Real-Time Adversarial Intelligence and Decision-making (RAID) Program
Frequently Asked Questions (FAQs)

Questions and answers are posted in reverse chronological order with the most recent question first.

Notice: This is the FINAL update to the FAQs

as of 15 April 2004

Q: Section F.5 (p. 37 of the Proposer's Information Packet) seems to indicate that SECRET clearance is required for at least one of the team institutions. My understanding was that for the Adversarial Reasoning Module (ARM), this was not required to be the prime contractor, but could be a subcontractor. In our case, team members have the required security clearance.

Could you please confirm whether my understanding on this point is correct?

A: For teams bidding on either technology area (adversarial reasoning or deception reasoning), a security clearance is NOT required for any members of the team. Only the System Integrator and the Experimenter/Evaluator must have a security clearance.

Q: Do pages of references count towards the page count of the section in which they appear?

A: Yes.

Q: Paragraph H.2.1 requires the BAA number and the DARPA control number to be listed. What is the DARPA control number??

A: The DARPA Control number is a unique identification number for each proposal submitted. The system automatically assigns these control numbers and it also automatically enters it on the cover page. You can view it on page two of your submission and you will receive an email confirming receipt of your proposal and providing the control number as an identifier for future correspondence.

Q: Paragraph H.1.2 Subcontracting. If the Prime Contractor is an SDB, is a subcontracting plan required?

A: A subcontracting Plan is not required if the Prime is a SDB.

Q: In section H.3.1 of the PIP, it specifies: Award instrument requested: cost-plus-fixed-fee (CPFF), cost-contract--no fee, cost sharing contract--no fee, or other type of procurement contract (specify), grant, agreement, or other award instrument;

However, in your answer to a previous question you identified a CPFF type contract as the prime type of contract. Is CPFF your preferred type of contract or is a T&M contract equally acceptable?

A: DARPA has no stated preference for any of the contract types made available by the FAR. Offerors may propose use of any of the available contract types based on the scope of work proposed, business needs, and any associated FAR/DFARS requirements.

as of 9 April 2004

Q: Does this program require a multi-agent technical approach?

A: This BAA neither prescribes nor discourages any applicable technical approaches.

Q: Can the data stores shown in Figure 2 of the PIP "live" on a separate PC from the execution code?

A: It is possible, but you need to justify the need for separate platforms and how the configuration could either migrate to a single PC or exist in a frugal combat computing environment.

Q: Does the processor for the Adversarial Reasoning Module/Deception Reasoning Module have to reside on a single motherboard vice networked processors, such as a cluster?

A: That would be preferred. If a cluster is required, please explain and justify.

Q: Will the Deception Reasoning Module developer need to coordinate with the Adversarial Reasoning Module developer to understand and access the databases developed by the Adversarial Reasoning Module developer?

A: Yes. In general, the System Integrator will be responsible for coordination of all accesses to data and interfaces.

Q: Is there a standard Operating System (Windows XP, LINUX, etc.) specified?

A: No, but a commonly used Operating System is preferred given our goal to transition to a future deployment environment.

Q: Must the proposal address the entire technology area (Adversarial Reasoning Module or Deception Reasoning Module) or can it address a subset, such as a sub-module or unique technology?

A: Each proposal needs to address the whole technical area. If your expertise has a particular focus on part of the area, then you need to form a team with someone to address the entire technical area.

Q: Can we offer a specific/unique capability to the program as a whole instead of addressing an entire technical area?

A: No.

Q: Does the Adversarial Reasoning Module developer specify the data formats of Flows 1 & 7 (database updates and recommended blue actions) shown in Figure 2 of the PIP?

A: Yes, at least in the Phase I, but in coordination with the System Integrator.

Q: In section H.3.2 you ask for "Costs of major program tasks by year and month; (See example)" but none of the examples show a task breakdown. Can we supply a table along the lines of :

	Oct-04	Nov-04	Dec-04…
Task1	$$	$$	$$
Task2	$$	$$	$$
Task3	$$	$$	$$
…			

to meet this requirement? Is it sufficient to provide these costs at the task level and not the subtask level?

A: Provide costs at whatever task breakdown level you have described in your proposal.

Q: For purposes of budgeting, can you tell us how often program meetings will be held?

A: Twice a year in conjunction with the major experiments.

Q: Do we have to abide by the TFIMS (Technical Financial Information Management System) reporting rules required by other IXO BAAs?

A: Yes.

Q: What facilities is the System Integrator responsible for?

A: The System Integrator must provide the integration facilities and the experimentation facilities. However, the experimentation facilities should be priced separately in case the government provides the experimentation facilities.

Q: How detailed and accurate does the travel cost need to be?

A: Make reasonable assumptions that cover the semiannual experiments/program meetings. The System Integrator and Experimenter and Evaluator should also budget for travel to the technology developers for potential onsite support. Locations need not be exact and variances in cost due to differences in proposed locations and actual locations will not be an evaluation issue.

Q: From a System Integrator perspective, how many Adversarial Reasoning Modules and Deception Reasoning Modules will there be and will they be cooperative or competitive efforts? If competitive, how should the System Integrator deal with multiple technology producers.

A: There will be up to two (2) of each and they will be competing products that will be downselected during later phases. The System Integrator proposal should describe how it will manage interfaces to multiple producers/products/languages/etc.

Q: Will the 'deployed' RAID (the version transitioned to an operational system) have a Combat Simulation System?

A: Not necessarily. The Combat Simulation System is meant to replicate the battlefield and associated sensor feeds, so it was not intended to be part of the final system configuration. However, some technical approaches may use simulation as part of their technique so some sim capability may be part of the deployed solution.

Q: Should the cost proposal cover all three years of the program or just FY2005?

A: All three years.

Q: When participating in multiple proposals that could be linked, should that link be made explicit in the proposal?

A: The linkage can be mentioned but you may not want to make them "hard" dependencies where one proposal can't be selected without the other.

Q: My firm does not have DCAA-approved rates. Can we still serve as the prime contractor on this project?

A: To serve as the prime on a cost-plus-fixed-fee contract your company would need to have a cost accounting system that has been determined by DCMA/DCAA (Defense Contract Management Agency/ Defense Contract Audit Agency) to be adequate for accumulating contract costs. DCAA approved rates, such as via a Forward Pricing Rate Agreement, are not mandatory - although this does greatly assist in contract negotiations.

Q: Is there a threshold below which one does not have to provide supporting information for rates? For instance, if a company's overhead or G&A is below 10%, do you still need to see all of the supporting documentation?

A: No such threshold exists. If your rates have not been reviewed/approved by DCAA, you would be required to provide supporting documentation for the purposes of determining reasonableness - although, the type and quantity of supporting information needed to determine the reasonableness of your rates would be a decision of the Contracting Officer conducting the negotiation - DARPA uses various contracting agents to negotiate and issue resulting contracts.

Q: What if some of the overhead information is going to change before October? For instance, the company we are sub-letting space from is looking for new office space, so our rent will change this summer but we don't know what the cost of the new space will be. (It will be lower than the cost of the existing space). In addition, our health insurance costs might change slightly.

A: As noted above, these are issues that would be resolved by Contracting Officer during negotiations. It is recommended that you contact your DCMA/DCAA point of contact to discuss the development of your rates.

Q: Do you want the same level of cost detail from the subcontractors that you require from the prime contractor?

A: Yes - doing so will significantly reduce the amount of time required to conduct/complete the negotiation process.

Q: How shall we account for fringe benefits? Should they be in included in direct labor costs for employees who work directly on the project or should they be included in overhead?

A: As noted above, it is recommended that you contact your cognizant DCMA/DCAA point of contact to discuss the development of your rates.

Q: We are a woman-owned small business. Do we qualify for any set-asides?

A: As stipulated in the BAA/PIP, no set-asides exist for this BAA.

Q: Is it acceptable to DARPA that participation of a Government entity/lab be under a Cooperative Research and Development Agreement (CRADA) set up between the Prime and the Government entity/lab after proposal selection?

A: Yes.

as of 2 Apr 2004

Q: Could the Deception Reasoning Module provide multiple options/likelihoods of predicted Red status and possible Red actions?

A: Yes.

Q: When will the integration environment be available? Prior experience with these kind of programs indicates that there may be up to a six month delay for a fully realized integration environment with populated scenarios and operational simulation.

A: The System Integrator is expected to bring a mature combat simulation system to the program. Time to populate the scenarios and make initial modifications to the simulation will be minimized as much as possible.

Q: Very few urban terrain models currently exist. What is the plan to reduce the risk and lead time?

A: Some models of urban environments do exist. The System Integrator is expected to adapt or provide one early in the program.

Q: How will RAID capabilities be improved and expanded? Will there be a “step function” between phases or will some planning for subsequent phases be done during current phases?

A: RAID capabilities should evolve in a continuous progression during each phase and over the entire program.

Q: Will internal, component-level metrics be considered for the Adversarial Reasoning Module and Deception Reasoning Module for the phase gates?

A: No. Gates are as defined in the PIP.

Q: Should there be a correlation between internal, component-level metrics and the system-level phase gates?

A: It would be desirable.

Q: Is there interest in automated testing tools for use at the Adversarial Reasoning Module/Deception Reasoning Module and lower component levels?

A: Only to the extent that it would support the primary goals of the program. You would need to show the value added to justify the use of and investment in the tools.

Q: Would you be interested in a testing environment that supports various levels and types of models and can support testing to evaluate the value of these model differences?

A: That may be a useful idea, but not a requirement.

Q: In Phase I, will it be common knowledge to both the red and blue players that all information is known to both sides? Won't this affect tactics?

A: Yes. Yes.

Q: Will we know the organizational affiliation of the lowest entities, i.e. Charlie Platoon of the 2nd Company of the 1st Brigade?

A: In Phase I, the units (fire teams or squads) will all report to a single central command node, and the identity of each entity will be known (e.g., "team-5"). In Phases II and III, the organizational affiliation will be more complex (see PIP) and identities will have to be determined by each side's intel capabilities.

Q: What is meant in PIP by "game playing" as opposed to "game theory"?

A: "Game playing" was used to refer to highly heuristic approaches (often without much theoretical grounding) used in some game-playing software.

Q: In Phase I, will status information include orientation, such as direction of troops or weapons?

A: This is yet to be determined; will depend on requirements of the technology developers.

Q: Who will provide the experiment personnel for the Blue, Red, White cells, and data collection teams?

A: The Experimenter and Evaluator will be responsible for providing the personnel, with the understanding that the Government may bring in some outside operators on occasion.

Q: Does the RAID program have a transition partner?

A: Discussions are underway with the DCGS-A program.

Q: What is the difference in the 2 sets of experiments for each phase?

A: The first experiment (mid-phase) will be like a mid-term exam to check progress toward the phase gates and to identify shortcomings. The second experiment (end-of-phase) will be the experiment of record.

Q: How many wargaming runs per experiment session?

A: The number, 20, has been mentioned notionally (10 benchmark games and 10 with RAID). However, the Experimenter and Evaluator should recommend and justify the appropriate number based on their experiment design.

Q: What kind of SMEs (subject matter experts) does the Experimenter and Evaluator need to provide? Is experience in adversarial reasoning required?

A: Insights in adversarial actions and urban operations are important.

Q: For end-of-phase experiments, when will reports be due?

A: An experiment session would typically take about 4-6 weeks and will include setup, debugging, training, dry runs, and formal runs. Due to the relative frugality of the phase metrics, minimum processing, perhaps a few days, should be required to determine the program success with regard to phase gates. However, in-depth analysis should be available within a month to support detailed feedback to the developers.

Q: Will the technology developers be on-hand for the experiments?

A: Yes; but if and when the experiments are classified, then only if they have appropriately cleared people.

Q: Will the System Integrator be on-hand for the experiments?

A: Yes.

Q: Will there be any issues with regard to feedback from the experiments to the developers?

A: If an experiment is classified, and a technology developer cannot handle classified information, appropriate procedures for feedback will need to be worked out, and the feedback may have to be appropriately limited.

as of 25 Mar 2004

Q: The Adversarial Reasoning and Deception Reasoning technologies seem to be closely linked. Can a proposal for one of the technologies show a duality in their approach or does the other technology need to be completely excised from the proposal?

A: It is possible that, for example, an approach to Deception Reasoning would provide, as a side effect, useful results for the purposes of Adversarial Reasoning, and vice versa. This can a positive factor; do point out such "duality" in your proposal. Each proposal will be evaluated in application to a single area, but there is nothing negative about a side-effect benefit for another area.

Q: How mature does the Deception Reasoning need to be as compared to the Adversarial Reasoning in Phase I?

A: We anticipate to see more mature work in Adversarial Reasoning during Phase I. The Deception Reasoning research will have more latitude during the first year. As a simplification, concealment will not be a factor during Phase I.

Q: Research does exist at higher levels of classification in the area of deception. Is there interest in this program at these higher levels?

A: There are no plans in this program to perform work at higher than Secret level.

Q: Is there interest (as a goal or transition target) in pursuing a high fidelity model of the urban environment?

A: The Combat Simulation System will hold a "true" urban terrain model, populated by the System Integrator, and the Adversarial Reasoning/Deception Reasoning Modules will probably work with an abstracted version as depicted in the PIP. Extensive research in high-fidelity modeling of urban environments is not a focus of this program.

Q: Given the limited capability of existing Combat Simulation Systems, the System Integrator task could be overwhelming in terms of modifications and upgrades. Is this considered a large effort?

A: The System Integrator is expected to recommend a Combat Simulation System most suitable to the goals of the program, and make the minimum changes needed to meet the experimental requirements. Extensive enhancements to the Combat Simulation System are not desired; it is merely an experimental tool and not a focus of this program.

Q: Is there some guidance on the level of effort for the System Integrator task?

A: No.

Q: Can the Combat Simulation System be a federation vice a single, monolithic simulation?

A: Yes.

Q: Would you consider simulations from the gaming world?

A: Yes, although operational credibility and validation issues need to be carefully considered.

Q: What is meant by the phrase, "...the System Integrator will act as the prime contractor..."?

A: The System Integrator will have a leadership role in establishing the architecture, standards, controls and interfaces, but we do not anticipate a need for a formal prime/sub contractual relationship between the System Integrator and the technology developers. It is common in DARPA programs that the System Integrator leads by influence rather than by contract.

Q: Will the System Integrator and Experimenter and Evaluator start earlier than the technology developers?

A: Very unlikely.

Q: How much fidelity or effort is envisioned for the user interface?

A: User interfaces will be required but are not a key focus of the program. In Phase I and II, the System Integrator may consider using the native interface of the Combat Simulation System and/or possibly reuse existing code from other projects and systems, thus minimizing costs and effort. In Phase III, different, lightweight interfaces will be needed that can work in realistic tactical environments with portable display devices.

Q: If submitting multiple proposals, do personnel need to be fully decoupled?

The program announcement says "Teaming is encouraged. An organization can propose to more than one area, with a separate proposal for each area. However, no individual should be named in more than one proposal." Does this prohibit an individual from being a subcontractor to two different prime contractors, each of which is proposing to a different area?

A: Each proposal is evaluated independently. If the same person is bid on several proposals, the conflict and level of effort will be resolved during contract negotiations. The personnel restriction was inadvertently left in the FedBizOpps announcement.

Q: Are you interested in turn-taking game approach or simultaneous moves for the reasoners?

A: You need to justify whichever approach you propose.

Q: How firm are the performance gates at each phase milestone? Will we be able to tradeoff some exciting research breakthroughs for delayed or lower performance.

A: They are firm. We must meet the gates.

Q: How much hardware (workstations) is needed?

A: Consider the number of personnel mentioned in Fig. 3 of PIP. In addition, depending on the Combat Simulation System, the integration and configuration setup, and the networking configuration, servers and other processors may be required.

Q: Does the Combat Simulation System have to be HLA compliant?

A: It is not a requirement.

Q: The PIP says, "…unnecessary technical innovations or technical risks in the integration infrastructure are not desired." Can you explain?

A: The system and integration infrastructure is not a research area in this program. The System Integrator is encouraged to use and reuse appropriate proven and reliable tools, practices and approaches, in a cost-effective manner.

Q: What is the terrain model which is shown as a component of the Adversarial Reasoning Module and the responsibility of the Adversarial Reasoning Module developer in Phase I.

A: A "true" terrain database (accurate representation of the urban environment) should reside in the Combat Simulation System and will be the responsibility of the System Integrator. The 'Terrain Model' depicted in Fig. 3 of the PIP represents a suitable abstraction of the "true" terrain database, as required to support the algorithms in the reasoning modules.

as of 19 Mar 2004

Q: What is the limit on the computer processor?

A: We are looking for algorithms that can run on a standard PC (<2.5 GHz as specified in the PIP).

Q: The target computing environment is a 2.5 GHz single processor. But in an operational setting we might expect a networked suite of computers providing complementary functions (e.g., terrain analysis, visualization). Is the intent of RAID that just the core Adversarial and Deception Reasoning modules be capable of running on a single processor, or that all related functionality reside on that processor as well?

A: First, terrain analysis will NOT be an explicit part of the processing in this program. We will have pre-processed terrain representation that would presumably come from some other processes. Basically, we would like to limit the computing requirements in some way. If you believe you require more computing power, then say so in your proposal and explain the reasons to support that. We are trying to restrict the computer processing to a platform which, today, looks reasonable, readily available, and deployable in a real-world environment.

Q: Can deception occur with full knowledge of the battlespace?

A: Yes, feints and misleading shows of strength and other tactics are possible.

Q: Will communications security (or lack thereof) be a means for detecting and sourcing Red or Blue information?

A: No, please assume that all communications (Red and Blue) are secure.

Q: Re: algorithms that learn, will data from the experiments be made available to the technology developers to "train" the algorithms before the integrated "bake-off"?

A: First, we plan to make an unclassified version of the simulation system and unclassified data and scenarios available to all of the developers. If you are a technology developer, you will be handed an unclassified simulator and it will be most reasonable for you to integrate your reasoning module with that simulation

system and to test it as many times as you want and that will provide you with some training data.

Q: Re: algorithms that learn, will there be classification issues – i.e., will the data from the experiments be classified?

A: Unfortunately, yes. If you are a technology developer who operates at the unclassified level, you will throw your technology over the wall and the System Integrator and Experimenter/Evaluator will provide you sanitized feedback on the performance of your algorithms. That is a challenge. Also, if you are working at the unclassified level, you will not be able to "train" algorithms on the results of those experiments. If your technical approach absolutely requires access to the classified experiments, then you should think about forming your team with classified capabilities.

Q: Re: algorithms that learn, will the output of each of the 10 tests be available for input into the next run such that subsequent tests can learn as they go along?

A: I have not thought about this. It might be okay or it might be counter-productive. If you run every next case with a slightly different algorithm, then how would you evaluate it. We would have to look into this with the Experimentation and Evaluation team to come up with a methodology for such experiments. That doesn't mean that you can't use data generated by runs outside of the formal experiments.

Q: Have government agents been selected for this program?

A: No.

Q: Would you accept a separate proposal on just the user interface portion of the System Integrator role?

A: No.

Q: Will any work on Deception Reasoning start during the first year?

A: Yes, work on Deception Reasoning will start in the first year. We do not expect to have it integrated with Adversarial Reasoning during the first year. That year is provided to Deception Reasoning to build up the capability in that area.

Q: Will subject matter experts on urban warfare be available during Phase 1 to provide details of the scenarios?

A: The details of the scenarios will be provided by the Experimentation and Evaluation Team. They will also have subject matter experts available for consultation and will have the responsibility for making them available to the technology developers as needed and within reason.

Q: Will the Combat Simulation System selected be specific to urban warfare?

A: It certainly must have substantial urban warfare capabilities and very few combat simulation systems have that. In fact, those that do have capabilities, do not have them in sufficient quality and quantity to meet the requirements of this program. I would expect the System Integrator to suggest enhancements to whatever Combat Simulation System that they recommend.

Q: Is the contractor for Adversarial Reasoning expected to have all the domain knowledge?

A: This question could have two meanings.

If the question means, "is the Adversarial Reasoning team expected to provide knowledge experts as part of his team?", then the answer is no. The Experimentation and Evaluation team will provide a central pool of expertise.

If the question means, "is the Adversarial Reasoning module the only place where some knowledge repository or knowledge base will reside?", then the answer is not necessarily. Deception Reasoning may have a knowledge base of some sort. Also, neither of them may have knowledge bases, depending on the technical approach.

Q: Were/are there seedling efforts related to this procurement? If so, who and what topics, and are results available to us?

A: There was a seedling effort called Sidekick. It was oriented on unmanned robotic warfare and we did some work on simulation of such actions. We had a scenario which was very similar to the RAID, but instead of dismounted troops on the blue side, we had robots. The seedling motivated this program but did not contribute any prototypes or technologies. In that sense it is not directly relevant to this effort.

Q: Is it a) necessary or b) desirable for the Adversarial or Deception Reasoning teams to have embedded expertise in the domain (military ops, urban tactics, etc.) or is this to be provided ?

A: It is not necessary; there will be a pool of expertise provided by the Experimentation and Evaluation team.

Q: Can a university with no classified facility serve as a prime contractor for the Adversarial Reasoning or Deception Reasoning and not be a subcontractor to another?

A: Yes, it is entirely possible. If you are a university with no classified capabilities and you have foreign graduate students as performers, you can still propose as a technology developer. You will develop unclassified technology and it will be up to the System Integrator to modify it, as necessary, to make it more realistic.

Q: If an Adversarial Reasoning proposal includes experiments with a particular simulator which is different that the government selected simulation – will this negatively affect the evaluation?

A: I don't think a technology proposal should specify a particular simulator, but you may want to specify some capabilities that you want in the simulation. You should be prepared to work with the simulation system that the government selects and it will be the System Integrator's responsibility to help you with the integration. You don't need to be an expert in integration techniques, the System Integrator should provide you with reasonable and easy-to-use interfaces as specified in the PIP.

Q: In the PIP it is stated that Level 1 & 2 fusion products will be available as input to RAID to create a Level 3 output. However, Level 2 technologies don't exist or are very immature. Is there a plan to develop Level 2 products or do we assume aggregation of forces is done by some other process?

A: Yes, we assume aggregation of forces is done by some other processes. You may know that there are several efforts underway to develop such capabilities, for example the Army Research Lab runs a Science and Technology Objective that is looking at fusion. The assumption is that someone will succeed and that capability will be available. Also, one can envision some technical approaches that don't require aggregation of forces or at least don't depend heavily on it.

Q: Is it okay to participate on multiple teams for the same technical area?

A: Yes.

Q: Could you provide some insights as to how the problem complexity and solution speed requirements were derived?

A: The problem complexity was patterned along the lines of a conventional game branching tree for a game with simultaneous moves for multiple pieces. This may not be the best way to do this and if you have ideas on this please feel free to share them with us.

The solution speed requirements were based on what appeared to be reasonable from an experimental basis. Taking into consideration the number of distinct steps in the process and the number of times we can stop the simulation in Phase 1, 5 minutes should be a reasonable number. The Phase 3 requirement of 30 seconds is an educated guess at how long a human commander might be willing to wait for a response. If you have strong thoughts about that let us know.

Q: The Deception Reasoning Module will need to model system dynamics. Thus it will require some code analogous to part of the Adversarial Reasoning Module. Do you foresee how this will be accomplished? Would the Deception Reasoning Module need to subsume some of the Adversarial Reasoning Module?

A: Some technical approaches may have significant overlap. This does not appear to be a huge problem. You may want to consider the possibility that the Deception Reasoning Module can send a question to the Adversarial Reasoning Module asking, "If I assume that this is the real situation, how would it evolve? what would be the results of this battle?" In other words, the Deception Reasoning Module can use the Adversarial Reasoning Module as an advisor on the future of the battle and that may eliminate some or all duplication.

Q: What leads us to think that the first year RAID would beat a team of 7 presumably experienced operators? Remember how long it took to develop Deep Blue.

A: Well, it took a long time to develop Deep Blue to the point that it could beat Kasparov. It took a lot less to build the first competent chess playing algorithms. We will have competent, experienced people playing the Red and Blue cells, but it is not clear that they are at the level of Kasparov or that there are any "Kasparovs" in that field at all. This is a good question, but this is our hypothesis and we will know the answer at the end of the first year.

Q: Is not the term 'most likely case' misleading in flatter distributions (take throwing a die as an extreme example)?

A: Fair question. But I don't know how flat this distribution is and it's not entirely clear to me that it is very flat.

Q: Why predict likely adversary action, as opposed to a set of viable options (like chess)?

A: I envision the Adversarial Reasoning Module producing a small set of more likely options. It may or may not be possible to evaluate the relative likelihood.

Q: I understand true information in Phase 1, but full information is unrealistic and indeed not well-defined?

A: What I mean by full information is a very restrictive definition, which includes: where the units are, their location at any given moment, their identity, and their strength. Full information can certainly mean much more, but I use a very restricted version in this context.

Q: How much revision or tuning of the Adversarial Reasoning algorithms do you envision allowing during the conduct of the experiments?

A: Don't know yet. On the one hand, one might say there is nothing wrong with tuning them during the experiments. On the other hand, one might say that tuning will make the experiments very uncertain. I don't know the answer. The simple answer is to say no tuning will be allowed, but it may be possible. Again, this is a matter for the Experimentation and Evaluation team to consider.

Q: Can you say more about the separation of adversary actions and adversary deceptions? The adversary/deception dichotomy seems very artificial …

A: It was a difficult decision to decide to separate these two functionalities after weighing several pros and cons. The cons, of course, are that these are related functionalities and in some technical approaches these are almost inseparable functionalities. Nevertheless, I chose to separate them for several reasons. One reason is that you can think of them as providing answers to two different questions. For Deception Reasoning, you can think of the following question, "Given what I have seen on the battlefield so far, where is the enemy hiding his forces (if he is hiding any) and what are the deceptions that he could be presenting to me (decoys, misleading actions)?" You can think of it as the question, "What is NOT true in the picture that I see at this minute?" For Adversarial Reasoning, you can think of the following question,"Assuming I know everything about the battlefield (that I have full state information), how will the battle evolve for the next 2 hours?" These are orthogonal questions. The second reason is application oriented in that it may be possible to fail at Adversarial Reasoning and succeed at Deception Reasoning and it would still be useful. The third reason is programmatic. It was my sense that there is a lot more preliminary work needed in the area of Deception Reasoning, than Adversarial Reasoning. Therefore, for programmatic reasons it would be reasonable to proceed the first year with Adversarial Reasoning while letting the Deception Reasoning folks play in their own sandbox until they can develop more capabilities. For those that feel there is an overlap between the two, you are right.

Q: Re: the terrain data base, the simulation wargame (TBD), if it is able to simulate combat on urban terrain, will have a representation for urban terrain. Yet the Adversarial Reasoning Module is to design and build the terrain DB (PIP pg 14), the System Integrator is to implement … terrain (PIP pg 15), and the Experiment and Eval is to design … terrain (PIP pg 22). How much freedom will the Adversarial Reasoning developer have to develop useful terrain representations? What do the apparently conflicting roles (for Adversarial Reasoning Module, System Integrator, and Experimentation and Evaluation) really mean?

A: The Adversarial Reasoning team will be responsible for building the terrain model in Phase I because they will most likely know what they need. They will be on the critical path. The alternative would be to let the System Integrator, who would be the most logical choice, try to figure out what the Adversarial Reasoning and Deception Reasoning people need and write a detailed requirements document and then begin to design and then begin to implement, etc., etc… Our preference is to let the Adversarial Reasoning developers to prototype the terrain model in Phase I, then the System Integrator will see what is needed and will have a chance to talk to the Deception Reasoning developers to see what they need. Then in Phase II, the System Integrator can rearrange things. Thus, in Phase I, the Adversarial Reasoning developer will have the necessary freedom to design the internal terrain representation that fits the reasoning technology.

Besides the reasoning-specific terrain representation, other teams will also produce their terrain information. The Experimentation and Evaluation team will design the terrain "on paper". They will say, "our area of operation will have 100 buildings, with this layout, of this type, of this height, etc." They will hand this paper design to the System Integrator, who will be people who can translate this design into electronic representation of the terrain appropriate for the Combat Simulation System. They will be responsible for putting the "bits & bytes" into the Combat Simulation System. The terrain is represented in at least three different ways: on paper by the Experimentation and Evaluation, within the Combat Simulation System by the System Integrator, and within the terrain model by the Adversarial Reasoning developer.

Q: I am concerned that giving a charter for terrain data generation to each Adversarial Reasoning Module (ARM) developer as well as the System Integrator (SI) will lead to multiple terrain data bases that would be similar, but different. Even small differences in geometry would lead to inconsistent functional properties -- particularly terrestrial line-of-sight -- that would inject unwanted and unnecessary variability into the experiments. As I understand it, your intent is to give the ARM developers maximum flexibility to implement tailored terrain representations in the limited time available to them prior to the Phase 1 experiments. This is a worthy goal, but I think you have confused functional representation with terrain content. My fundamental point is that you want to give the teams the opportunity to design and implement tailored

representations of a common synthetic environment that maintain inherent geometry and attribution. You should not give the teams the license to generate a unique terrain data base from some common specification. ARM teams can choose to use an existing format or ingest the source data exported in one of the other formats to feed a compilation process that they implement to provide a novel ARM representation.

A: The "terrain model" mentioned in PIP is meant to be the Adversarial Reasoning Module/Deception Reasoning Module-specific representation. Perhaps the terrain DB should be called "terrain reasoning representation" or such. The terrain model is *not* the "true" terrain data you are referring to but rather an application-specific abstraction of the "true" terrain. The "true" terrain data that you discuss are obviously also required and we lumped it into "Combat Simulation System".

Q: Adversarial Reasoning tasks contain terrain modeling, COP DB, and Red/Blue/Green models. Does this assume Red/Blue/Green models will be unclassified (i.e. force capabilities)? Will the System Integrator need to re-establish these models for classified experiments?

How will Deception Reasoning model be able to tie into the terrain DB and COP DB if multiple Adversarial Reasoning awards are won?

Can the terrain DB and COP DB be integral to the reasoning module or are these components expected to be replaced in the transition phase?

A: Yes. Yes. If the technology developer works at the unclassified level, then the System Integrator will need to modify the models for the classified experiments.

The issue of multiple databases will be handled by the System Integrator through some kind of interface, which is not clearly defined yet.

The terrain and COP databases should be made as separable as possible because they will be modified by the System Integrator for the experiments, they may need to be replaced in the transition phase, and so on. These kind of sub-components need to be kept as separate as possible from the “core engine”.

Q: Are your comments about representing the interior of buildings as some kind of averaged out, viscous media applicable to just Phase I or to all three phases?

A: Strictly speaking, it applies to Phase I. However, I don’t see anything on the horizon that might handle it more explicitly in any of the phases. So it might apply to all three phases. If you have a better idea, please tell us.

Q: Will there be an unclassified data set provided for experimentation performed by the Adversarial Reasoning Module/Deception Reasoning Module contractors?

A: Yes, not only data sets, but a whole simulation system with implemented scenarios will be available. Just plug your stuff into it and play it and see how it works.

Q: If I submit a proposal for the System Integrator that specifies a particular CSS, is it possible that the government will select my proposal but require me to use a different CSS?

A: Theoretically it is not impossible, but not very likely. One of the key strengths of the System Integrator should be familiarity with a particular or multiple combat simulation systems and the know-how to plug various things into it. I assume that the System Integrator will say, "We know XYZ simulation system, we really know how to integrate it, we really know how to modify it, etc. and we recommend it." So, why would the government tell that System Integrator, "No, go and do something else."

Q: The current format requiring multiple proposals incurs an inordinate amount of risk on the System Integrator because they have no control over and no clue how to estimate complex integration costs. Would the government entertain packaged proposals, i.e. a proposal consisting of a team that would deliver the Adversarial Reasoning Module, Deception Reasoning Module and System Integrator portions?

A: The BAA has been designed to request proposals in individual areas. That is the most reasonable way to do it at the moment. If you have a team which is proposing to do work in several areas, feel free to submit several proposals. As far as risk to the System Integrator, yes it takes a special skill to be a System Integrator on a DARPA program.

Q: What kind of computer support capabilities will the 5-7 person blue team have in the control experiments, i.e. what is RAID competing against?

A: Both the Red and Blue teams will have minimal computer support. All they will have is some means of seeing where red and blue entities are, as displayed by the Combat Simulation System.

Q: Will the members of the Red team see the situation displayed on the computer screen or will there be a long delay before they see updates?

A: Both the Red and Blue teams will see the situation displayed on their Combat Simulation System interfaces. In Phase I, we will run experiments where the red and blue teams will be able to see all the entities instantaneously. In Phase II & III, there will be a lot more fog of war, with latencies, plenty of incomplete information, and more realism in what can be seen on the display.

Q: Will the Red and Blue teams have the same computer support capabilities?

A: I envision them having identical facilities. They will not see the same picture. The Blue team will only see what Blue can see and the Red team will only see what Red can see.

Q: Will annual experiments be performed with classified technology versions, unclassified, or both?

A: The technology developers will run their own in-house experiments using unclassified versions and data. The annual validation experiments will most likely be run with classified version of the simulator, classified data, and possibly classified tactics for red and blue.

Q: Are the evaluator's SMEs expected to support both classified and unclassified domain knowledge development?

A: Yes.

Q: Is the highest level of classification SECRET? Does this include information about deception?

A: Yes. Yes. We do not envision a level of classification higher than SECRET.

Q: Will there be any relationship between RAID and the Joint Urban Operations experiments at JFCOM/J9?

A: We are in contact and are conducting discussion, but we don't envision a formal relation.

Q: Will the Experimenter/Evaluator be responsible for modeling green units [non-combatants] or will that be the responsibility of the System Integrator or Adversarial Reasoning modeler? If the Experimentation and Evaluation, then how do other teams obtain access to that information?

A: The answer is all three. The Experimentation and Evaluation will have to design an experiment with green units (noncombatants). In executing the experiments, the Experimentation and Evaluation will have to control the Green units (we may possibly need a green cell). The System Integrator will be responsible for implementing the necessary data sets, turning the design produced by the Experimentation and Evaluation into the "bits & bytes" that go into the data sets that go into the Combat Simulation System. The Adversarial Reasoning will have to model the behavior of the Green units for the purpose of reasoning about 'who goes where and how'. He probably needs to consider the fact that the Red units will try to hide amongst the Green units. He probably

needs to consider that civilians exhibit certain behaviors when they see the fight unfolding around them. You need to model what the Blue units should and should not do in the presence of Green units. So all three will have to consider noncombatants, but from different perspectives and for different purposes.

Q: Who are the human experts that will be used for comparison with RAID? What is their experience level and what factors will they consider in making their predictions of enemy actions?

A: We envision a mix of three types of people: senior, retired military people with significant insights into urban warfare; active duty military personnel, hopefully with insights into urban warfare; and the people who know how to operate the simulation system fast and effectively. The factors they will consider in making their predictions will include the sum total of their knowledge and experiences.

Q: How will experimentation biases be mitigated? For example, will the ordering of RAID vs no-RAID wargames be randomized per scenario.

A: Yes, we will try to randomize and do all the other good practices of eliminating biases. This is something that the Experimentation and Evaluation team will need to design and recommend.

Q: What is the procedure for evaluating "as good as a large unassisted human group" for the Phase I gate? Should this methodology be proposed?

A: The PIP explains that we will compare 10 (or so) games played by a human blue cell with the same games played by RAID plus one-two blue personnel. The results of the games will be compared for both series. Specific methodology should be proposed by the Experimentation and Evaluation team.

Q: Evaluation of the first phase is by comparison with people. How good are people at adversarial and deception reasoning? What is the variation of the people/ Which people will evaluation use?

A: We will put together a group of reasonable domain experts.

Q: The test plan seems to focus on an urban environment for all three phases. Was this operationally based or chosen simply to drive the complexity?

A: Yes, we will use the urban environment in all three phases. In fact, we will probably use similar scenarios and terrain in all three phases unless we see some strong reasons to change that. You may have heard that the Director of DARPA (Tony Tether) announced last week at DARPATech a new strategic thrust on

Urban Operations and this program reflects that strategic thrust. It was also chosen to drive the complexity. Both to drive the complexity up in terms of numbers and fragmentation of actions and number of features and so on. In terms physical grounding of decisions, it may actually drive the complexity down.

Q: Will Red team tactics be restricted and consistent between baseline and test games?

A: Yes, we will need to control the tactics to some extent.

Q: It was stated that "Prime contractor in each of the 4 task areas must comply with US National Security Requirements and Export Control Laws." Is there a reference where we can determine what this means? Does a university typically meet these conditions.

A: An Internet search for ITAR, Department of Commerce and DoD Industrial Security will yield many references. The assumption at this time is that work in the Adversarial Reasoning Module and Deception Reasoning Module will be at the 'basic research' or 'fundamental research' level using open sources and unclassified information. Therefore, universities should have no problem engaging in this research and participating in this program. If you are a university, you probably have access to legal counsel or security specialist who can point you in the right direction.

Q: Does funding start in October? Kickoff meeting in August. Where will the money for the kickoff meeting come from?

A: We envision that funding will start earlier than October, but we asked for costing based on October for simplicity purposes. We hope that fiscal year 04 funds will be available to allow us to start in August or September.

Q: How flexible are the page limits for each section of the technical volume? Could we use 2 pages for the Problem Statement and add 3 pages to the Program Concept?

A: The page limits are already fairly liberal, so there is no need to play with the page limits.

Q: Could a single company bid for a technology area, Area 1, and as a System Integrator, Area 3, or Experimentation and Evaluation, Area 4?

A: A single company can send us as many proposals for as many areas as they want.

Q: Can a proposal be submitted on only the Adversarial Reasoning, or do you want to see a complete solution outlined in the proposal?

A: The BAA asks for proposals in four areas. Pick your area and write your proposal for that area. Adversarial Reasoning is one area, Deception Reasoning is another area. If you think you have something to offer in both Adversarial Reasoning and Deception Reasoning, write two proposals.

Q: Is there room for university-centric participation that will focus on analytical methods applied to in-house, but sufficiently sophisticated, test-bed examples??

A: The BAA asks for proposals as defined in the BAA areas... A partial response would not work. Consider teaming with an industrial partner?

Q: I am concerned that giving a charter for terrain data generation to each Adversarial Reasoning Module (ARM) developer as well as the System Integrator (SI) will lead to multiple terrain data bases that would be similar, but different. Even small differences in geometry would lead to inconsistent functional properties -- particularly terrestrial line-of-sight -- that would inject unwanted and unnecessary variability into the experiments. As I understand it, your intent is to give the ARM developers maximum flexibility to implement tailored terrain representations in the limited time available to them prior to the Phase 1 experiments. This is a worthy goal, but I think you have confused functional representation with terrain content. My fundamental point is that you want to give the teams the opportunity to design and implement tailored representations of a common synthetic environment that maintain inherent geometry and attribution. You should not give the teams the license to generate a unique terrain data base from some common specification. ARM teams can choose to use an existing format or ingest the source data exported in one of the other formats to feed a compilation process that they implement to provide a novel ARM representation.

A: I think we miscommunicated. The "terrain db" I have in my slides is meant to be the Adversarial Reasoning Module/Deception Reasoning Module-specific representation. Perhaps the terrain DB should be called "terrain reasoning representation" or such. The terrain DB is *not* the "true" terrain data you are referring to but rather an application-specific abstraction of the "true" terrain . The "true" terrain data that you discuss are obviously required and I lumped it into "Combat Simulation System".

as of 11 Mar 2004

Q: Is the System Integrator and the Experimenter and Evaluator the same role or different?

A: These are two very distinct task areas.

Q: Does the System Integrator need technical capabilities in the two technology development areas?

A: Yes, the System Integrator is expected to have technical competence beyond mere systems integration. E.g., the System Integrator must be competent in customizing the combat simulation system, knowledgeable enough about the domain to manage the notional and realistic data sets, and technically qualified to work closely with developers of adversarial and deception reasoning and to modify their technologies for classified experiments.

Q: The program schedule looks very aggressive, e.g. An adversarial reasoning developer must have a working system approximately by month 8. Does it mean we have to have a working software even before the program starts?

A: Proposer's extant intellectual property could be a significant factor in the evaluation of the proposal's technical depth and feasibility.

Q: If a team involves both university and commercial entities, is there a requirement or preference for which kind of entity is proposed as the prime contractor for proposals directed at ARM or DRM?

A: There is no preference. However, if a team wishes to have access to any classified information, it is the prime that must be able to meet security requirements.

Q: Is there any available guidance on the size of acceptable proposals in dollar amounts or FTEs? Is there any anticipated funding profile for the four areas under the RAID program? Any projected or estimated funding information would be beneficial .

A: No guidance is available, except that we don't envision that the funding will be unusually small or unusually large as DARPA programs go. Proposers are encouraged to use their past experience data or other defensible methods to calculate their cost estimates.

Q: Since the project requires (initially) annual evaluations of the technology to be developed, we are wondering what you envision about the distribution of basic research vs. more application-oriented research vs. development. Ask differently, how large a team of researchers do you envision for the various subtasks and, most importantly, how many people of the team should be devoted to basic research (i.e. developing new methods) vs. more application-oriented research (i.e. adapting existing methods to your task) vs. development (i.e. building a prototype)?

A: Answer: Rather than specifying team size or dollar amount or distribution of efforts, the BAA focuses on defining a set of experiments and experimental objectives. Proposers are encouraged to identify specific tasks and levels of

efforts (which could differ dramatically between proposers depending on technical approaches and extant intellectual property) required to meet these experimental objectives. Note, for example, the demanding requirements at the end of the first year and consider what would it take your team to meet them.

as of 5 Mar 2004

Q: What does “real-time” mean?

A: “Real-time” was used to emphasize that this capability would be used during actual execution of a military operation and not just during deliberate planning. Not to be confused with the usage in Computer Science.

Q: How will the COP (common operating picture) be populated?

A: In the experiments, the COP will be populated from the data available within the Combat Simulation System. It will be comparable to the information available to the players in systems like OTB or JSAF. Experiments may include adding latency or ”fog” to this picture, to simulate more realistic availability of data in future intel and C2 systems.

Q: Are sensors and fusion part of the research agenda?

A: No, future sensor and fusion capabilities and their products will be simulated.

Q: Are Adversarial Reasoning and Deception Reasoning seen as part of a fusion architecture?

A: These technologies can be attributed to Level-3 fusion, although this program is not making a conscious effort to formally align itself with fusion Level 1-5 definitions.

Q: Do the performance metrics have a basis in documented operational requirements?

A: No, although the metrics were established in consultations with SMEs.

Q: How important is a distributed architecture?

A: Not seen as an initial requirement, but this may evolve as the program progresses.

Q: How important is knowledge engineering?

A: It certainly could be an important part of a particular approach of a proposer, but does not have to be. If a proposer intends to use an approach that relies on

extensive knowledge engineering, then they will be expected to provide their own SMEs and not rely solely on the consultants provided by the Experimenter.

Q: How important is operator interactions, mixed initiatives, and user interfaces?

A: This is not a research focus of this program, but effective user interfaces will be required.

Q: What is the projected contract start date?

A: Optimistically, August.

Q: Will someone provide data and scenario to technology developers?

A: Yes, the System Integrator will provide the information to the technology developers that has been developed by the Experimenter.

Q: Will the Combat Simulation System be available to the tech developers?

A: Yes, the System Integrator is responsible to make sure that tech developers have the simulation system (unclassified) available for in-house integration and tests.

Q: Will the simulation system be ITAR-controlled?

A: Very likely, yes. However, if a tech developer does not have the ability to handle ITAR-controlled materials in-house, the System Integrator will make the simulation system available for remote testing, to be accessed by ITAR-admissible persons.

Q: Does a tech developer need to hire a SME (subject matter expert)?

A: No. The Experimenter is responsible for providing access to SME consultants for tech developers (within reason).

Q: The PIP says "Teaming is encouraged." Does it mean we have to team?

A: Absolutely not. Only if it makes good sense. There are no extra points given for teaming.

Q: Can we team or partner with a DoD lab?

A: Yes

Q: What is the expected timeframe for research in the two technical areas?

A: Both will run for the full 3 years. However, the evaluation of the Deception Reasoning research will be less demanding in the first year.

Q: Is there a requirement for rigorous theoretic proofs of the basic technology and algorithms?

A: No. The experiments will be the proof.

as of 3 Mar 04

Q: Does the paragraph F.5 SECURITY imply that all performers under RAID must have SECRET-level capabilities?

A: No. Only the performers in the Experimentation and Evaluation and System Integration areas must have SECRET-level capabilities. Performers in the Adversarial Reasoning and Deception Reasoning areas do not have to have capabilities to work with classified information.

Q: The PIP implies that technology developers will work on unclassified aspects of the program, while the System Integrator and Experimenter will work on classified aspects of it. What are those and how do they differ?

A: Detailed classification guidance is yet to be worked out. However, at this time it is anticipated that the System Integrator and the Experimenter will build and work with a significantly more realistic and detailed version of the domain-specific elements of the program than the Technology Developers. These domain-specific elements, including domain-specific data, knowledge, models, and experiments, will be realistic in the case of the System Integrator and the Experimenter, and notional in the case of the Technology Developers.

Q: How do you envision technology developers (unclassified work) to interact with integrator and experimenter (classified work)?

A: Detailed classification guidance is yet to be worked out. However, at this time it is anticipated that it will be the responsibility of the System Integrator to establish and manage the "firewall" between the classified and unclassified efforts of the program. Technology Developers will develop their core technologies using open source and notional elements of domain-specific nature: data, knowledge, models, tactics, and simplified experiments. The System Integrator will modify these elements significantly to reflect realistic knowledge of the domain and results of realistic (potentially classified) experiments. The Technology Developers are to propose technical and programmatic approaches that would enable the System Integrator to perform such modifications effectively.

Q: Will the entire duration of the program involve classified elements?

A: Detailed classification guidance is yet to be worked out. However, at this time it is anticipated that the first phase of the program may not involve any classified elements for any of the performers.

Q: Our organization wishes to propose against a technology development area, and we do have the capabilities to work with classified information. Would it be a positive factor in evaluating our proposal?

A: Yes, it could potentially significantly simplify the interface between such a Technology Developer and the System Integrator, strengthen the security plan and improve the overall efficiency of the program. Still, remember that technical depth and feasibility is the most important criteria, and a proposer without classified capabilities can win on technical strengths.