SeeMe Industry Day
Questions & Answers
27 March 2012

Q1. Will SeeMe BAA proposals be for Phase 1 only, or will Phase 2 & 3 be included?

The SeeMe proposals will request Phase 1 only at this time. Phase 2 proposal guidance will be provided to performers at or near the end of Phase 1. The intent is that only integrated system teams will proceed into Phase 2, and aperture technologies will be incorporated into system designs to go forward. In addition, one of the outputs for Phase 1 will be a business case analysis, showing that the planned system can accommodate non-continuous production while staying within cost constraints.

Q2. Must Phase 1 proposal costing be fully FAR-compliant, or can other constructs (like OTAs) be used?

Phase 1 proposal costing has to be fully FAR-compliant; alternatively DARPA can manage OTAs and different methodologies for contracting. Additional information will be found in the SeeMe BAA.

Q3. What is the budget for the BAA?

$45M

Q4. Do potential providers of non-traditional apertures or membranes need to team with a system provider, or can they propose separately?

The intent of the BAA in Phase 1 is that spacecraft system and technology areas will be run in parallel, to allow non-traditional technology providers the opportunity to participate. For Phase 2, the intent is that the non-traditional apertures and bus must come together for an integrated system design. The Government's expectation is that teaming arrangements will be set prior to or at the P1 -> P2 interface.

Q5. Beyond raw imagery, is there other tactical information that the system could provide that would be of interest to the end user (i.e., soldier on the ground)? For instance, image analytics for tactical situational awareness, e.g. automatically detected and highlighted humans, vehicles, escape routes in the scene, etc.

Yes, multiple types of additional information could be of use to the end user; however, from the SeeMe perspective, the objective of the program to keep it simple by focusing on visible imagery and tying the images into data fusion systems on the ground that are already being developed at DARPA and other various military establishments. The future intent is to overlay imagery onto georectified information for a value-added product. SeeMe program is working with existing DARPA and other gov't agency programs on this.

Q6. What is the complete URL for the FAS website that shows NIIRS vs. GSD?

http://www.fas.org/irp/imint/niirs.htm

Q7. $500K per spacecraft is in what year dollars?

Initial indication is in the Phase 3 year dollars.

Q8. Can we get to NIIRS 5.5 at a different altitude than 300km?

Yes. The only fixed value is cost. Performance goals (NIIRS 5.5), persistence, lifetime, and altitude are tradable.

Q9. Are you expecting bids to be separate between the two areas of interest, or is the first category just the bus or the whole satellite?

Tech area 1 is for the system (bus plus payload). Tech Area 2 is for non traditional apertures and techniques. They must be bid separately.

Q10. Do you require +/- 5km imagery to the ground, ~20,000 x 20,000 pixels?

This is a goal, not a requirement. This will be traded between area, resolution, bandwidth, and will depend on user needs, anecdotally within single-digit kilometers. The objective is to provide tactical effectiveness at a low cost. The onus is on the proposer to make this trade.

Q11. Will you consider using Other Transaction Authority (OTA) rather than following FAR procurement requirements if there is considerable cost-sharing?

Yes, DARPA does use OTAs.

Q12. How can we minimize the procurement requirements to focus instead on creating the technology? Also, why is the FAR requirement waived at the $700K level?

The requirement for cost and pricing data threshold is at a contract value of $700,000. Beyond that threshold cost and pricing as described in FAR Subpart 15.4 is required, if using a traditional procurement.

Q13. The assumption is that the RF membrane/imager is a big part of the $500K per spacecraft production cost. How do two separate technical areas with likely different vendors during Phase 1 derive/reconcile that cost goal?

Idea is that the system level providers and aperture providers will talk and work together during Phase 1 to come to an integrated cost-effective solution, as appropriate and agreed to. Plan is to have PI meetings that combine both. Appropriate associate contractor agreements (ACAs) and non-disclosure agreements (NDAs) will be established. The goal is to have the best potential approach to be downselected and pursued into Phase 2.

Q14. Will advanced radio technology to meet SeeMe goals fall under Tech Area 1 or Tech Area 2?

Inclination is that it would be TA1, as part of the bus vs. the payload.

Q15. Where does imaging software reside, TA 1 or TA2?

Traditional software for imaging that works within a system should be in TA1. TA2 will be for non-traditional imaging software or techniques. If a provider has a unique imaging software that comports with their payload, it would most likely be part of TA1 solution.

Q16. In our proposal can we claim to be using ALASA for the launch portion, or do the proposals have to come up with other launch options?

ALASA is primary. It's acceptable for you to look at other launch vehicles for flexibility in system solutions.

Q17. What should we assume is the ALASA launch envelope?

Roughly 20-30" in diameter and 20-32" in length +/- 25%. Better dimensions will be provided at Phase 1 kickoff.

Q18. On slide 8, please clarify "accept performance at cost"?

The intent is that performance is tradable to meet cost goals. The philosophy is that cost is first, and various system solutions will have sets of performance that corresponds to a costs. Proposals are not competed against each other. A proposers solution will be evaluated based on their ability to meet cost, and maximize the flexibility of performance variables that can be accommodated or addressed.

Q19. Is the NIIRS 5.5 requirement independent of altitude? Does NIIRS 5.5 at 300km indicate that lower altitude orbits require higher NIIRS and higher orbits lower NIIRS?

The baseline NIIRs at a specific altitude is meant as a goal. Lower altitude with same optics may yield higher NIIRS, likewise higher altitude with same optics may yield lower NIIRS. All performance variables are part of integrated tradespace, since altitude will trade performance against lifetime. We are looking for flexible and robust system solutions. Provide interesting solutions that sit within the tradespace. (See Q8)

Q20. Does the 20% mortality rate take into account launch? If so, how do I take into account launch failures (i.e., failure rate probabilities) for ALASA and other launch methodologies? Something to consider: a new launch vehicle, e.g., ALASA has a very high failure probability rate and this increases risk.

We are asking for the "last 24" of the ALASA demo's 36 launches to get better reliability. A minimum set of service provided (ie time of request to delivery at a NIIRS value) will be required over a period of time for the system, without requiring additional launches. BAA will

detail what that is, which is then the performers task to translate that into their particular system solution.

Q21. Does SeeMe anticipate domestic applications, i.e. imaging within CONUS?

Not at this time. SeeMe is currently intended to support OCONUS warfighters.

Q22. Please clarify the BAA schedule.

The intent is to have the BAA released in April/very early May 2012, proposals due after Memorial Day 2012, and kickoff in September 2012.

Q23. Slide 7 showed that a $2M satellite that lasts 365 days allows total cumulative costs to be approximately half of lower bound of airborne alternatives. Given that, why will satellite costs >$500k be considered non-compliant. In addition, chart doesn't include important element, time of delivery to user on ground.

The goal of SeeMe is to truly create an "expeditionary space" capability. These includes elements that form a space solution can be built, deployed and launched on the same timeline and tempo as any other logistics and support material to warfighters around the world. The intent is to create a production architecture that allows various modalities and coverage percentages to the widest area of the earth, at the lowest possible cost. Traditional satellite architectures have always maximized life as a means to mitigate the relatively high cost of both non-recurring engineering and cost of launch. SeeMe intends to completely change that approach, by minimizing cost and trading life, both in terms of components that drive cost for life, and altitude, which lowers life but potentially increases performance in resolution. Slide 7 graph is predicated on a specific time of request to delivery (TTD) to a user on the ground. 24 is a reference number for the constellation size at a particular altitude. That number differs as you increase altitude and therefore go to higher inclination bands to keep that time of request to delivery at a particular number. It is not set in stone that 24 is the "right" number of satellites in the SeeMe constellation. It will depend on user's latitude to maintain the lowest delivery time at target value. A Constellation size also factors into to the mortality rate – losing one satellite has a larger coverage performance system impact if it has a longer life and is expected to be part of the . Beyond a year, costs start to rise again. In addition, costs are influenced by production rates.

Q24. Why specify resolution at an altitude, vs. just resolution?

Cost is driver with goals on various performance metrics. We have a goal of NIIRs 5.5, independent of altitude, but are realistic in terms of a system solution that can provide consistent resolution at a variety of altitudes, at lowest cost. (See Q8 and Q19)

Q25. Why does the spacecraft have to be so expensive? A phone costs $500 – why does the satellite need to cost 1000x that?

The satellite cost number came from a goal of no more than 90 minutes revisit around a +/- 10 degree latitude band centered at the equator, which translated to ~24 satellites. Coupled with ALASA as the launcher, the entire constellation including launch was to be less than $36M, where the satellite costs were $12M, defining a per unit cost of the satellite at $500k.

This reference satellite cost is the result of an effort to disaggregate system costs - $500k is by no means a minimum value. For a DARPA demonstration, we have to have a number to demonstrate the precepts of non-continous production, that translates to tactically effective and economically efficient space support.

Q26. Why wait so long for first demos in space? Just to link with ALASA? Can we go earlier?

Intent is to spend time developing innovative technologies, invest NRE up front to drive down RE later and get more effective final system. We have talked about doing payload demos on aircraft or UAVs earlier. Additionally, ALASA will launch multiple vehicles early for validation, possibility exists to piggyback on those launches for early SeeMe validation as well.

Q27. Based on the tech areas, it appears you are not looking for technology proposals for ground-based equipment (low TRL antennas or ground radios or personal devices). Do you expect SeeMe innovations to be space-based only and should we use existing ground-based infrastructure?

Yes, that's focus of SeeMe. Intent is to leverage other existing activities in ground hardware and data fusion (we plan to bring info / representatives to the kickoff meeting).

Q28. Is the $500k per satellite goal meant to be first unit cost, average cost over 24 units, unit #25 cost, amortized cost, or some other defined unit cost metric?

Intent for Phase 3 is 24 satellites within 90 days, $500k per unit at that level of production.

Q29. Do technical area 2 solutions have to be deployable to be funded?

No, we just showed examples of deployable systems, but proposals are certainly not restricted to that.

Q30. Is this a daytime only system, and/or are you considering the use of radar or nighttime imaging?

For this effort, focus is on visible EO imaging only. If this is successful, it is likely that future upgrades will include additional modalities.

Q31. For universities, will there be publication approval requirements?

Yes – funds for this effort are 6.3, which is not fundamental research, therefore all publications are subject to requirements. It may be possible to trade for 6.2 money if a good case is made for fundamental research.

Q32. Is the expectation to receive a single image or a stream of images (i.e., video) from the satellite?

Single image only. Notional scenario is to "press the SeeMe button, get an image".

Q33. What is the Phase 1 budget by tech area and how many anticipated awards (by tech area)?

In the BAA we will try to identify how many we would like to have. For Phase 2, want minimum of 2. For Phase 3, want minimum of 1.

Q34. It sounds like tech area 1 also includes a constellation design, conops, and business plan. Please clarify your expectations.

Yes, that's part of the system solution. TA 2 is enabling technology, not integrated solution.

Q35. 45 kg payload limit for ALASA – is that for a single spacecraft or constellation?

45kg per launch volume on ALASA. If the satellite is smaller and multiple can fit, that's great. Trying not to dictate or preclude any system solutions. Do not want to stifle innovations

Q36. "Teaming Arrangements: Is DARPA going to play "match-maker" for performers between Step 1 and Step 2? Do you encourage teaming and partnerships between proposals focused on different areas (e.g. S/C, optics/membranes, ops)?

DARPA will operate the Phase 1 program through PI meetings. Through that we encourage robust interaction on relevant technologies to both technical areas.

Q37. Does the processing of the image fit within the payload or bus tech area?

Image processing solutions may fit within both. TA 2 is looking for non-traditional techniques or image processing solutions that may not have been demonstrated previously. TA1 system solutions with payload included will be assumed to address image processing solutions as well.

Q38. Are there any standard models we should use when performing our analyses?

Recommend using latest version of MODTRAN, and 1976 US Standard Atmosphere table definitions.

Q39. How current does the image have to be, e.g., stored image available from satellite ahead in orbit (<15 minutes)?

That is up to the system performer and their solution. Time of request to delivery is the metric.

Q40. If the real-time view is obscured, should the system seek out a recent image and provide it?

That is up to the system performer and their solution.

Q41: What is the ground user interface?

Performer should consider both current ground devices that individuals use, as well as expectation of a commercial handheld (ie Android) device. These are devices at the individual level which would stress and drive the link budgets on the satellite. It is expected that during the course of development and initial demonstration additional devices on the ground (ie on top of a Humvee, at a CAOC/FOB, etc) will also be used to test and demonstrate the system.

Q42: The proposer's day briefing implies that DARPA in interested in non-traditional aperture technologies that increase the aperture over existing systems for Phase II. Is DARPA equally interested in non-traditional aperture technologies that would increase the military utility of the SeeMe system but do not increase the aperture's size?

Yes.

Q43: Is direct-solar-illumination scatter information available for the photon sieve membrane technology to support assessment of 1) the need for a sun shade, and 2) solar exclusion angle pointing constraints ?

Not at this time.

Q44: Is it consistent with the governments vision to offer a system concept (Space, Ground, ALASA Launch) compatible with, or better than, the SeeMe system price and performance goals, but utilizing fewer than 24 satellites that cost more than $500K each?

The 24 satellite/$500k unit price are representative based on a production based system solution including ALASA, delivered in 90 days from ATP, that supports a zero degree latitude band with time of request to delivery at less than 90 minutes. Alternative system solutions are encouraged. (See Q25)

Q45: Would it be correct to characterize the MOIRE and M-GRIN activities as representative of advanced technologies that contractors may choose to leverage in their system offerings, but are not required to be utilized to meet the objectives of SeeMe?

Yes.

Q46: It appears that the referenced NIIRS definition evaluates performance based on Ground Resolution Distance (GRD), but not such items as Image Signal-to-Noise Ratio (SNR), is this the Government's intent? If not, would the government provide a reference Image Quality Equation (IQE) to facilitate direct comparison (apples-to-apples) of offerors' performance.

Proposals are not compared against each other. The BAA will discuss the relationship between GRD and GSD and its reference to NIIRs as a means of measurement. Offerors will be encouraged to provide appropriate detailed insight into their solution relative to a definition of NIIRS that is consistent with the goals of SeeMe.

Q47: Will the government provide additional details on its "notional" 24 satellite architecture (i.e. aperture size, altitude, average orbit inclination, atmospheric drag assumptions, etc.)?

All system architecture variables are essentially tradable within the tradespace of potential SeeMe system solutions. (See Q8 and Q19)

Q48: Is the timeliness goal linked to the quality goal (i.e. is the goal to provide a NIIRS 5.5 image within 90 minutes of a request)?

In so far as they can be linked based on a system solution, yes. Again the tradespace is rich, the BAA will identify notional parameters for the tradespace and encourage performers to identify how their solution fits into that tradespace, and what the dependencies are between any of the variables.

Q49: Will the government provide additional detail on the intent of "responding to ~10 simultaneous user requests" goal? Are the users within a single region or are they global? Is "responding" equivalent to providing a NIIRS 5.5 image within 90 minutes?

Response implies delivery of a NIIRS 5.5 image within 90 minutes of request. The number of users identified is a goal, the total number of users at a time and over an area will be dependent upon the system solution that is presented. "Bandwidth", ie number of users per orbit, is an example of a system solution output that is completely dependent upon the overall architecture that incorporates a number of variables, as example storage onboard, data rate of the telemetry system, communications ability to other satellites, etc.

Q50: Is it correct to assume that mobile users have access to a local ground data network? If so, please describe (i.e. format, data rate, etc.)

There is no assumption that an existing ground network infrastructure exists that can be leveraged for data delivery to an individual. Goal is to examine a proposers system solution architecture to support a single individual device for technical capability request and delivery of an image. Ground data infrastructure and dissemination solutions are being pursued and explored by DARPA that would augment this capability, both through the demonstration and operationally. Additional details will be available at the kickoff meeting. (See Q27, Q41)

Q51: Is it correct to assume that the Phase 3 satellite build may allow purchase of long lead parts before the 90 day fabrication run?

One of the primary precepts is to explain and demonstrate no long lead part procurements or storage requirement to deliver a production run of satellites to support SeeMe. The performers will be encouraged to explore how to achieve that through non-traditional means or non-traditional aerospace supply chains, and where not possible to achieve, to identify exactly what pieces or parts are required and to what level of production they need to be in to support a production run, prior to the order being given.

Q52: Is it correct to assume that "Ground Task & Receive capable from existing in theater hand-helds" would also include HMMWV mounted / transportable equipment?

Yes. (See Q41 and Q50)

Q53: Is it correct to assume that the contractors concept must include Military / Commercial facility support equipment (as needed) for transportation, storage, launch integration, etc., for the satellites ?

The concepts should include identification of the facility support equipment that meets the SeeMe requirements for the system solution. This activity will be part of Phase 1 technical and business case analysis, and appropriate additional interface hardware requirements should be identified relative to commercial or military GSE.

Q54: Would the government consider adopting a common atmospheric drag model for Drag Force Density (N/m^2 versus altitude) such as Figure #2 from literature paper "A Critical Assessment of Satellite Drag and Atmospheric Density Modeling" by David Vallado (Center for Space Standards and Innovation) to support common mission life assessment between concepts?

See Q38