Provide Discipline support and leadership for the PACE spacecraft and OCI instrument (with separate subtasks for OCI and PACE) in the areas of Contamination and Thermal Control Coatings. (See specific Levels of Effort requested at the bottom)

Task 33
Task Number 05
POP 12/21/2015 - 09/30/2019

Contamination Control:
Provide technical leadership, engineering support, requirements generation and verification, perform analysis and provide hands on cleaning and sampling for all aspects of PACE and OCI design, development, assembly, test, system integration, environmental tests, transport, launch.

Provide general contamination control oversight for the OCI instrument and PACE spacecraft, bus, instrument suite (as applicable), spacecraft and instrument components as applicable, observatory integration and environmental test, and launch site planning preparations and launch site support.

Develop contamination documentation and analyses and update as necessary including but not limited to: cleanliness requirements based on EOL instrument and s/c performance requirements; contamination accumulation budget and update with real time data and predictive analyses results to demonstrate the EOL contamination requirements are met; contamination control plan (CCP) to meet the requirements; cleaning procedures; etc.

Attend project weekly systems meetings, weekly risk board meetings as applicable, weekly project/instrument team meetings, weekly hardware PDL meetings as needed; thermal vacuum test planning and preparation meetings (as often as they occur; prepare status charts and present at monthly Division Status Reviews (DSRs).

Prepare and support PACE and OCI gate reviews, engineering peer reviews etc., to detail contamination requirements and sensitivities, contamination requirements, verification processes and report on off-nominal events or risks.

Review ground support equipment designs for mission, hardware and cleanroom compatibility. When requested and/or when needed, review and provide comment on flight hardware designs, integration and test procedures, work orders, and other project design and integration and test documents.

Perform contamination control analytical modeling for outgassing and particle redistribution. This includes: develop and update as required analytical models for spacecraft bus components and instruments for ground, launch, and orbit vacuum operations. Analyses may include molecular transport analyses (including thruster plume analyses, uv photopolymerization, atomic oxygen, electrostatic return flux, backscatter, etc.) particle redistribution during ground operations, launch or orbital maneuvers, contamination effects, venting analyses or other contamination related analyses. Perform thruster plume impingement analysis as necessary to ascertain impact to instrument and spacecraft surfaces during applicable ascent portions, transfer orbits, orbital station keeping, and burn durations.

Provide oversight and verification of molecular and particulate contamination analyses performed by other entities in support of peer, PDR, and CDR reviews or when directed. When directed, perform analyses in support of Instrument and Spacecraft SRRs, TRR's, PER's, PSR's, and other reviews.

Support development of mission specific requirements and procedures for thermal vacuum tests and bakeouts and track achieved outgassing vs. requirements and adjust budgets as required. Provide outgassing requirements for all thermal vacuum testing and bakeouts (unless waived by the contamination technical lead.)

Support instrument and observatory Level Thermal Vacuum (TV) testing. This will include planning, procedures, review of GSE and flight suitability for TV test, modeling chamber, monitoring testing, producing reports. Document results in reports that include recognized methods or details of theory if new, assumptions, parameters, test data and interpretation of the data. Maintain project database of achieved outgassing levels for all hardware and adjust other hardware requirements as possible / as needed given outgassing achieved in completed tests.

Provide special outgassing tests as required using MOLEKIT, EXCALIBUR and other TV test set-ups to assess outgassing of off-nominal materials and hardware. When requested conduct bakeouts, molekit and other molecular kinetics testing. Manage project loaner QCM's, if required. Assist in installing QCM's into the chamber and instruct personnel on use. Provide thermal vacuum support to bakeouts and thermal vacuum performance tests when requested. Perform inspections and tests on hardware to assess surface cleanliness levels.

Provide ability to assess particle surface cleanliness levels using tape lifts, rinses, visual inspections and other accepted techniques. Take NVR samples and rinses from hardware. Evaluate fallout plates. Coordinate sample testing and reporting of the results. Analyze tape lifts. Develop cleaning process and assist and/or oversee cleaning of critical hardware and training personnel in cleanroom protocols and cleaning techniques.

Define facility cleanliness requirements, assess facility readiness and monitor particulate and molecular cleanliness levels throughout all ground and launch site operations, including the above inspection, testing and cleaning operations when requested or required. Keep database of cleanroom(s) performance using data collected from fallout wafers, NVR plates and particle counts. Corelate to number of bodies in facility, and type of operation if possible. Provide report at least every 6 months to CS lead and branch management, and copy 549 or facility owner.

Develop bagging designs and other protective measures to protect hardware for hardware travel out of clean facilities, and for time of hi risk (eg inclement weather, doors open ops etc.) and/or low/no activity in the cleanroom.

Estimate cleanroom materials and resources (include contamination control technician labor) needed to support the project and assist in reviewing and preparing work instructions and procurement technical requirements. Purchase miscellaneous equipment and supplies in support of project needs as required.

Thermal Control Coatings:

Provide a Thermal Control Coatings engineer to attend weekly thermal meetings, PDL hardware meetings and systems meetings. Conduct and coordinate 2-3 thermal control coatings committee meetings prior to CDR, in accordance with the thermal engineer lead's needs. Also re-convene the coatings committee, or part of it, as requested by the thermal engineer for off nominal needs. Provide a report to branch management, the thermal engineer and the project CM on the committee's findings, after each meeting.

Coordinate hardware coating, work schedules and work order authorization, QA support as needed. Provide thermal engineer and hardware leads with recommendations for coatings based on hardware substrate, geometry and intricacy of part to be coated. Provide thermal property measurements as needed and for each part coated, and provide a report on each of these measurements. Provide space environment testing as required, including but not limited to: UV exposure, Solar wind -low energy proton and electron, electrostatic build up; provide calorimetric and total hemispherical emittance, normal emittance, reflectance, transmission and absorptance measurements. Provide detailed reports on this testing, including environment exposed, property measurements before, during and post exposure; test set up, sample preparation etc.

SOW for Support in both 546 sub-disciplines:

Maintain up-to-date training in contamination control and thermal control to stay abreast of the latest technologies, standards and advances in the fields.

Maintain a file of “do’s and don’ts” and lessons learned for both contamination and thermal control coatings for this and future projects. Provide CS and branch management an updated file every 6 months and a complete summary at task end.

Maintain a detailed file of contamination and coatings approach for PACE and OCI, with pictures and data when informative. Provide CS and branch management an update on every 6 months and a complete summary at task end.

Above work will require: attending working meetings and reviews locally, nationally, and internationally (rarely); reviewing drawings and specifications; attending staff/status meetings; and defining requirements and generating required documentation (contamination control plans, bakeout test plans, work orders, etc.) as directed.

Below is a list of planned support needed per subtask through FY19, with the above work being partially completed in FY19:

PACE

Continued support from the following at these estimated LOEs (averaged through the year):

REDACTED	0.74
REDACTED	0.18
REDACTED	0.16
REDACTED	0.21
REDACTED	0.25
REDACTED	0.25

Lab Maintenance, random people as needed

REDACTED	0.1

OCI

Continued support from the following at these estimated LOEs (averaged through the year):

REDACTED	1.0
REDACTED	
REDACTED	0.7

REDACTED	0.35
Lab Maintenance, random people as needed	
REDACTED	0.1