

## Terminology:

1. Analyte(s): one or more component(s) of the gaseous mixtures supplied to the PACT device as per the guidelines in the Broad Agency Announcement (BAA). It is a goal of the PACT Program to rapidly identify the exact chemical composition and relative concentrations of these components.
2. Analyte Libraries: databases of spectral information associated with specific analytes.
3. Broad Agency Announcement (BAA): the BAA for the PACT Program, is available at:  
[https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=aed0293ba4c0f94a6a200a33c636acc5&\\_cview=0&cck=1&au=&cck=](https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=aed0293ba4c0f94a6a200a33c636acc5&_cview=0&cck=1&au=&cck=)  
This document explains the technical requirements and metrics of the PACT Program as well as selection criteria, format requirements, deadlines, and other crucial information for successful proposals.
4. Devices: the instruments provided by the performers, which are capable of carrying out the required tests and identifying analytes at the rates specified in the BAA.
5. Independent Verification and Validation (IV&V): this denotes an independent team designated by the Government to perform all testing required for the PACT Program.

## Questions regarding Analytes:

Q1: When will the 100 components of the Phase 1 library be identified and published?

A1: The Government will release the Phase 1 libraries to performers after the award of Phase 1 contracts.

Q2: For the purposes of spectrometer design, is it possible to release an initial list of about 10 compounds from the Phase 1 library that reflect the range of molecular sizes and chemical composition involved in the project?

A2: The library will only be released to performers after the award of Phase 1 contracts. Proposals for the PACT program must reflect the ability to identify gaseous analytes of any type, not only specific sizes or chemical classes.

Q3: What are the anticipated analytes?

A3: The Government may select any substances that exists as a gas at room temperature. Proposers are advised not to assume that any or all of the gases will relate to specific categories (e.g., explosives, chemical warfare agents, etc.) and are instead encouraged to think as broadly as possible.

Q4: Will performers be required to develop their own standards?

A4: Performers should include in their technical and cost proposals the procurement of analytes, as well as any associated labor or equipment necessary to prepare calibrated mixtures for their own testing. Samples for official testing to establish performance against the program metrics will be prepared, calibrated, and furnished by the Government.

Q5: Will the analytes contain particulate matter or aerosols?

A5: No. Per the BAA, Section 1.1, PACT focuses only on gaseous mixtures.

Q6: In what form will the analytes be supplied to the PACT device?

A6: Analytes will be neat mixtures of gaseous components, possibly including a carrier gas or gases, in the quantities outlined in the BAA (Sections 1.1 and 1.2.) for various Phases. The pressure has yet to be determined and may be adjusted to fit the needs of each particular PACT device.

Q7: Will the analytes provided be consistent with HAST (Hyperadsorptive Atmospheric Sampling Technology) Program gas concentrations?

A7: Not necessarily. Per the PACT BAA, during Phase 1, the performer must identify *up to* 100 gases in a sample where each gas may be present in quantities ranging anywhere from 500 picomoles to 50 micromoles. Thus, the sample will be less than five millimoles (~0.11 L-atm at room temperature), as the fidelity metric requires that the analytes will be present in varying quantities.

Q8: In Phase 1 (Base), the government plans to provide 100 mixed gas samples for final testing. In what type of container and physical state will these samples be provided?

A8: The analytes will be delivered at a rate, pressure, and temperature that meet the needs of the performer's device.

Q9: Will Phase 1 mixtures include just pure gases or will the samples be provided "in air?" If "air," can you provide the composition of the gas being used?

A9: A carrier gas or gases may be present along with the analytes.

Q10: Should the system be capable of differentiating isotopes?

A10: Differentiating isotopes is not a requirement, but resolving isotopic distributions and anomalies might be useful in determining chemical composition of unknowns in Phase 3.

Q11: Page 8 of the BAA states that the Phase 2 testing will include 12,000 samples on HAST sorbents. Will the specialized analytical extraction technology be provided to remove the analytes?

A11: Yes. One of the requirements of the HAST program is the extraction of analytes from the adsorbent materials. Specifications for the technology required to interface with the gas stream provided by these devices will be provided at the end of Phase I to facilitate proposal preparation for Phase II.

Q12: Are we expected to include HAST sorbent material handling in PACT or can we assume that we will be provided with a sample vapor stream that results from the analytical extraction carried out in HAST?

A12: You may assume that you will be provided gaseous analytes which have already been extracted by the HAST device.

Q13: What is the physical form of the HAST material (powder, membrane, etc.)?

A13: The physical form of the HAST material has not been determined; it is the subject of an ongoing program.

Q14: The volume of the analytes for Phase 1 is unspecified. May we assume that we will be able to specify that the challenge compounds can be received/presented in a volume less than 10 microliters? Or has a different rough order of magnitude volume already been predetermined?

A14: Neither the pressure nor the volume of the analyte is specified in the BAA, though it would be reasonable to bound these in the proposal by treating them as ideal gases.

Q15: If the volume of the challenge sample in question is larger than 10 microliters, a preconcentrator (such as a solid adsorbent or cryotrap), in addition to the HAST program concentrator, will likely be necessary for both Phase 1 and Phase 2.

A15: Selection of a preconcentration strategy is entirely up to the proposer and is not constrained in any way by the current HAST concepts.

Q16: The BAA states “Materials that are not in the library will be aggregated into an ‘unknown’ category and tabulated as a single combined contribution to the composition for the purpose of computing fidelity and accuracy.” Can you clarify your approach for how a single combined contribution will be scored for accuracy if several unknown components are present at a range of concentrations that intermingle with concentrations of known analytes?

A16: The ‘unknown’ material will be aggregated into a single bin for the purposes of computing fidelity and accuracy; in other words the position of the ‘unknown’ composition in the ranking will be set by the total number of moles of all materials other than those in the library.

Q17: When assessing the fraction of sample that is not part of a library, several units of measure could be used, with different ones naturally arising from different methodologies. Is weight fraction acceptable? Mole fraction? Fraction defined by integrated UV, IR, or microwave absorption strength in a defined band?

A17: Fractions are defined in terms of the number of molecules or moles.

Q18: What fractional concentration accuracy (minimum concentration difference between analytes) is required for each analyte to meet this requirement?

A18: The mole-number resolution of the system has not been specified as a requirement other than that it must correctly rank the relative quantities of the analytes.

Q19: What is the toxicity level of the analytes we will be testing? For cost purposes, can we assume that the analytes in Phases 1 and 2 are no more dangerous than we would find in the typical hardware or auto supply store?

A19: The Government may select for testing any analyte which could reasonably be present in ambient air.

Q20: For Phase 3 (Option 2), is the goal to determine the chemical composition (i.e. the molecular formula), the specific chemical compound, or the full three-dimensional structure (i.e. isomer and/or conformer structure)? For compounds that are chiral, is enantiomeric composition required?

A20: The minimum requirement for determination of chemical composition is the number and type of elements in the molecule and the connectivity of the atoms. Additional insight into the molecular topology may be useful but is not a requirement.

#### Questions regarding Program Metrics:

Q21: The BAA refers to analyte libraries during Phases 1 and 2 but also mentions (in Part One, Overview Information) that the technology will be capable of identifying analytes without “reliance on preconceived libraries.” Is this a contradiction?

A21: No. Libraries that are formulated beforehand (i.e. preconceived) will be available to meet the throughput, cost, fidelity, and accuracy requirements of Phases 1 and 2. Liberation from preconceived libraries is an objective of Phase 3, where unknown materials are identified from first principals. It should be noted that the throughput, accuracy, and fidelity metrics are different for the Phase 3 objective than for those of the earlier phases.

Q22: If a system is capable of meeting the fidelity and accuracy metrics mentioned in Phases 1 and 2 without the use of analyte libraries, must the system use libraries?

Q22: No. Performers may use libraries if they wish, but performers are only held to the metrics outlined in Section 1.2 of the BAA.

Q23: Can I submit a proposal based on technology allowing standoff detection?

A23: None of the Program Metrics require identification at a distance. Proposers may choose to use technology allowing standoff detection so long as they meet all of the specified Program Metrics.

Q24: Does the cost metric include personnel?

A24: No.

Q25: What if we identify a compound as present in the sample, but it is not there (i.e., how do you measure fidelity with respect to false alarms like this)?

A25: Identification of compounds that are not present (i.e. a false positive) will not be counted against the fidelity score. These false positives would be removed in order to generate a correct rank order and compute accuracy as defined in Section 1.1 of the BAA. For example, if a method identified ten compounds, five of which were actually present the fidelity would be 100%, but the accuracy could be no more than 50%, presuming that the compounds actually present were correctly ranked in order of increasing concentration. The amended BAA also describes probability of detection (Pd) and probability of false alarm (Pfa) requirements at the lowest quantities (500 and 50 picomoles in Phases 1 and 2, respectively). See the amended BAA for details.

Q26: If we feel we can complete/meet the metrics for Phase 1 of PACT within a few months, is this acceptable to propose?

A26: Yes.

Q27: Is there a time constraint during the Phase 1 testing?

A27: In Phase 1, the goal is to identify the composition of 100 mixed gas samples comprised of up to 100 components from a library of 100 reference materials in 24 hours or less. See the BAA, Section 1.2, Table 1.

Q28: In Phase 1, are we limited to creating and/or using one machine?

A28: No, although all machines must be included in the amortized capital equipment cost, as specified in the BAA, Section 1.2, Table 1.

Q29: What are the size, weight, and power requirements for the system?

A29: The only requirement is that the total system volume must be less than 67 m<sup>3</sup> during Phase 2, as stated in the Program Metrics – Table 1.

Q30: Do helium tanks, power supplies, etc. need to fit into the <67 m<sup>3</sup> total system volume requirement during Phase 2?

A30: Consumable supplies for one day (three 8-hour shifts) of operation should be included in the volume budget, as should power supplies that are internal to the instrument(s). However, an external power source from an electrical grid or external generator that does not count in the volume budget may be presumed. See BAA, Section 1.2, Table 1.

Q31: Does the 1/100<sup>th</sup> scale prototype need to process samples at a cost of <\$0.10/sample and a throughput of 125 samples per hour?

A31: The system, at a minimum, must process 125 samples per hour during Phase 2, at a cost per sample of <\$0.10. See the BAA, Section 1.1.2.

Q32: The cost metric is stated to be inclusive of electrical costs and consumables; is it your intention that those costs be at present year, or computed with a certain inflation factor over time?

A32: Either is acceptable as long as the contributions to the cost model are clearly articulated.

Q33: Is Phase 3 (Option 2) of the PACT Program tied to Phase 2 (Option 1)? In other words, are technologies developed in Phase 3 dependant on technologies developed in Phase 2?

A33: The objective of Phase 3 is to provide technology that will allow identification of new materials for incorporation into an evolving library that allows the Phase 2 technology to meet emerging chemical mapping requirements. However, there need be no link between the methods used in Phases 2 and 3; different technologies may separately fulfill the Phase 2 and Phase 3 requirements.

Q34: The BAA states (pg. 8) that "Testing at the end of Phase 3 will include analytes that are unlikely to appear in existing libraries- identification will require first-principles analysis of the acquired data." Could you clarify what you mean by 'first-principles analysis'?

A34: Phase 3 performance will be measured against analytes which are unlikely to be present in existing spectral libraries. As such, success will require a device capable of extracting and interpreting all information necessary for identification without necessarily being able to rely on matching against finite lists or tables of spectral data.

Q33: How early can we propose to begin investigating Phase 3 of the PACT Program?

A33: All proposals must include a schedule which addresses all three phases of the PACT Program. The schedule is at the discretion of each proposer.

Q34: I believe that Phase 3 will require very expensive computing capabilities. How should we budget for that in our cost proposal?

A34: If you believe you require something to achieve the program metrics, you should include it in your technical and cost proposals. It is up to each Proposer to assess realistic costs and schedules for the work required to achieve the PACT metrics.

Q35: Is the system required to be transportable during any Phase?

A35: No, but the additional transition opportunities available to a transportable system could be seen as advantageous under selection criteria 5.1.3 (Potential Contribution and Relevance to the DARPA Mission) and/or 5.1.5 (Plans and Capability to Accomplish Technology Transition).

Q36: The PACT Program will produce a massive amount of data. Will PACT performers be responsible for analyzing that information for actionable use?

A36: No. Extraction of actionable information is not among the program metrics.

Q37: The cost metric of \$0.10 per sample is associated in most places in the BAA with the scaled-up objective system. Is this actually intended to represent the cost for using the as-built 1/100th scale development prototype, or still with regard to the total scale-up?

A37: The performance metric is a final 1/100th scale system that will process samples at a total cost of \$0.10 per sample at the end of Phase 2.

Q38: In the BAA (pg. 7, Section 1.1.3), it is stated that the Phase 3 system will identify unknown species in pure gas samples at a rate of five samples every two hours, which is equivalent to one sample every 24 minutes. Later (pg. 8, Section 1.2), the Phase 3 performance metric for analysis speed is described as the ability to identify the chemical composition of unknown species in gas samples at the rate of 100 samples in 50 hours, which is equivalent to one sample every 30 minutes. Please clarify the speed metric for testing that will be performed on the Phase 3 system.

A38: The correct rate is one sample every thirty minutes, performed over one hundred total samples. An amendment to the BAA will reflect the correct rate. This inconsistency has been corrected in the amended BAA.

Q39: The BAA (page 8, Section 1.2), does not specify how many mixtures will be tested at the end of Phase 3. This impacts the 90% accuracy and fidelity metrics. If only a single analysis of a mixture is conducted, the system would have to achieve 100% accuracy and fidelity (five out of five analytes correctly identified and quantified). However, if the testing requirement is to measure a larger number of mixtures, then the accuracy and fidelity metrics can be applied more rigorously. Can you please clarify?

A39: The number and composition of the mixtures will be selected to provide statistically significant determination of performance against the program metrics.

Questions regarding IV&V:

Q40: The BAA specifies that the integrated prototype will be subjected to independent testing. Who will be the IV&V entity?

A40: The Government has not yet identified the IV&V team.

Q41: The BAA does not specify the location of the IV&V testing. Will this be at a Government location or at the performer location?

A41: The location of the IV&V testing will be determined after Phase 1 is underway. It is possible that the testing will be held at either the Government's location or the performer's location. Realistic cost proposals will contain provisions for either contingency. In order to facilitate preparation of cost proposals testing at the Government's location may presume Washington, DC as the test site.

Q42: Will the performer operate their system during IV&V testing or will the Government operate the system?

A42: The Government will negotiate testing protocols with the IV&V entity at a later date. For planning purposes, the performer will operate their equipment with Government witnesses.

Q43: Should we plan to team with a HAST performer when developing our proposals for PACT?

A43: Teaming with a HAST performer is not a requirement. We do not know which HAST performer(s) will meet HAST Program metrics. Each PACT proposal should stand on its own merit and not rely on the HAST Program outcome.

Q44: We are not interested in being a performer for PACT but would like to be considered for IV&V. How do we go about proposing to do that?

A44: DARPA is not soliciting for IV&V services and will not consider proposals for IV&V that are submitted under the BAA as responsive.

Contractual Questions:

Q45: What is the time frame for the contract award?

A45: The estimated timeframe for contract award is 2nd quarter FY09.

Q46: Is there a problem with a proposal that includes cost sharing?

A46: From the BAA, Section 3.2: Cost sharing is not required; however, cost sharing will be carefully considered where there is applicable statutory condition relating to the selected funding instrument (e.g., for any Other Transactions under the authority of 10 U.S.C. 2371). Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

Q47: Can I propose in conjunction with a Federally Funded Research and Development Center (FFRDC)?

A47: Per DFAR 235.017-1, an FFRDC may respond to solicitations and announcements for programs which promote research, development, demonstration, or transfer of technology, either as part of a team or independently. Also, per the BAA, Section 3.1, the FFRDC in question must 1) clearly demonstrate that the work is not otherwise available from the private sector, and 2) provide written documentation citing the specific statutory authority (as well as, where appropriate, contractual authority) establishing their eligibility to propose to government solicitations. The full text of the relevant section of DFAR is available from [http://www.acq.osd.mil/dpap/dars/dfars/html/current/235\\_0.htm](http://www.acq.osd.mil/dpap/dars/dfars/html/current/235_0.htm)

Q48: How many proposals does DARPA plan to award?

A48: Per the BAA, Section 2: "Multiple awards are possible. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds. The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation, and to make awards without discussions with proposers."

Q49: I have an idea involving (technology). Should I propose to the PACT program?

A49: DARPA can neither encourage nor discourage specific proposers from deciding to submit a proposal to the PACT program. The BAA outlines the program goals and requirements, and it is up to each individual proposer to determine if and how they will reach those requirements.

Q50: Page 17 of the BAA outlines constraints on indirect costs for work funded in the category 6.1, Basic Research. Will the PACT program use 6.1 funding?

A50: DARPA expects the maturity of the proposals to be beyond the Basic Research (6.1) level and therefore does not anticipate using 6.1 funds for PACT. However, this language, including the indirect cost limitation, was retained in the solicitation to accommodate less mature proposals and encourage broad participation in the program.

Q51: Are we allowed to submit a cost plus fixed fee proposal for this effort?

A51: Per the BAA, Section 4.3.1.2, this is one of the acceptable award instruments.

Q52: The Government has indicated that proposals should provide a description of any actual or potential organizational conflict of interest, as well as measures we would

take to neutralize or mitigate such a conflict. Because an explanation of an approach to mitigate OCI can be rather lengthy, is it acceptable to provide this description in a Cost Proposal, which allows unlimited pages, rather than in a Technical/Management Proposal, which is page-limited?

A52: Per the BAA, Section 3.1.1., "If a prospective Proposer believes that any conflict of interest exists or may exist (whether organizational or otherwise), the Proposer should promptly raise the issue with DARPA by sending Proposer's contact information and a summary of the potential conflict by email to the mailbox address for this BAA at DARPA-BAA-08-62@darpa.mil, before time and effort are expended in preparing a proposal and mitigation plan."

Q53: On page 17 of the BAA (Detailed Cost breakdown), Indirect Costs include Fringe. Is that correct? We have always bid Fringe as a direct cost under our government-approved pricing principles.

A53: The Detailed Cost breakdown in the BAA is the norm. Proposers should propose in accordance with their cost accounting standards.

Q54: Also on page 17 of the BAA, Cost of Money and Material Handling Burden are listed as indirect costs. Is that correct?

A54: The Detailed Cost breakdown in the BAA is the norm. Proposers should propose in accordance with their cost accounting standards.

Q55: On BAA page 17 (Section 4.3.1.2, Item (3) under "Detailed Cost Breakdown"), the Government has indicated that offerors can provide subcontractor proposals in sealed envelopes. However, because the proposals are to be provided electronically, does this mean that we should have subcontractors send their proposals directly to the Government electronically also? If this is the case, is there any particular way you want the subcontractors to identify which prime offeror's proposals their materials go with?

A55: Please see the last paragraph of 4.3.1.2, which states that all proprietary subcontractor proposal documentation, prepared at the same level of detail as that required of the prime, of which cannot be uploaded to T-FIMS, shall be made immediately available to the Government, upon request, under separate cover (i.e., mail, electronic / email, etc.), either by the Proposer or by the subcontractor organization.