role, significant level of effort, etc.**

or

- 1/3 Cost Share… not to exceed 1 page
- Past Performance… not to exceed 1 page
- Personnel… not to exceed 1 page
- Organizational Experience… not to exceed 1 page
- Cost Breakdown

Proposal Not to Exceed 15 Pages

Significant Participation of Non-Traditionals

- **Significant participation can be defined as a meaningful portion of work performed by a Nontraditional Defense Contractor (NDC) that without the NDC's participation, the efforts being performed under a project award would either not be possible or produce results of a less successful nature.**

Forms of Significant Participation

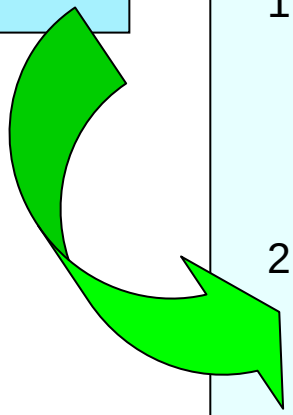
- **Supplying new key technology or product(s)**
- **Accomplishing a significant amount of the project effort**
- **Causing a material reduction in cost or schedule or increase in performance**

Lessons Learned from Initial Collaboration

- Project Proposal Submission/Evaluation/ Selection Process should be reviewed to ensure “Significant Contribution” is adhered to in the aggregate on an annual basis
  - Government will accept proposals that have significant contribution from non-traditional, or propose 1/3 cost share
  - Proposals without significant contribution or cost share will be acceptable to the government with the proviso that in the aggregate the terms of the OTA are satisfied …this places burden on those proposals with cost share or significant non-traditional contributions
  - RTC must provide government a set of proposals that enables adherence to OTA criteria, regardless of possible combinations of selections, or proposals may not be chosen for definitization within the OTA

So What Does This Really Mean?

RTC members prepare and submit proposals



Project Proposal

SOW:

1. Project Overview
    - 1.1 Purpose
    - 1.2 Background
    - 1.3 Scope
    - 1.4 Goals & Objectives
2. Technical Approach
    - 2.1 Technical Solution
    - 2.2 Deliverables
    - 3. Methodology
3. Resource Estimates
    - 3.1 Schedule of Events
    - 3.2 Integrated Baseline
    - 3.3 Cost Breakdown
4. Project Management
    - 4.1 Roles & Responsibilities
    - 4.2 Risk Management

Significant Contribution or 1/3 Cost Share

Past Performance

Personnel

Organizational Experience

Project Overview

- **1.1 Purpose**
  - "The purpose of this project is to ...."
  - This should be a *short, broad general statement* of what you are to do. (Be specific in the Objectives subparagraph.)
  - This subparagraph is where the proposal explains the value of the effort to the warfighter
  - Show the connection between the technology and the benefit to the DoD, often this is best accomplished by describing what military tasks are enabled by the utilization of the technology and how performing that task with the new technology is an improvement over how the task is performed today by DoD.

Project Overview

- **1.2 Background**
  - This subparagraph should present a *concise* but complete history of the problem or whatever generated the task you are undertak-ing.

- **1.3 Scope (How Much)**
  - This subparagraph should define in concise terms exactly how much you are going to develop, test, demonstrate, or do. The main purpose of this paragraph is to define, limit or bound the project. It is not intended to explain the concept of how you are going to accomplish the task; that will be accomplished later in the proposal. *Sometimes it is equally important to define here what you are NOT going to do*.

Goals & Objectives

- **1.4 Goals**
  - This subparagraph should convey in concise terms the outcome of the overall effort and show clear linkage to project purpose
  - **e.g., "Robotic Mess Hall" – Goal 1: Demonstrate a technical solution for conducting specified tasks such that on-going design maturity is likely to result in meeting threshold performance requirements.**
  - **e.g. Goal 2: Mature technology from TRL 4 to TRL 5**

- **1.4 Objectives (What)**
  - This subparagraph should clearly state in specific, measurable terms each task you intend to accomplish to demonstrate goal was achieved
  - **e. g., Demonstrate increase in meal preparation throughput from 200 meals per hour to 600 meals per hour; Increase task execution to 60% max speed, etc.**
  - **e.g., demonstrate breadboard technology in relevant environment during Limited Technology Demonstration 1.**

Technical Approach

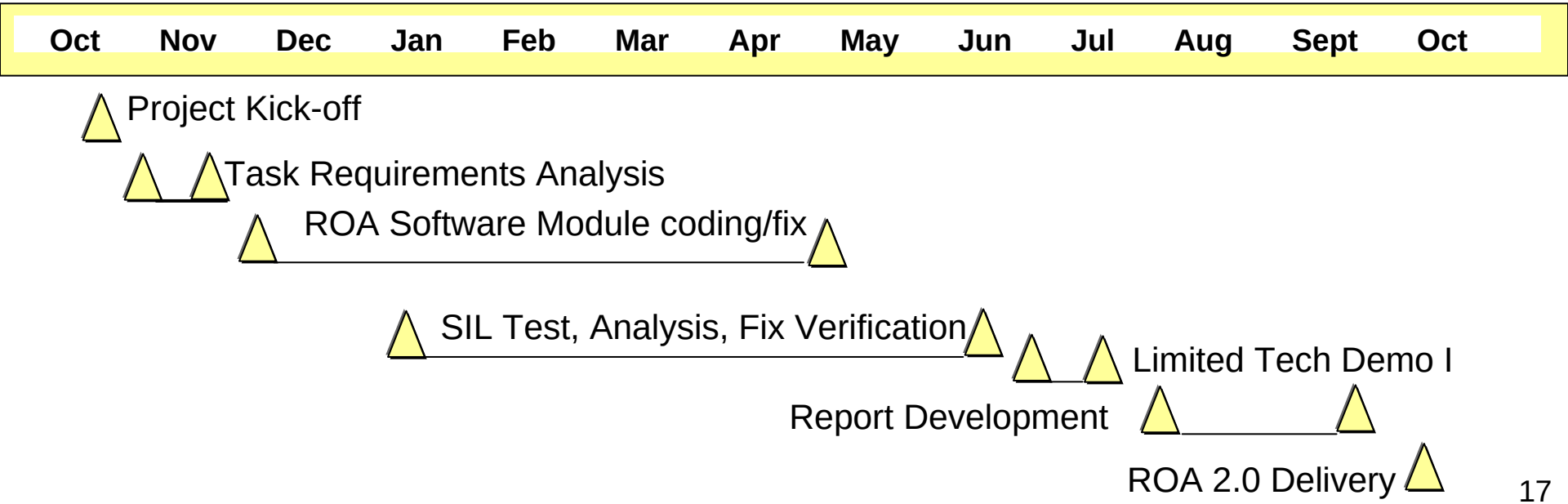
- **2.1 Technical Solution**
  - Describe the proposed technology advancement and the attributes that lead to the desired maturity/readiness level
  - e.g., “Fully autonomous tasks will be integrated with tele-operated tasks for a hybrid control schema that enables the operator to oversee complex preparation and service tasks, but render reduced control for clean-up tasks. This will be accomplished via the integration of additional software modules within Robot, Object, Arm (ROA) Operating System”, etc.
- **2.2 Deliverables**
  - Describe the tangible items will result from conduct of this effort that will be provided to the DoD, and indicate delivery date
  - e.g. ROA Operating System Build 2.0, 4th qtr FY09

Technical Approach

- **2.3 Methodology**
  - Describe what activities will occur in developing the technology (analysis, software coding, hardware integration, hardware/software integration, testing, etc.)
  - e.g. “This project will demonstrate component validation of the ROA Operating Systems in a relevant environment (TRL 4) via software-in-the-loop testing and analysis using the Simulation Integration Laboratory (SIL) here on the premises of XYZ Corporation”, etc.

Resource Estimates

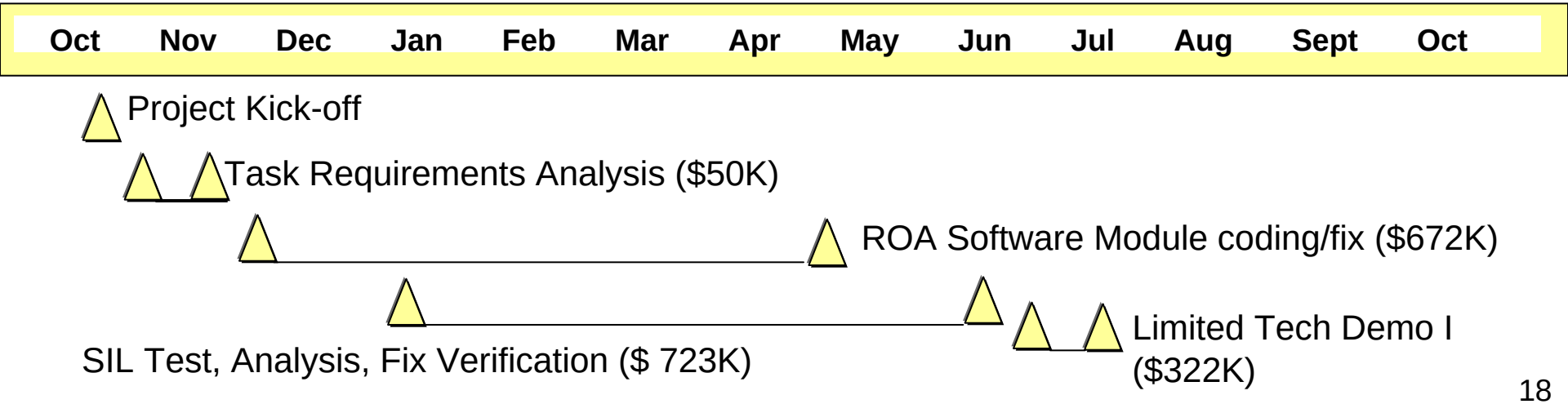
- **3.1 Schedule of Events**
  - Depict tasks with start and finish dates that must be completed to achieve each objective and prepare deliverables
  - A major milestone type (Gantt type chart) schedule may be included or a more detailed schedule may be included in the proposal
  - e.g.



Resource Estimates

3.2 Integrated Baseline/Milestone Completion Verification

- Indicate the funding estimated to complete each task identified within the projected schedule
- The Integrated baseline provides a depiction of the significant tasks that must be conducted to complete the project, how long each of the tasks will take to complete, the timing of the tasks relative to each other, and the estimated required cost for completion of each task. The Integrated baseline should provide a projection of expected work to be performed and associated cost at any point in time along the schedule. This will be used to track project performance against budget and schedule.



Cost Proposal Detail

- **Direct Labor**
- **Other Direct Costs**
  - **Material/Equipment/Special Tooling/Test Equipment/Computer Usage**
  - **Travel**
  - **Subcontractors/Consultants**
- **Overhead, G&A, Fringe Benefits, Cost of Money, etc.**
- **Fee**

Project Management

- **4.1 Roles and Responsibilities**
  - Identify Key personnel, organizations, and roles associated with the project.
  - Explain the roles of the major organizational elements involved in the project. It is important to recognize all stakeholders in the event and their role, even if it is a passive role (such as funding the event).
  - Responsibility for providing personnel, equipment, facilities, or for specific functions to be performed should be described here.

Project Management

- **4.2 Risk Management**
  - Describe the risks associated with the project and the proposed means to mitigate those risks.
  - Describe risk in terms of high, medium, low risk of an event occurring that results in a high, medium, or low consequence as appropriate.
  - Indicate actions that can be taken to prevent the events from occurring, or actions that can be taken to “get well” if the event occurs.
  - e.g.

FY08 RTC Projects

- **Non-Line-of-Sight (NLOS) Tele-operation** (NSWC EOD Technology Division)
- **Improved Depth Perception to aid Tele-Operation** (AFRL Robotics Research Group)
- **Architecture for Rapid Structure Characterization** (SPAWAR San Diego)
- **Unmanned Sniper Detection** (Joint Center for Robotics)
- **Force and Tactile Sensing based Manipulation** (NSWC EOD Technology Division)
- **Mapping in Complex Urban Terrains** (SPAWAR San Diego)

Non-Line-of-Sight (NLOS) Tele-operation

1. **Demonstrate a wireless communication system integrated on a teleoperated robot that provides:**
   - **Robust communication link in NLOS conditions including inside and around multi-story buildings and in dense urban environments**
   - **Low latency video and command and control sufficient for NLOS teleoperation**
   - **Support for multiple frequencies in military and commercial bands**
   - **The ability to operate in close proximity to interference sources/jammers.**
2. **Demonstrate positive control of the robot under LOS and NLOS conditions when wireless communications are intermittent.**
   - **Demonstrate the capability to provide feedback to operator on status of communication link**
   - **Demonstrate the capability to adaptively prioritize data and control sensor resolution based on current wireless link capacity.**

Non-Line-of-Sight (NLOS) Tele-operation (cont.)

3. Demonstrate the capability to autonomously reestablish communication or recover the robot, in the event the wireless link is lost.

4. Demonstrate improved robot local situational awareness sufficient to enable mobility and manipulation in complex environments under NLOS teleoperation.

5. Provide operator assistance in conducting control tasks to compensate for the operator's loss of direct Line of Sight.

6. Demonstrate a Human Robot Interface for NLOS teleoperation that is simple and intuitive.

Non-Line-of-Sight (NLOS) Tele-operation: Technical Evaluation Factors

1. Understanding of the work. Demonstration of innovation and thoroughness shown in understanding the Statement of Objectives.

2. Evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.

3. Anticipation of potential problem areas, creativity and feasibility of solutions to problems.

4. Anticipation of logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.

5. Ability to manage the contract with clear evidence of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.

6. Quality and effectiveness of Project Management approach and allocation of personnel and resources.

Non-Line-of-Sight (NLOS) Tele-operation: Past Performance Evaluation Factors

1. Relevancy and quality of recent and similar completed projects.

2. The organization's history of successful completion of projects; history of producing effective technology solutions.

3. History of staying on schedule and within budget.

Non-Line-of-Sight (NLOS) Tele-operation: Personnel Qualifications Evaluation Factors

1. The currency, quality and depth of technical, academic and professional experience/qualifications of individual personnel in working on similar projects. Demonstrated expertise and experience related to the purpose of the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity.

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualification these people would be expected to possess.

Non-Line-of-Sight (NLOS) Tele-operation: Organizational Experience Evaluation Factor

1. The degree of comparability of past projects related to the current project, including number of projects, complexity, workload and dollar amount. Supporting subcontractors, consultants and partners will be considered.

Non-Line-of-Sight (NLOS) Tele-operation: Evaluation Factor Relative Importance

- **Technical is the most important evaluation factor.**
- **Past Performance, Organizational Experience, Personnel Qualification and Cost/Price are of equal importance but less important than Technical.**

Improved Depth Perception to aid Tele-Operation

1. Develop and demonstrate a real-time perception system that provides visual depth information to improve tele-operation control and enhanced situational awareness for the operator of a small (EOD class) robot system.

2. Demonstrate a significant improvement in the field of view (FOV) and resolution compared to current approaches to depth information representation. Desired goal is no less than 120 degrees horizontal FOV, at 1920×1080 resolution, at a minimum of 15 hz update rate.

3. Demonstrate measurable improvement in the ability of operators of ground robots to perform manipulation tasks, reconnaissance, and maneuver in confined spaces via the improved depth perception.

4. Provide an effective user interface that reduces the burden on the operator while providing the improved depth perception.

5. Inclusion of depth perception should not substantially increase the logistics, or training requirements of the entire robot system.

6. Inclusion of depth perception should not substantially increase the weight or power consumption of the entire robot system.

Improved Depth Perception to aid Tele-Operation: Technical Evaluation Factors

1. Demonstrated understanding of the objectives, technical challenges, and technology gaps in this project. Demonstration of innovation and thoroughness shown in the proposed solution.

2. Proposed solution should provide evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.

3. Anticipation of potential problem areas, creativity and feasibility of solutions to problems.

4. Quality of proposed approach with regards to task layout, schedule, spend plan, description of deliverables and anticipation of any logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.

Improved Depth Perception to aid Tele-Operation: Technical Evaluation Factors (continued)

5. Ability to manage the contract with clear evidence of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.

6. Quality and effectiveness of Project Management approach and allocation of personnel and resources.

7. Indication that solution will integrate with as many different architectures, systems, standards, and sensors as possible without direct support from the original developer.

Improved Depth Perception to aid Tele-Operation: Past Performance Evaluation Factors

1. The degree of comparability of past and current projects related to this project, including number of projects, complexity, workload and dollar amount. Supporting subcontractors, consultants and partners will be considered. Ability to leverage current and ongoing work and/or internal funding.

2. The organization's history of successful completion of projects; history of producing effective technology solutions and a demonstrated history of staying on schedule and within budget.

Improved Depth Perception to aid Tele-Operation: Personnel Qualifications Evaluation Factors

1. The currency, quality and depth of technical, academic and professional experience/qualifications of individual personnel planned to work on projects. Demonstrated expertise and experience related to the purpose of the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity.

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualifications these people would be expected to possess.

Improved Depth Perception to aid Tele-Operation: Organization Experience Evaluation Factors

1. The degree of comparably of past projects related to the current project, including number of projects, complexity, workload and dollar amounts. Supporting subcontractors, consultants and partners will be considered.

Improved Depth Perception to aid Tele-Operation: Evaluation Factor Relative Importance

- **Technical is significantly more important than Personnel Qualifications.**
- **Personnel Qualifications is slightly more important than Past Performance.**
- **Past Performance is slightly more important than Organizational Experience.**
- **Organizational Experience is slightly more important than Cost.**

Architecture for Rapid Structure Characterization

1. Deliver modular software components that will provide:
   - Coordination of multiple small-UGVs and sensor data
   - Use that coordination for fast mapping and characterization of urban structures
   - Output of sensor data and characterization of the urban structure(s) to the operator. The software components should be capable of being integrated into existing platform and OCU architectures.

2. Demonstrate that the components provide the capability to rapidly characterize attributes of interest associated with the urban structure(s) utilizing multiple vehicles and sensors for speed and efficiency. Attributes that may be of interest/concern include but are not limited to entry and exit points, the basic floor plan with dimensions, and the locations of stairways and any unreachable locations. The number and approximate position of the occupants of the structure is a plus.

3. Demonstrate that the software accounts for the relative positions of the multiple unmanned devices, and appropriate communications that must be maintained among them to complete the characterization.

Architecture for Rapid Structure Characterization (continued)

4. Assess and document the effectiveness of the software with respect to the increase in speed and efficiency to characterize the urban structure(s) compared to use of a single vehicle and as number of vehicles/sensors increase.

5. Assess the effectiveness of the software by integrating the new components with an existing, commonly used software architecture and characterizing the performance in a realistic urban structure.

6. Delivery of a software solution that will integrate with as many different architectures, systems, standards, and sensors as possible without direct support from the original developer. Delivery of comprehensive documentation of the software components and their interfaces.

Architecture for Rapid Structure Characterization: Technical Evaluation Factors

1. Demonstrated understanding of the objectives, technical challenges, and technology gaps in this project. Demonstration of innovation and thoroughness shown in the proposed solution.

2. Proposed solution should provide evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.

3. Anticipation of potential problem areas, creativity and feasibility of solutions to problems.

4. Quality of proposed approach with regard to task layout, schedule, spend plan, description of deliverables and anticipation of any logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.

Architecture for Rapid Structure Characterization: Technical Evaluation Factors (cont.)

5. Ability to manage the contract with clear evidence of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.

6. Quality and effectiveness of the Project Management approach and allocation of personnel and resources.

7. Indication that solution will integrate with as many different architectures, systems, standards, and sensors as possible without direct support from the original developer.

Architecture for Rapid Structure Characterization: Past Performance Evaluation Factors

1. The degree of comparability of past and current efforts related to this project, including number of projects, complexity, workload and dollar amount. Supporting subcontractors, consultants and partners will be considered.

2. Ability to leverage current and ongoing work and/or internal funding.

3. The organization's history of successful completion of projects; history of producing effective technology solutions and a demonstrated history of staying on schedule and within budget.

Architecture for Rapid Structure Characterization: Personnel Qualifications Evaluation Factors

1. The currency, quality and depth of technical, academic and professional experience/qualifications of individual personnel planned to work on projects. Demonstrated expertise and experience related to the purpose of the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity.

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualification these people would be expected to possess.

Architecture for Rapid Structure Characterization: Evaluation Factor Relative Importance

- **Technical and Cost are of equal importance and are more important than Past Performance, Personnel Qualifications, and Organizational Experience.**

Unmanned Sniper Detection

1. Demonstrate integration of sniper detection capability integrated onto a ground robotic platform that can support dismounted operations.

2. Demonstrate that the sniper detection capability integrated into the robot can detect that snipers have line-of-sight to the maneuvering unit.

3. Demonstrate that the sniper detection capability integrated into the robot can accurately and rapidly localize the position of the sniper upon shots being fired and transmit appropriate location data to the unit being supported.

4. Demonstrate that the sniper detection capable robot can be effectively controlled by a dismounted operator during maneuver if the operator must react to the sniper fire.

Unmanned Sniper Detection (continued)

5. Demonstrate that the maneuver conducted by the robot upon detection and/or localization of sniper fire integrates appropriately with the dismounted unit's movements.

6. Inclusion of sniper detection and localization should not substantially increase the logistics, or training requirements of the entire robot system.

7. Inclusion of sniper detection and localization should not overwhelmingly increase the weight or power consumption of the entire robot system.

Unmanned Sniper Detection: Technical Evaluation Factors

1. **Understanding of the work. Demonstration of innovation and thoroughness shown in understanding the Statement of Objectives.**
2. **Evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.**
3. **Anticipation of potential problem areas, creativity and feasibility of solutions t problems.**
4. **Anticipation of logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.**
5. **Ability to manage the contract with clear evidence e of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.**
6. **Quality and effectiveness of Project Management approach and allocation of personnel and resources.**

Unmanned Sniper Detection:
Past Performance Evaluation Factors

1. Relevancy and quality of recent and similar completed projects.

2. The organization's history of successful completion of projects; history of producing effective technology solutions.

3. History of staying on schedule and within budget.

Unmanned Sniper Detection: Personnel Qualification Evaluation Factors

1. The currency, quality and depth of technical, academic, and professional experience/qualifications of individual personnel in working on similar projects. Demonstrated expertise and experiences relayed to the purpose f the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualifications these people would be expected to possess.

Unmanned Sniper Detection: Organizational Experience Evaluation Factor

1. The degree of comparably of past projects related to the current project, including number of projects, complexity, workload and dollar amounts. Supporting subcontractors, consultants and partners will be considered.

Unmanned Sniper Detection: Evaluation Factor Relative Importance

- **The following evaluation factors are listed in descending order of importance: (1) Technical, (2), Personnel Qualifications, (3) Past Performance, (4) Cost/Price, and (5) Organizational Experience.**

Force and Tactile Sensing based Manipulation

1. Demonstrate measurable improvement (speed, safety, dexterity) in the ability of operators of ground robots to manipulate objects by providing force and tactile sensory feedback to the operator.

2. Ensure the force and tactile feedback provided to the operator complements other forms of feedback, such as visual, available to the operator.

3. Demonstrate that the force and tactile feedback, when combined with other available sensory feedback, results in a measurable reduction of burden on the operator.

4. Ensure that the technology demonstrated can, with additional effort, be integrated into a variety of mobile manipulators and their control systems.

5. Provide a “hands-on” demonstration of the technology (at TRL 6) in the Southern Maryland area for EOD and other military user communities. (Maximum duration of three days)

Force and Tactile Sensing based Manipulation: Technical Evaluation Factors

1. Understanding of the work. Demonstration of innovation and thoroughness shown in understanding the Statement of Objectives.

2. Evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.

3. Anticipation of potential problem areas, creativity and feasibility of solutions to problems.

4. Anticipation of logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.

5. Ability to manage the contract with clear evidence of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.

6. Quality and effectiveness of Project Management approach and allocation of personnel and resources.

Force and Tactile Sensing based Manipulation: Past Performance Evaluation Factors

1. Relevancy and quality of recent and similar completed projects.

2. The organization's history of successful completion of projects; history of producing effective technology solutions.

3. History of staying on schedule and within budget.

Force and Tactile Sensing based Manipulation: Personnel Qualifications Evaluation Factors

1. The currency, quality and depth of technical, academic and professional experience/qualifications of individual personnel in working on similar projects. Demonstrated expertise and experience related to the purpose of the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity.

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualification these people would be expected to possess.

Force and Tactile Sensing based Manipulation: Organizational Experience Evaluation Factor

1. The degree of comparability of past projects related to the current project, including number of projects, complexity, workload and dollar amount. Supporting subcontractors, consultants and partners will be considered.

Force and Tactile Sensing based Manipulation: Evaluation Factor Relative Importance

- **Technical is more important than Personnel Qualifications and Cost/Price, which are of equal importance.**

- **Personnel Qualifications and Cost/Price are more important than Past Performance and Organizational Experience, which are of equal importance.**

Mapping in Complex Urban Terrains

1. Demonstrate a robust, reliable, and accurate localization and mapping capability in complex urban terrains that enables effective control and complete situational awareness for the operator of the robot system.

2. Demonstrate the ability to map and localize while navigating in urban features such as curbs, rubble piles, uneven surfaces, inclines, stairways, debris, rough terrain, unimproved roads, urban interiors, etc.

3. The mapping and localization capability must account for pitching, rolling, and vibration of the ground robot as it progresses over complex terrain at a wide range of speeds.

4. Inclusion of the complex urban terrain mapping and localization capability should not impose significant additional power consumption on the robot system. The proposed solution should be designed to work with sensors and processors that are appropriate for small UGVs.

5. Delivery of a software solution that will integrate with as many different architectures, systems, standards, and sensors as possible without direct support from the original developer.

Mapping in Complex Urban Terrains: Technical Evaluation Factors

1. Demonstrated understanding of the objectives, technical challenges, and technology gaps in this project. Demonstration of innovation and thoroughness shown in the proposed solution.

2. Proposed solution should provide evidence of specific methods and techniques for completing each objective, to include appropriate measures to indicate successful completion of each objective.

3. Anticipation of potential problem areas, creativity and feasibility of solutions to problems.

4. Quality of proposed approach with regards to task layout, schedule, spend plan, description of deliverables and anticipation of any logistics, schedule, availability of systems and/or subsystems, and any other issues of which the Government should be aware.

5. Ability to manage the contract with clear evidence of procedures for quality control, configuration management, and review and description of methods to assess technology development progression.

6. Quality and effectiveness of Project Management approach and allocation of personnel and resources.

7. Indication that solution will integrate with as many different architectures, systems, standards, and sensors as possible without direct support from the original developer.

Mapping in Complex Urban Terrains: Past Performance Evaluation Factors

1. The degree of comparability of past and current projects related to this project, including number of projects, complexity, workload and dollar amount. Supporting subcontractors, consultants and partners will be considered.

2. Ability to leverage current and ongoing work and/or internal funding.

3. The organization's history of successful completion of projects; history of producing effective technology solutions and a demonstrated history of staying on schedule and within budget.

Mapping in Complex Urban Terrains: Personnel Qualifications Evaluation Factors

1. The currency, quality and depth of technical, academic and professional experience/qualifications of individual personnel planned to work on projects. Demonstrated expertise and experience related to the purpose of the project.

2. Demonstrated experience of the Project Manager in directing projects of comparable technical and management complexity.

3. Inclusion of resumes for all personnel (not to exceed 3 pages each). For staff not yet identified, include specific qualification these people would be expected to possess.

Mapping in Complex Urban Terrains: Evaluation Factor Relative Importance

- **Technical is the most important factor.**
- **Past Performance is more important than Cost/Price and Organizational Experience, which are of equal importance.**