AtmOS Shortwave Spectrometer Instrument

Identification Number: RFI-GSFC-AtmOS-SWSpec
Agency: National Aeronautics and Space Administration
Office: Goddard Space Flight Center
Location: Office of Procurement

Notice Type:
Sources Sought

Posted Date:
06/28/2021

Response Date:
07/26/2021

SYNOPSIS

NASA Goddard Space Flight Center is hereby soliciting information from potential sources for flight Shortwave Spectrometer Instruments for potential future AtmOS acquisition.

The National Aeronautics and Space Administration (NASA) GSFC is seeking capability statements from all interested parties, including all socioeconomic categories of Small Businesses and Historically Black Colleges and Universities (HBCU)/Minority Institutions (MI), for the purposes of determining the appropriate level of competition and/or small business subcontracting goals for flight Shortwave Spectrometers for potential future AtmOS acquisition. The Government reserves the right to consider a Small, 8(a), Women-owned (WOSB), Service Disabled Veteran (SD-VOSB), Economically Disadvantaged Women-owned Small Business (EDWOSB) or HUBZone business set-aside based on responses received.

No solicitation exists; therefore, do not request a copy of the solicitation. If a solicitation is released, it will be synopsized on SAM.gov. Interested firms are responsible for monitoring this website for the release of any solicitation or synopsis.

Interested firms having the required capabilities necessary to meet the requirements described herein should submit a capability statement of no more than 25 pages indicating the ability to perform all aspects of the effort.

Please advise if the requirement is considered to be a commercial or commercial-type product. A commercial item is defined in FAR 2.101.

This synopsis is for information and planning purposes only and is not to be construed as a commitment by the Government nor will the Government pay for information solicited. Respondents will not be notified of the results of the evaluation.

AtmOS BACKGROUND

The Atmosphere Observing System (AtmOS) was established by the NASA Science Mission Directorate Earth Science Division to fulfill the science needs proffered in the 2017 Earth Science Decadal Survey for the combined Designated Observables: Aerosols and Clouds, Convection and Precipitation (ACCP). The AtmOS Constellation Architecture is the result of a 2.5-year ACCP Architecture Study. The ACCP Architecture Study concluded in February 2021 and the mission was authorized to move into Pre-Phase A on May 23, 2021. The respondent may find information on the study results including the Science and Applications Traceability Matrix at the ACCP Architecture Study website: *https://vac.gsfc.nasa.gov*.

The AtmOS Constellation will make measurements of the aerosol and cloud microphysical properties as well as the measurements of the vertical velocity of convection, aerosol redistribution and precipitation to understand the processes that drive the Earth's atmosphere. By employing a multi-satellite architecture, AtmOS will be able to cover the relevant temporal and spatial scales, thereby transforming our understanding of this critical part of the Earth System. As part of pre-formulation and formulation activities, the AtmOS team is performing trade studies to determine options to make measurements and achieve samplings that meet as many of the AtmOS science objectives as possible within cost and schedule constraints. Through this RFI, the AtmOS team seeks information on Shortwave Spectrometer approaches to further refine the payload assignments, spacecraft needs, and mission concept of operations necessary to meet the science objectives.

The selected AtmOS architecture is illustrated in Figure 1**Error! Reference source not found.**. This architecture encompasses flight assets in two orbit planes: (1) Polar: Sun-Synchronous Orbit, 450 km, and 1330 Ascending Node and (2) Inclined: Nominally 50 to 65 Degree Inclination, 407 km. Within the AtmOS Constellation, Inclined Plane assets will be launched first to achieve the earliest possible science with instruments that will make advancements in understanding aerosol and cloud properties and target the **dynamics** of cloud processes and precipitation on sub-daily to sub-minute time scales. The polar plane will follow a year or two later with more advanced measurements targeting the seasonal, global scale microphysical properties of clouds and aerosols and their linkage to atmospheric radiation and longer-term climate **change**. The constellation targets understanding the dynamics of the Earth's Atmosphere and the processes that drive change over time.

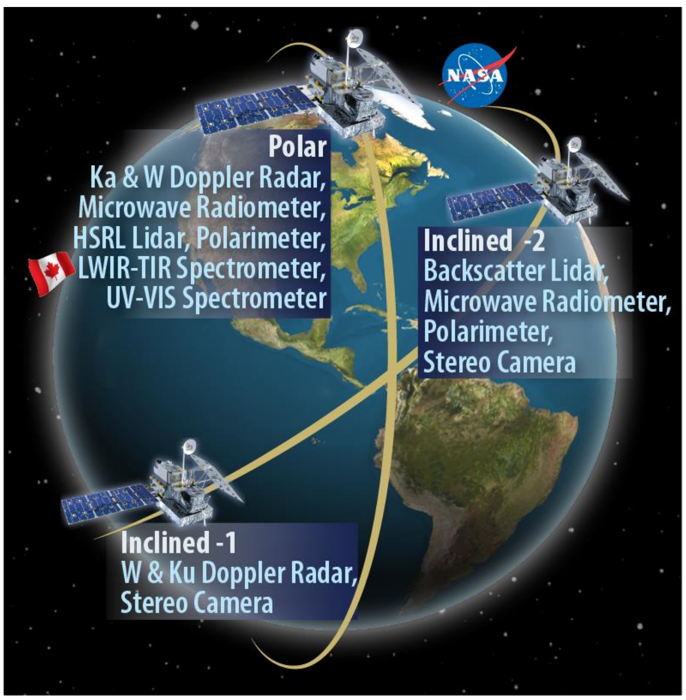

Figure 1 Preferred AtmOS Architecture Concept

While the concept illustrated in Figure 1**Error! Reference source not found.** accurately reflects the AtmOS intent, the number of spacecraft in the two orbit planes and the specific instrumentation assignment on the spacecraft remains under study during the pre-Phase A period.

The anticipated instrumentation suite for the AtmOS Constellation as assigned to the Inclined Orbit and the Polar Orbit is shown in Table 1. Note that some passive instrumentation/sensors (i.e., Polarimeter, Microwave Radiometer) are found in both orbit planes but their performance and spacecraft allocation needs may differ depending upon the assigned orbit plane. The Shortwave Spectrometer is intended for the Polar Orbit Plane.

Table 1. Anticipated AtmOS Science Instrumentation.

Polar Orbit Plane Instrumentation	Inclined Orbit Plane Instrumentation	Acquisition Comment for Passive Instruments
---	W/Ku Band Doppler Radar	Subject of a separate AtmOS RFI
W/Ka Band Doppler Radar	---	Subject of a separate AtmOS RFI
---	Backscatter Lidar	Subject of a separate AtmOS RFI
High Spectral Resolution Lidar	---	Subject of a separate AtmOS RFI
LWIR-TIR Spectrometer	---	Proposed CSA Contribution
Microwave Radiometer	Microwave Radiometer	Subject of a separate AtmOS RFI
Polarimeter	Polarimeter	Subject of a separate AtmOS RFI
UV-VIS-NIR-SWIR (Shortwave) Spectrometer	---	**Subject of this AtmOS RFI**
---	Stereo Camera (Tandem Stereographic Cameras)	Subject of a separate AtmOS RFI

SHORTWAVE SPECTROMETER

Introduction

The AtmOS hyperspectral shortwave (SW) spectrometer (SWSpec), covering the near UV, visible (VIS), near infrared (NIR) and shortwave infrared (SWIR) spectral regions, will enable new capabilities, in particular pixel-level SW radiative flux closure studies to better understand radiative processes and cloud radiative effects [Stephens et al., 2021]. The spectrometer will also allow for enhanced scene identification (e.g., aerosol dust discrimination [Green et al., 2020], cloud detection and phase [Thompson et al., 2016; Coddington et al., 2017]) as well as improved retrievals of aerosol (Hou et al, 2017) and cloud Geophysical Variables (GVs) [Coddington et al., 2012]. In addition to stand-alone uses, SWSpec parameters provide unique information content that is expected to bring strong mission synergy with other expected AtmOS polar orbiter imaging assets, e.g., a multispectral/multi-angle polarimeter (subject of a separate RFI), an anticipated proposed contributed longwave spectrometer [Libois and Blanchet, 2017], and an imaging microwave radiometer (subject of a separate RFI), as well as AtmOS active sensors. A summary of the information available from hyperspectral shortwave observations and the contribution to AtmOS science objectives is presented in Stephens et al. [2021].

The legacy for hyperspectral atmospheric multispectral GV retrievals includes multispectral satellite imagers that have a long history of providing observations applicable to a wide variety of Earth science studies. MODIS, the NASA Earth Observing System (EOS) imager, has provided about two decades of data records from two platforms. More relevant to AtmOS, the MODIS and follow-on operational VIIRS imagers have provided global aerosol and cloud products that have found wide use in the radiation and atmospheric communities [e.g., Hsu et al., 2019; Sawyer et al, 2020; Platnick et al., 2021].

Measurement Parameters and Performance Targets

Table 2 provides a set of targeted expected spectrometer performance values that will address shortwave flux and GVs to be retrieved with sufficient accuracy to meet the capabilities provided in the Science and Applications Traceability Matrix (SATM) from the ACCP study. The *Expected* target performance describes capabilities that will enable core mission science objectives; the *Desired* target performance describes capabilities that will enhance mission science objectives. Table 1 is intended to solicit responses that address SATM objectives without prescribing design solutions. An orbit altitude of 450 km is assumed.

Table 2. Measurement Parameters and target performance values, separated into four separate parameter categories: spectral, optical, radiometric, and signal/noise/dynamic range. The rationale for

some parameter targets are included. An orbit altitude of 450 km is assumed. Definitions of Expected and Desired performance targets are given in the text.

Spectrometer Parameter	SWSpec Target - Expected	SWSpec Target – Desired (if different than Expected)
Spectral		
Spectral coverage (µm)	0.35–1.8 µm. Flux rationale: covers about 91% of TOA reflected SW energy. Retrieval rationale: provides some coverage for Program of Record algorithms including near-UV for aerosol absorption (OMI, OMPS) and VNIR/SWIR aerosol and cloud properties.	0.35–2.4 µm. Flux rationale: covers 94% of TOA reflected SW energy. Retrieval rationale: gives full SWIR coverage for Program of Record algorithms, provides unique cloud phase and microphysical information.
Number of channels	No requirement. Determined by spectral coverage and channel bandwidth/binning.	---
Channel bandwidth with binning for radiometry	10 nm. Flux rationale: sufficiently resolve spectral structure in water vapor absorption bands, enable radiative kernel methodology. GV retrieval rationale: sufficient for Program of Record GV algorithms and synergy.	5 nm. Flux rationale: better resolve spectral structures. GV retrieval rationale: better eliminate atmospheric absorption contamination from aerosol and cloud retrieval channels, allow for O2 A-band radiative aerosol and cloud top information.
Spectral sampling	Oversampling (i.e., sampling < channel bandpass) anticipated	---
Tunable spectral capability	No requirement. Potential flexibility with oversampling; desirable to align a channel to O2 A-band.	---

Spectrometer Parameter	SWSpec Target - Expected	SWSpec Target – Desired (if different than Expected)
Optical IFOV, FOR, etc.		
Across-track swath width (km)	100 km. Provides spectral scene context for active sensors and some overlap with other passive sensors.	≥ 300 km. Improved coverage for synergistic observations with other passive imagers.
Instantaneous across-track field of view (deg)	Determined by across-track swath and operating altitude	---
Accessible across-track field of regard	Same as across-track swath width	---
[a] Ground footprint per pixel at nadir	500 m. Captures aerosol and many cloud radiative spatial scales. Similar or better than MODIS SWIR channels and VIIRS M-bands.	≤ 300 m. Better captures cloud scales in heterogeneous (including surface) and broken cloud scenes. Similar to MODIS 250 m VNIR channels and VIIRS I-bands.

[a] Ground footprint per pixel at most oblique view angle/edge of FOV (i.e., worst case)	No added requirement. Specify if known.	---
Along-track spatial coverage	Continuous	---
Pixel co-registration across the spectrum	≤ 100 m (0.2 of ground IFOV)	---

[a] Respondent can define the spatial resolution metric as considered appropriate, e.g., encircled energy, PSF, MTF.

Spectrometer Parameter	**SWSpec Target - Expected**	**SWSpec Target – Desired (if different than Expected)**
Radiometric		
Radiometric calibration technique(s), e.g., on-board systems, vicarious	Methodology not a requirement driver but description of calibration strategy, mission support (e.g., maneuvers) and expected performance should be provided.	---
Absolute spectral radiometric uncertainty (%)	5%	≤ 3%
Channel-to-channel spectral radiometric uncertainty (%)	3%. Expected to be suitable for preserving spectral structure features for flux and cloud thermodynamic phase retrievals.	1%. Relevant to GV optical/microphysics property retrievals, e.g., comparing cloud spectral microphysical retrievals across the SWIR windows.
Radiometric stability (%)	< absolute spectral uncertainty requirement	< 1% over mission lifetime, based on GV experience with MODIS/VIIRS. Depending on radiometric accuracy methodology, acceptable to be corrected or improved in re-processing.
Polarization spectral sensitivity, knowledge	No target specified at this time. Describe likely sensitivity and knowledge.	---

Spectrometer Parameter	**SWSpec Target - Expected**	**SWSpec Target – Desired (if different than Expected)**
Signal, noise, dynamic range, etc.		
S/N, NEdL, NEdR, dynamic range, saturation	See Table 3. Derived from heritage MODIS/VIIRS requirements.	See Table 3. Derived from heritage MODIS/VIIRS requirements.
Precision	Quantization ≥ 12 bits. To exceed NEdR and dynamic range (see Table 3) with 1-2 bits of margin. Consistent with SW flux precision of <0.1%.	---

Table 3 gives dynamic range and noise performance targets for various spectrometer spectral regions. The noise equivalent delta reflectance (NEdR) is used as the primary driver for defining noise performance and is given as 0.001 and 0.0005 for the expected and desired targets, respectively. Because of the wide dynamic range needed to accommodate aerosol and cloud scenes, the traditional specification of the typical radiance (L_{typ}) or reflectance (R_{typ}) values are of limited practical use. However, for example purposes, the typical values were chosen to roughly correspond to the reflectance from an optically thin cirrus cloud over a dark ocean surface (R_{typ}=0.04 for all spectral channels for simplicity). With noise and typical values tied to reflectance units, SNR at L_{typ} is 40 and is roughly 1000 for R_{max}. See the table notes for more details.

Table 3. Spectral dynamic range and noise performance targets.

CW (nm)	Solar Spectral Irradiance* ($W/m^2/\mu m$)	Rmax[a] (μ_0=1)	Lmax[a] ($W/m^2/sr/\mu m$)	Ltyp[b] ($W/m^2/sr/\mu m$)	NEdL[c] Expected	NEdL[c] Desired
412	1624	1.10	569	20.7	0.517	0.258
490	1948	1.10	682	24.8	0.620	0.310
550	1868	1.10	654	23.8	0.595	0.297
650	1583	1.10	554	20.1	0.504	0.252
750	1266	1.10	443	16.1	0.403	0.201
860	977	1.10	342	12.4	0.311	0.156
940	866	0.88	243	11.0	0.276	0.138
1250	460	1.00	146	5.9	0.146	0.073
1380	354	0.88	99	4.5	0.113	0.056
1640	227	0.88	64	2.9	0.072	0.036
1880	132	0.88	37	1.7	0.042	0.021
2135	86	0.83	23	1.1	0.027	0.014
2250	74	0.83	19	0.9	0.023	0.012

Footnotes for Table 3:

[a] Max values chosen for consistency with MODIS 1 km native resolution channels. Values also generally consistent with corresponding VIIRS M-bands and PACE OCI (courtesy G. Meister, GSFC). For MODIS, R_{sat} margin was generally 1.15R_{max} in these channels.

[b] Provided as an example only, L_{typ} in the table is for R_{typ} = 0.04 (roughly corresponding to a thin cirrus cloud with an optical thickness of 0.2–0.3 over a dark ocean surface).

[c] Corresponding to expected NEdR = 0.001; desired NEdR = 0.0005 or better, generally consistent with corresponding MODIS 1 km native resolution channels. Since L_{typ} and NEdL values are tagged to fixed reflectances, SNR = 40 at L_{typ} and 830-1111 at L_{max}. Expected and desired bandpasses are 10 nm and 5 nm, respectively. To the extent that L_{min} is defined as the radiance corresponding to SNR=1, L_{min}=NEdL.

* VIS/NIR: Neckel and Lab (1984); SWIR: Thekekara (1974).

REFERENCES

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SHORTWAVE SPECTROMETER RESOURCE ALLOCATION TARGETS

The AtmOS team has developed target spacecraft resource allocations for the SW Spectrometer based on information gathered during the ACCP Architecture Study Phase, including information gathered from an instrumentation Request for Information submitted during that period. From this information the mission systems team developed spacecraft concepts commensurate with allocations as found in Table . The respondent should provide both their Current Best Estimate and Maximum Expected Value resource needs in the attached spreadsheet under the tab labeled 'Spacecraft Accommodation.' Note: The values in the table below are not requirements but rather for informational purposes to provide the respondent with the notional resource needs currently envisioned by the AtmOS team. Exceedance of these values are acceptable and expected, especially in the event of enhanced performance capability.

Table 4. SW Spectrometer Target Resource Allocations

Resource	**Units**	**Target Allocation (Current Best Estimate)****
Mass	kg	27
Operational Power (Orbit Average)	W	70
Envelope Dimensions in Operational Configuration (L x W x H)	cm	45 x 20 x 35
Data Rate (Peak*)	bits/second	74×10^6
*Peak data rate is the nominal rate while the		**Please provide both the Current Best Estimate (CBE) and the Maximum Expected Value (MEV) for these resources. MEV = [(100 + XX)/100] CBE where XX is contingency in percent.

instrument is in its acquisition mode.		

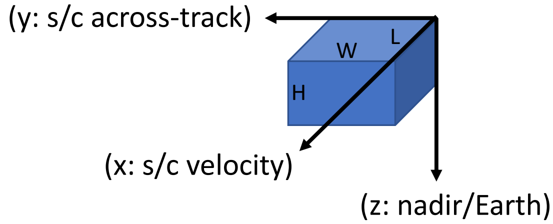

Figure 2. Instrument reference coordinate system.

INSTRUMENT MATURITY

The respondent is encouraged to use the narrative section of the response to describe the technical maturity and supporting basis for instrument use in spaceflight. In addition to the narrative, the respondent should address the itemized requests within the spreadsheet on technology readiness assessment.

Suitable instrument candidates must be no less than Technology Readiness Level (TRL) 6 by the SW Spectrometer Preliminary Design Review (PDR), see Table 2. TRL definitions can be found in the NASA Systems Engineering Handbook, and they apply to the relevant, intended environment (e.g., airborne instrument demonstrated in that environment would be considered TRL 6, but would not be considered TRL 6 if they were intended for a spaceflight environment for AtmOS).

If the candidate instrument is not currently at TRL 6 for the intended environment, the response should include the following:

a) An estimate of current TRL, using the TRL definitions in Appendix G of the NASA Systems Engineering Handbook (NASA SP-2016-6105 Rev. 2, 2016);
b) A technology maturation plan that outlines the approach and timeline to achieve TRL 6;
c) Identification of the external funding source(s) supporting the effort to achieve TRL 6 and qualify the hardware for the intended environment.

COST ESTIMATE

The AtmOS Constellation is cost-constrained. The AtmOS team requests a rough-order-of-magnitude estimate on the total cost in 2021 dollars for the SW Spectrometer. For purposes of cost estimation and planning, the respondent should consider award of the instrument Phase A contract NET March 2022. Award of an instrument delivery contract should occur sometime in Phase B for Phase C-E. Phase B is expected to start NET March 2023. The respondent should assume that the instrument is delivered to a spacecraft provider for integration and testing at observatory-level and for delivery to the launch site for launch and a follow-on period of on-orbit checkout. For purposes of developing the Cost Estimate, the respondent should assume the following draft AtmOS milestone schedule found in Table 2.

Table 2 Draft AtmOS Milestone Schedule

Milestone	Date
Mission Concept Review	2/1/22
SWSpec System Requirements Review	10/1/22
Mission Systems Requirements Review	12/1/22

SWSpec Preliminary Design Review	4/1/24
Mission Preliminary Design Review	6/1/24
SWSpec Critical Design Review	4/1/25
Mission Critical Design Review	6/1/25
Inclined Orbit Plane Systems Integration Review	6/1/26
Polar Orbit Plane Integration Review	6/1/27
Inclined Systems Integration Review	6/1/26
Polar Systems Integration Review	6/1/27
Inclined Launch	3/1/28
Inclined On-Obit Checkout Complete/Operations Commence	6/1/28
Polar Launch	3/1/29
Polar On-Obit Checkout Complete/Operations Commence	6/1/29

MISSION ASSUMPTIONS AND SPACECRAFT INTERFACE ASSUMPTIONS

When developing their response, the respondent should consider the following Mission and Spacecraft Interface assumptions detailed in Table 3. Note: Since the SWSpec instrument is intended for the Polar Orbit Plane, assumptions for the Inclined Orbit Plane are not applicable.

Table 3 Mission and Spacecraft (MSC) Interface Assumptions

Identifier	Category	Polar, Inclined, or Common	Mission Parameters and Spacecraft Interface: Driving/Key Assumptions
MSC1	Orbit	Polar	450 km +/-10 km altitude, Sun Synchronous Polar Orbit, Ascending Node: 1330
MSC2	Orbit	Inclined	407 km +/- 10 km altitude, 50 to 65 degree inclination
MSC3	Orbit and Thermal Interface	Inclined	For thermal purposes, the Inclined Spacecraft will perform approximately 9 to 12 180-degree yaw maneuvers per year to maintain a consistent 'cold side' to the spacecraft. The responder should note any instrument performance or functional concerns with this inclined ConOps assumption.
MSC4	Launch Date	Inclined	See Table 2
MSC5	Launch Date	Polar	See Table 2
MSC6	Instrument Design Life	Polar	Minimum 3 Years, accommodate 5 years for any consumable.
MSC7	Instrument Design Life	Inclined	Minimum 3 Years, accommodate 5 years for any consumable.
MSC8	Instrument Risk Classification	Common	Risk Class C per NASA 8705.4A
MSC9	Launch Vehicle	Common	Assume environment envelope of the following launch vehicles: Falcon 9, Blue Origin New Glenn, and ULA Vulcan Centaur.
MSC10	Deployments	Common	Deployments for initial instrument configuration are acceptable. and should be noted by the vendor. For example, this might include protective aperture covers or release mechanisms for a system locked during launch.

Identifier	Category	Polar, Inclined, or Common	Mission Parameters and Spacecraft Interface: Driving/Key Assumptions
MSC11	Orbital Debris Reduction	Common	The instrument should retain with the instrument any deployed hardware. No hardware is to be released into orbit.
MSC12	Thermal Interface	Common	Instrument is responsible for its own thermal management, including any cryocoolers, operational heaters, thermal radiators, thermal straps, and heat pipes. Assume that spacecraft will accommodate field of view for instrument radiators with view to a 'cold side' of the spacecraft. Conductive heat transfer between instrument and mounting interface will be restricted.
MSC13	Survival Power	Common	Spacecraft will provide dedicated power feed for survival heaters from nominal 28 V DC power service. Instrument is responsible for its own survival heaters and control (e.g., thermostats).
MSC14	Operational Power Service	Common	Assume nominal 28 V DC power service from spacecraft battery system, notionally 23 V to 32 V DC range of variation.
MSC15	Spacecraft Attitude Control System	Common	The spacecraft will maintain a nadir-pointing attitude during operations.
MSC16	Science Data Management	Common	Instrument need not provide its own data storage system. Assume spacecraft will provide adequately sized data recorder to store instrument science, telemetry, housekeeping for periodic spacecraft downlinking.
MSC17	Science Data Management	Common	Data Rate values provided in the targeted resource allocation are for uncompressed data. Assume that the spacecraft will not implement any data compression on the instrument science data. The instruments may wish to implement data compression (lossy or lossless) algorithms prior to transfer to the spacecraft.

SOLICITATION

The AtmOS team will conduct a Pre-Acquisition Strategy Meeting with NASA Headquarters and Earth Science Division (ESD) in late Summer 2021 and a final Acquisition Strategy Meeting during Phase A. The purpose of this solicitation is to help inform the AtmOS team in preparation for those Acquisition Strategy meetings. NASA Headquarters Earth Science Division (ESD) will make the final determination as to the acquisition approach including a determination if the SW Spectrometer will be commercially competed.

The Key Decision Point (KDP) A for AtmOS is expected to be no earlier than 3/2022. If solicited, the SW Spectrometer solicitation will be posted no earlier than first quarter CY 2022.

DATA SECURITY

The information provided will be maintained on GSFC-maintained secure servers, and accessed only by civil servants, or contractors that have signed Non-Disclosure Agreements (NDAs) that preserve vendor proprietary and competition sensitive data.

It is not NASA's intent to publicly disclose vendor proprietary information obtained during this solicitation, including any cost estimates provided. To the full extent that it is protected pursuant to the Freedom of Information Act and other laws and regulations, information identified by a respondent as "Proprietary or Confidential" will be kept confidential.

The North American Industry Classification System (NAICS) code for this procurement is 336419, Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing, with a size standard of 1,000 employees.

RESPONSE CONTENT REQUIREMENTS. This RFI is to solicit specific capability information from any experienced source and promote collaboration and competition. The RFI seeks responses that provide the technical resource footprint, science performance, and vendor capability statements for the SWSpec. The description of the SWSpec should include any relevant laboratory, sub-orbital, or spaceflight information regarding the hardware configuration as previously demonstrated and the science returned, as well as the instrument calibration and data validation methods.

Interested offerors/vendors having the required specialized capabilities to meet the intended application should submit a capability statement indicating the ability to perform all aspects of the effort described herein. Responders are invited to submit a narrative and to fill out the attached SWSpec spreadsheet. The narrative should not exceed 25 pages. Science publications and other relevant information can be referenced in the narrative to provide examples of the source's expertise, facilities, and prior work, especially regarding hardware and/or test results for the SWSpec. The respondent should include within the narrative a description of the SWSpec operating principles within the larger AtmOS operational concept including any measurement synergies enabled by the instrument. The respondent is encouraged to use the narrative to include an instrument functional block diagram, technology readiness assessment basis, identification of any long-lead components or subsystems, and any potential risks (cost, technology, or schedule) envisioned for the SWSpec based on the AtmOS schedule and flight architecture.

The attached AtmOS SWSpec spreadsheet offers a convenient and concise means of addressing the anticipated SWSpec performance, spacecraft resource, and mission operational concept needs. The spreadsheet includes the technical information necessary to support Mission Concept development/pre-formulation. The spreadsheet includes separate tabs for General Information, SWSpec Performance, Supplemental Information, Spacecraft Accommodation, Orbit and Attitude, and TRL. Please complete one spreadsheet for each candidate instrument submitted.

Responses must also include the following: name and address of firm, size of business; average annual revenue for past 3 years and number of employees; ownership; whether they are large, small, small disadvantaged, 8(a), Woman-owned, Veteran Owned, Service-Disabled Veteran Owned, Historically Underutilized Business Zone and Historically Black Colleges and Universities/Minority Institutions and number of years in business. Also include affiliate information: parent company, joint venture partners, potential teaming partners, prime contractor (if potential sub) or subcontractors (if potential prime), list of customers covering the past five years (highlight relevant work performed, contract numbers, contract type, dollar value of each procurement; and point of contact - address and phone number).

This synopsis is for information and planning purposes and is not to be construed as a commitment by the Government nor will the Government pay for information solicited. Respondents will not be notified of the results of the evaluation.

Technical questions should be directed to: Vickie Moran at Vickie.E.Moran@nasa.gov.

Procurement related questions should be directed to: Jonathon D. Wingerberg at jonathon.d.wingerberg@nasa.gov .

Interested offerors should respond to this RFI in written format as described in the previous paragraphs by electronic mail to: Vickie Moran at Vickie.E.Moran@nasa.gov by **TBD**. Responses can be submitted via email. The subject line of the submission should be "RFI for AtmOS SWSpec," and attachments should be in Microsoft WORD, POWERPOINT, EXCEL or PDF format. The email text must give a point-of-contact and provide his/her name, address, telephone/fax numbers, and email address.

Contracting Office Address:
NASA/Goddard Space Flight Center
Greenbelt, Maryland 20771

Primary Point of Contact:
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