THEMIS PROGRESS REPORT FOR
January 2004

UC BERKELEY CONTRACT NAS5-02099
SWALES AEROSPACE P.O. 1-0000754359
For the Period 1/1/04 through 1/31/04

Title: THEMIS Bridge Phase
UCB Technical Monitors: Peter Harvey and Dr. Vassilis Angelopoulos
Swales Manager: Mike Cully

This report summarizes major activities from January 1 through January 31, 2003. Swales provides weekly status (generally Monday) informally via scheduled conference calls to UCB management.

I. SUMMARY OF WORK PERFORMED

1.0 WBS 2.2.1.1 PROJECT MANAGEMENT

- Provided a third revision of responses to the Probe and Probe Carrier RFAs focusing on RFA #44 (Separation System) and RFA #11 (second image of flight software).
- Completed subcontract negotiations and sign off of Sun Sensor contract with ADCOLE. ADCOLE has begun long lead procurements of Solar Cells and Reticle Substrates.
- Completed subcontract negotiations and sign off of Transponder contract with L3-Com. Have begun
- Continued to work GDDS interface on Processor Board. Anticipate revised cost proposal from GDDS the first week of February with closure on Terms and Conditions by mid February.
- Received proposals from two vendors (Yardney and AEA Technology) for flight batteries and have begun evaluation of proposals. Anticipate decision on flight batteries by mid February.
- Met with Research Analysis Office (RAO) at GSFC in regards to Swales cost proposal
- Held Technical Interchange meeting at Swales to discuss resources and readiness for confirmation review.
- Provided a number of inputs to UCB/GSFC for the Pre-Confirmation Review to be held at GSFC on February 4t
- Provided to UCB funding projections through February 29, 2004
- Met with Provided data to the Research Analysis Office at GSFC in regards to Swales cost proposal
- Issued Solar Array RFPs and support questions from vendors
- Continue to add detail to the integrated schedule
- Further develop procurement schedules and integrate Sun Sensor and Probe I&T schedule into our master schedule
- Initiate contract meetings with UCB to finalize subcontract structure
- Held Technical Interface Meeting (TIM) at Aerojet on 1/28/04
- Held TIM meeting with GDDS the week of 1/26/04

2.0 WBS 2.2.1.2 SYSTEMS ENGINEERING

- Supported ongoing Systems meetings
  - Monday status meetings
  - Systems Engineering meetings with UCB
  - Magnetics telecon with UCB
  - ESC telecons with UCB
  - Mechanical telecons with UCB
  - LV/KSC telecons
  - Mission Operations Telecon with UCB and Hammers
  - Thermal telecons with UCB.
- Supported ongoing subsystem activities
  - C&DH
    - Participated in Thruster and Separation System Electronics Design Review
  - FSW
    - Code size vs. EEPROM size study (RFA #11)
  - Comm
    - Antenna design including vendor site visits
    - Transponder vendor negotiations
  - Power
    - Solar Array sizing activities
    - Solar Array procurement
    - Battery procurement
    - ESC
    - Magnetic cleanliness
    - Shadowing analyses
  - Harness
    - Probe Bus wire list review
    - Probe Carrier harness design
  - RCS
    - Propulsion vendor design discussions
  - ACS
    - Stability analysis
    - Propellant budget review
  - Mech
    - Solar Panel attachment point redesign to increase array area
    - Separation system trades
  - Thermal
    - Heater power assessment
    - Battery DOD in eclipse
  - I&T
    - EGSE and ITOS requirements definition

- Supported TIM with UCB
- Supported TIM with KSC
- Supported ACS review with Carl Hubert
- Supported Power Control Board Requirements reviews
- Supported Thruster and Separation System Electronics Design Review
- Reviewed KSC Orbital Debris report.
- Created multiple solar cell layouts in support of power analysis

- Checked power analysis parameters for validity
- Calculated shadow dimensions on side solar panels due to all instruments and booms at first wedding day (Feb 21, 13 deg tilt of top deck toward sun)
- Determined tool to be used for subsequent detailed power system shadowing analyses
- Prepared initial maneuver plan/timeline
- Prepared new concept for separation system actuation
- Prepared System Overview material for Confirmation Review at GSFC
- Continued work on Draft version of the THEMIS Environmental Design Specification
- Discussed Env. Test and Verification Spec. with UCB, and agreed on approach.
- Continued Range Safety Requirements Tailoring Effort
- Completed Draft of a THEMIS System Safety Program
- Continued Development of a THEMIS System Safety Program

3.0 WBS 2.2.1.3 LAUNCH VEHICLE INTERFACE

- Supported biweekly telecons with KSC mission manager
- Hosted TIM with KSC at Swales
- Discussed getting a Boeing contract in place to address thermal, separation, launch mass and ODA issues.
- Highlighted separation as the prime area of discussion

4.0 WBS 2.2.1.4 LOGISTICS AND PLANNING

- Completed subsystem schedule reviews and continue update to integrated schedule

5.0 WBS 2.2.1.5 DESIGN REVIEW

- No activity in this area

6.0 WBS 2.2.1.6 QUALITY ASSURANCE

- Reviewed Antenna Specification ands SOW
- Continue development of the WOA Database based on recent NRL experience
- Worked parts issue with ADCOLE
- Updated Quality Assurance Implementation Plan
- Continue supporting electrical lead in selection of EEE parts

7.0 WBS 2.2.2.1 GN&C SYSTEMS

Attitude Control Subsystem

- Updated sun sensor SOW and Specification
- Helped assess VirtualSat capabilities and potential upgrades for THEMIS
- Estimated propellant usage for each probe and issued analysis report
- Generated ACS WBS dictionary for detailed design phase

REACTION CONTROL SUBSYSTEM

- Held TIM #2 at Aerojet the week of January 26th
- Completed inputs for RCS ICD. Release of ICD is pending Battery down selection

- Visited ValveTech and MOOG January 16th
- Scrub Aerojet and ARDE Schedules, Integrate with Program Schedule
- Support Mechanical group in RCS packaging study

8.0 WBS 2.2.2.2 S/C ELECTRICAL AND AVIONICS SYSTEMS

- BAU
  Processor board requirements specification released
    - EDU delivery scheduled for end of April
    - Planning delivery of 2nd Processor EDU in May
    - Schematic 90% complete, FPGA design underway
    - Parts list complete
      - Increased PROM capacity to 64 kbytes to accommodate enhanced boot mode functionality
      - SDRAM solution reduced part count by factor of 4, parts cost by 80%
      - Radiation analysis predicts one error per day

  Power module design specification in process
    - Preliminary power module partitioning complete
    - Schematic 50% complete, preparing FPGA requirements
    - Performed design split – Controller board and Regulator board
      - Tasking GD to develop DC-DC converter implementation

  Comm Interface module design specification in process
  Performed preliminary housing design, defined preliminary connector assignments
- Power subsystem
  - Refined Solar Array requirements after performing shadowing analysis
    - Developed plan for performing higher fidelity shadowing/power analysis
      - Performed informal trade study of available resources
    - Developed several layout options and performed power analysis and energy balance for each option
- Supporting alternative separation system design trade
- Continuing refinement of Harness design to reduce mass
- Flight Software requirements document released
- Communication subsystem
  - Initiated Biweekly Telcons with L3-Com
  - Working RF license actions
  - Held meeting at Ball Aerospace on Antenna design. Two antenna design has been basedlined eliminating need for Transponder mounted Diplexer
  - Assessing RF Rack Make/Buy
- Harness Design underway
  - Worked out proper sizing of harness wire for class of signals & identified opportunities for mass reductionsBus Avionics Unit development

9.0 WBS 2.2.2.2.3 FLIGHT SOFTWARE

- THEMIS Flight Software Requirements Specification – Final Pre-release draft distributed, all comments reviewed and incorporated from Working Group meetings, etc – to be released 02-Feb-2004.
- Completed and released first draft of the THEMIS VirtualSat (VSAT) requirements.

- Supported Technical meetings at Swales with regard to Processor design, hardware and software issues.
- Supported I&T meetings, Telecons with UCB.
- Timing Study completed on performing software EDAC on Telemetry Frames prior to storage/downlink. Determined that this approach will not be feasible.
- Continued THEMIS specific FSW development for Build 1.
    - THEMIS-specific Intertask-messaging design/coding complete
    - Begin network driver interface for commanding and telemetering THEMIS Build 1 Flight Software executing on Coldfire development board.
    - Refinements made to FSW Development Tools
- VirtualSat hardware received.
  Hammers personnel completed RTX training (to be used in VSAT review

10.0 WBS 2.2.2.3 MECHANICAL SYSTEMS (PROBE)

- General
    - Supported UCB TIM
    - Supported RAO analysis response for structure cost estimates
- RCS Support
    - Released propulsion tank EO to cover required ARDE CDR changes
    - Circulated proposal for the division of analysis work between Aerojet and Swales
    - Provided solid model of Probe to Aerojet for propulsion line layout studies
    - Supported Aerojet TIM
    - Evaluated pressure transducer qualification status – ok as is provided resonant frequency is greater than 75 Hz
- Mass Properties and ACS support
    - Updated the ACS initialization spread sheet
    - Delivered updated Probe central body mass properties to UCB - Based on an immature Pro/E model of the bus
    - Ran initial spin balance mass analysis and showed that the required balance mass is very sensitive to the ESA-IDPU placement.
    - Identified maturity factors to be applied to future mass estimates
- Solar Array design / procurement
    - Used ProE render software to produce movie of shadow effects on spinning Probe
    - Worked with systems and power team to help identify best software package for analyzing shadows
    - Identified preliminary design approach for removing fasteners from solar panel cell area:
        - Estimate 1.5 kg mass impact for all fasteners
        - Approximately 0.6 kg impact for removing only top and side fastener
        - Conclusion is to only do it on the vertical edges which is minor impact
    - Provided mass impacts for extending solar panels without removing fasteners from front
        - Approximately 0.6 kg impact
    - Held discussion with principle investigator with regards to solar cell layout
    - Provided detailed inputs to the solar array specification
    - Responded to vendor questions on flex coupon and delivery dates
- Battery Procurement

    - Supported battery evaluation meeting
    - Provided conceptual packing options for large AEAT battery
        - Poor connector and integration access
    - Evaluated notching approach – acceptable so long as frequency is high
- UCB Interface
    - Held bi-weekly telecons with UCB to discuss outstanding interface issues
    - Evaluated proposal to move SCM pre-amp box from top deck to IDPU side
    - Provided updated ICD status spreadsheet
- Structure Design and Analysis
    - Updated analysis for thermal mismatch between aluminum boxes and graphite deck. - The flush insert design does not have sufficient margin
        - Preliminary plan is to use co-cured inserts which have higher allowables
    - Held coupled loads analysis and stress margin meeting
- Structure manufacturing
    - Completed development pull tests for some of post cured inserts and the allowables are greater than analytical predictions
    - Meet with manufacturing engineer to review design and manufacturing process
        - Solar arrays are a concern due to kapton making panel unsymmetrical
    - Met with manufacturing engineering and management to discuss assumptions for manufacturing costing and planning activities
        - Provided design baseline drawings and guideline document
- Met with I&T manager to discuss mechanical mfg, assy and integration flows

11.0 WBS 2.2.2.4 THERMAL

- Integrated 1st set of instrument detailed models with s/c.
    - SSTs, FGM boom, SCM boom, Axial EFI, Spin Plane EFI exceed limits in the hot case because of VDA surface (high alpha to epsilon ratio).
- Performed heater power optimization trades
    - Vapor Deposited Aluminum (VDA) on top deck and corner panels require about 4 Watts of heater power during the cold sunlit case.
    - Vapor Deposited Gold on top deck and corner panels require less heater power than VDA (about 0.5 Watt), but the hot top deck-to-sun case temperatures exceeded limits for the BAU, battery, and IDPU.
- Performed probe thruster plume analyses
    - Impingement on corner panel necessitates plume shield on the corner panel near the bottom and top tangential thrusters
    - Impingement on the side solar panel causes local panel temperature to rise up to 95°C at the end of a 20 minute burn. Solar panel edge will require high temperature plume shield.
    - Impingement on the SCM causes local blanket temperature to rise up to 450°C, and SCM structure temperature to 100°C at the end of a 20 minute burn. If thruster needs to be fired, the duration of a 100% duty cycle firing must be less than 10 minutes to stay below temperature limits. SCM MLI must be securely fastened so that the thruster plume will not cause it to come off.
- Performed thermal gasket interface sensitivity analyses
    - Cho-Therm gasket thickness greater than 60 mils thick will cause box temperatures to exceed limits.
- Performed shunt resistor placement trades

    - Shunt resistors placed on propellant tanks causes temperatures to rise to 85°C during the hot case. Shunt resistors should be heat sunk to the bottom deck to spread heat out to the entire bus.
- Performed probe carrier detailed thermal design analyses
    - Bottom of Probe Carrier and struts will be blanketed.
    - Third stage plume shield not required.
- Supported Aerojet TIM #2 in Redmond, WA
    - Aerojet reworking RCS thermal design and analysis to meet 2 watt heater power requirement.

12.0 WBS 2.2.2.5 PROBE BUS I&T

- Held I&T planning meeting at Swales on 1/22 to focus on Instrument work flows at Swales
- Support subsystems in I&T planning and have initiated I&T planning document

13.0 WBS 2.2.4 PROBE CARRIER & SEPARATION SYSTEM

- Continued to refine structure design and analysis
- Delivered information package to new PC designer – Nerses Armani
- Evaluated Probe A adapter change from forged machined part to 3-ring assembly
    - Unacceptable mass impact
    - Plan to investigate forging process and limitations in detail
- Supported TIM with KSC and telecon with Boeing on LV interface issues
    - Provided Coupled loads summary to KSC
    - Provided updated c.g. location to KSC
- Delivered updated draft of PDR #44 separation system RFA to Program Management
- Performed detailed assessment of Probe release trajectory initial motion to optimize position and orientation of separation connector
- Sent out debris booty for vendor evaluation
    - Acceptable as is
    - Released drawing
- Placed bolt cutter order
- Released separation stud drawing and sent out for procurement
- Placed initial GSE order
- Evaluated proposal to change bolt cutter from electrical to ordnance actuation
    - Feasible but probably high cost and schedule impacts
    - Proposed LV switched alternative

14.0 WBS 2.2.5 MISSION INTEGRATION & TEST

- The THEMIS I&T Manager Marc Kaylor has been brought on to the program. Marc has extensive experience in leading I&T teams and in the past several years has supported the Hubble Servicing Missions. Marc has begun following the progress of the Swales facility upgrades and is actively participating in System trade studies. Marc's primary focus will be ingenerating the Preliminary I&T plan for CDR and coordinating all planning activity for I&T which includes staffing and ground hardware acquisition.

II. ANALYSIS OF WORKED PERFORMED

1.0 WBS 2.2.1.1 PROJECT MANAGEMENT

- Awaiting final Terms and Conditions for contract
- Plan to begin discussions with UCB on full contract implementation (Phase B/C/D). The long lead procurements may be impacted relative to cost and schedule if new requirements are imposed by NASA that are significantly different than the Draft Contract Terms and Conditions provided back in May 2003, although indications are that the no significant changes are envisioned.

1.1 SIGNIFICANT PERSONNEL CHANGES

- No significant personnel changes this period

1.2 CHANGES OR SCHEDULE / COST IMPACTS

BAU Processor Board (Replaces Customer Furnished Equipment)

- Swales has finalized the requirements on the Processor Board. As reported above GDDS made a down selected on the SDRAM after completing a radiation analysis which has been provide to UCB. A revised cost proposal is not due until the first week of February. This will be reviewed and evaluated as soon as possible. The cost impact will be relayed and as discussed with UCB this will be included in the first modification of the contract.

Long Lead Procurement

- Long Lead procurement planning continues. The procurement schedule is moving ahead consistent with an August 2006 launch. Attachment 2b provides the latest detail schedule (derived from Open Plan schedule). Generally there is at least one month of slack between scheduled delivery date (consistent with component / subsystem SOW) and need date for unit I&T. Schedules will be updated based upon the detail schedules provided by the subcontractors. Highlights of major procurements are provided below
    - Tank contract is in full swing with initiation of the Development Tank fabrication
    - The RCS contract is moving forward with detail design. A TIM was completed the last week of January. Aerojet has the current components on order:
        - Pressure Transducers
        - Latch Valves
        - .
    - BAU development as discussed above. GDDS has developed a plan to build short for the EDU since the SDRAM will be the last parts to arrive. Flight material will be placed by the third week of February. The Power Module design progress has improved and status is provided above. A meeting was held with GDDS and they have offered up flight power circuits to speed up the design process. The Communication Module design has picked up in pace with arrival of the ASRC team. A specification walk through is scheduled for the second week of February at Swales. also has been progressing slower than plan primarily due to staffing issues.

- Separation System long lead procurements for both the ETU and flight units have been begun with the release of the bolt cutter and miscellaneous parts. The NASA Standard Initiator (NSI) and ring procurements should be released in early February. Swales will be leveraging Pyro Box designs from the GSFC Hitchhiker program for all of the ground testing.
- L3-Com is under contract and they have begun long lead procurements. L3-Com is supporting the NTIA licensing effort in coordination with Manfred Bester and GSFC. L3-Com has identified the frequency selection cut off date as 2/13/04 after which there will be negative impact to schedule and costs if a change is made at a later date. Swales has also informed L3-Com that a diplexer is no longer needed due to the Sband antenna proposed design. However L3-Com will have to add filtering.
- ADCOLE is under and has placed orders for Solar Cells and recticle substrates However, we are still awaiting a more detailed schedule from Adcole to fully understand their procurement schedule
- Have begun the evaluation of two battery proposals and anticipate down selecte by mid February.
- Solar Array proposals are due to Swales in early February.
- Antenna proposal is due February 13th from Ball Aerospace. We anticipate awarding this contract by late February. Ball is planning to deliver a Prototype antenna by the first week of May so that testing can begin at GSFC.

Instrument Interface Control Documentation & Instrument Thermal Models

- Instrument ICDs were received prior to Probe and Probe Carrier PDR. Mechanical drawings have been commented upon by Swales and forwarded back to UCB.. An updated status of the ICDS is provided in Enclosure 4.

Major Milestone Schedule

- Enclosure 2A contains the major milestone schedule. No changes have been made to the major milestone schedule this last period. As stated in the last period the Probe Fabrication and Subsystem integration durations were reduced due to the CDR slip from the CSR assumptions. There is no definitive plan in place to recover this time to maintain the CSR launch date. As the long lead procurements firm up we will have a better understanding what actions can be taken in attempt to recover this time.:

1.3 INTEGRATED SCHEDULE STATUS

Swales has completed the second cut of the integrated schedule using the Welcom Home Open Plan tool. This is provided in Enclosure 2B. This schedule includes the following major updates

- Subsystem updates
  - Mechanical System Probe & Probe Carrier
  - RCS
  - Tank
  - BAU

- Sun Sensor
- Transponder
- ACS Design & Analysis
- Thermal
- Range Safety

1.4 Risk Management Status

Enclosures provide copies of the Risk Exposure report and the Stoplight report for the last period.

2.0 WBS 2.2.1.2 Systems Engineering

2.1 Resource management

Enclosure provides the latest Mass and Power status for the Probe and Probe Carrier systems. We have kicked off a tiger team to address the harness mass to assure that we are minimizing the mass throughout the detail design stage. We will continue to pursue aggressive light weighting of the mechanical structure and components (Diplexer, BAU, etc.) to further increase the probe mass reserves.

We have started a detailed study of available power verses the requirement, and will be reassessing this over the next month.

2.2 System Engineering Issues

- A number of the Instrument Thermal models have been received in the last period and therefore this is not an issue at this time. A status of the Thermal models has been provided in Enclosure 4
- The Probe Mass contingency is at 3.85% using the current best estimates with the reduction driven by the Harness mass changes discussed above. This is below the SEMP requirement of 10% and we will attempt to increase the mass contingency by further light weighting of the structure and other components. However we are reaching the point of diminishing returns.
- Inertia ratio of the Probe after all booms are deployed is an issue discussed at the Probe PDR that continues to be analyzed, but can be addressed by boom length selection, and is no longer a critical issue at this time.
- The Magnetic stability requirement mentioned last period of 0.1nT imposed by UCB remains a challenge to the Probe design. The impact to compliance has not been fully captured and the methodology of verification needs to be worked further by all members of the team. The biweekly meeting on magnetics, led by UCB, continues to address magnetic compliance and design
- ESC requirements will be very difficult for the solar array vendors to meet. The impact will be quantified during the solar array RFP cycle that is ongoing
- Shadowing of arrays by instruments coupled with implementing of surface charging has reduced power available to loads. Swales, in conjunction with UCB, have placed this issue as one of the highest priority issues for the team and we are attacking this from a number of areas as indicated below:
    - Increase area for cell space by changing the mechanical configuration of the panels

- UCB addressing any changes that can easily be made to instrument booms and radial EFI protrusions
- Assessing system impact for adding additional light weight panels on corner panels of Probe and Axial Boom extension
- Assessing lowering requirement if existing area is sufficient to meet estimated loads plus conservative margin

3.0 WBS 2.2.1.3 LAUNCH VEHICLE INTERFACE

- No issues at this time

4.0 WBS 2.2.1.4 LOGISTICS AND PLANNING

- No issues at this time

5.0 WBS 2.2.1.5 DESIGN REVIEW

- No issues at this time

6.0 WBS 2.2.1.6 QUALITY ASSURANCE

- No issues at this time

7.0 WBS 2.2.2.1 GN&C SYSTEMS

- See inertia ratios discussions above in Systems section

8.0 WBS 2.2.2.2 S/C ELECTRICAL AND AVIONICS SYSTEMS

- Bus Avionics Unit development schedule is the highest risk item, as discussed above, in the management section

9.0 WBS 2.2.2.2.3 FLIGHT SOFTWARE

- Progress has been made on the following items, however, they are being included in this month's report pending finalized design:
    - Vendor-specific Boot/initialization operations needed for C&DH Processor Board—these are yet to be defined.
    - Need finalization of BAU Processor design, with all DMA transfers and protocols clearly identified.
    - Design Review for BAU Hardware has slipped.
    - Decisions needed on:
        - Boot approach – two compressed images (RFA 11). Have determined that 32KB PROM space will be marginal.
    - Bulk Memory Design
        - Non-HW EDAC approach will require designing a new Flight Software component.

- Determined that a Software EDAC emulation algorithm will not be feasible due to timing constraints.
- Flight Software RAM sizing- Bulk Memory may be unsuitable for storage of tables, etc – need to re-visit FSW RAM sizing requirements.

10.0 WBS 2.2.2.3 MECHANICAL SYSTEMS (PROBE)

- Key issues
  - Resolution of systems, electrical and interface issues that affect the Probe mechanical design
    - Most critical is choice / location of battery, BAU and transponder - Directly affects mass balance and RCS design progress
  - Skin connectors
  - Harness accommodation
  - Potential impacts of thermal design aspects
    - Vapor deposited gold on top deck
    - Precision thermal couplings
  - Final solar array mechanical impacts
    - Size of side solar panels
    - Layout of top solar panels

11.0 WBS 2.2.2.4 THERMAL

- Held Post PDR Thermal Peer Review
  - Received suggestions on design details from Sales senior thermal engineers
    - Attendees: Nick Teti, Mike Coyle, Jack Hunter, Bill Chang, Dan Powers, and Warren Tolson
- Supported weekly thermal telephone conferences with UCB
  - Reported design status and reduced modeling results
- Redesigned probe for all Solar Aspect Angles
  - Removed MLI on the outer surface of Top Deck and replaced with VDA tape
  - Radiatively coupled Top Deck with electronics boxes
  - Top Deck to Sun Case: Temperatures within limits. Power Positive
  - Bottom Deck to Sun Case: Temperatures within limits with 5 °C margin
  - Hot Science Case: Temperatures within limits with 5 °C margin
  - Cold Eclipse Case: Heaters cycling. Battery at 54.4% DoD at the end of the 3 hour eclipse. Sunlit portion of orbit requires 6 Watts of heater power
- Performed reduced model thermal analyses

12.0 WBS 2.2.2.5 PROBE BUS I&T

- No issues at this time

13.0 WBS 2.2.4 PROBE CARRIER

- Key issues
  - Harness routing approach and mechanical design and mass impacts
  - PCA launch case thermal analysis for Probe solar array, strut and separation system temperatures
    - To assess the need for solar array shields on PC
  - Marmon band vs. bolted interface decision

- Final decision between electrical and ordnance driven pyros

14.0 WBS 2.2.5 MISSION INTEGRATION & TEST

- No issues at this time

III. PLANNED WORK

1.0 WBS 2.2.1.1 PROJECT MANAGEMENT

- Provide final inputs to UCB/GSFC on Pre-Confirmation Review
- Present at Pre-Confirmation Review at GSFC on 2/04/04
- Complete action items from Pre-Confirmation Review
- Continue to work closure of Probe and Probe Carrier RFAs
- Complete Battery proposal evaluation and down select vendors. Initiate fact finding and finalize subcontract documentation.
- Begin evaluation of Solar Array proposals and begin down select of vendors
- Evaluate Antenna proposal and finalize contract with Ball Aerospace
- Finalize subcontract with GDDS on Processor Board. Hold contract meeting with GDDS the week of 1/9/04
- Further develop procurement schedules and integrate Battery and Probe I&T schedule into our master schedule
- Issue Probe and Probe Carrier document list to leads for comment and review
- Initiate contract meetings with UCB to finalize subcontract structure
- Host TIM at Swales on 2/5 on Flight Software Requirements

2.0 WBS 2.2.1.2 SYSTEMS ENGINEERING

- Continue supporting ongoing trade studies including Thermal design, RF antenna, separation system and solar array area
- Complete end-to-end system environmental verification matrix to be incorporated into the THEMIS Verification and Environmental Test Specification
- Continue work on Draft version of the THEMIS Verification and Environmental Test Specification
- Continue work on Draft version of the THEMIS Environmental Design Specification
- Begin system design for fault management
- Further define system states for thermal / power and propulsion design, to remove unnecessary conservatism
- Continue work on SEMP
- Document the Separation Subsystem Safety inhibit design
- Continue Effort on System Safety Program Plan
- Continue Tailoring of EWR 127-1, Direct Completion of Tailoring Forms
- Begin Development of Safety Compliance Checklist

3.0 WBS 2.2.1.3 LAUNCH VEHICLE INTERFACE

- Continue Monthly Dialogs with KSC Mission Integration Manager
- Develop Launch Vehicle Meeting Schedule and Documentation Flow

4.0 WBS 2.2.1.4 LOGISTICS AND PLANNING

- Continue updating and refining schedules

5.0 WBS 2.2.1.5 DESIGN REVIEW

- No activity planned

6.0 WBS 2.2.1.6 QUALITY ASSURANCE

- Support procurements
- Support fact finding on battery procurements as required
- Continue to work EEE parts selection with engineers

7.0 WBS 2.2.2.1 GN&C SYSTEMS

ATTITUDE CONTROL SUBSYSTEM

- Develop parameters for flexible axial boom simulation model
- Apply generalized stability criteria to updated mass properties
- Continue sensitivity analysis of onboard attitude determination
- Assess probe natural frequencies and potential impacts to thrust operations

REACTION CONTROL SUBSYSTEM

- TIM to be held at Aerojet the week of January 26th
- Complete RCS ICD
- Visit ValveTech and MOOG January 16th
- Scrub Aerojet and ARDE Schedules, Integrate with Program Schedule
- Finalize RCS Design Details
    - Single Pressure Transducer
    - Thruster Heat Shields
- Provide Aerojet w/ pressure panel design review.
- Close Action Items from Aerojet TIM #2

8.0 WBS 2.2.2.2 S/C ELECTRICAL AND AVIONICS SYSTEMS

- Bus Avionics Unit development
    - Finalize BAU footprint, packaging scheme
    - Work out details with GD for BAU development
        - Finalize contract for flight avionics build
    - Finish Processor module design, release ICD
        - Define SDRAM error detection & correction requirements
        - Develop register set definition, memory map
        - Hold Design Convergence review at GD
    - Complete Power module preliminary design
        - Define DC-DC converter requirements
        - Develop design specification
        - Hold design review with GD – hand off schematic, parts list
    - Complete Comm Interface module design
        - Develop design specification, perform preliminary design
        - Hold design review, hand off schematic, parts list to GD
    - Develop BAU test plan and design test fixtures

- Power subsystem
  - Select battery vendor, refine charge regulator design
  - Review solar array proposals and select vendor
  - Begin refining cell layout
  - Perform more shadow analysis with help from Mechanical/Thermal group
  - Refine BAU power consumption analysis
  - Define SAS and battery charge rack requirements
- Work with UCB to update Spacecraft to Instrument ICD, develop Command, Telemetry Format documents
- Harness Development
  - Refine wire list using updated Power module design info
  - Close design trades for BERB location, SPG placement
  - Need Solar Array implementation baselined to finish design
- Flight Software

Develop Boot Code requirements specification

9.0 WBS 2.2.2.2.3 FLIGHT SOFTWARE

- Participate in Flight Software meetings and Requirements Reviews with UCB.
- Continue THEMIS Flight Software Development for Build 1, including network driver.
- Finalize boot code pending input from GDDS regarding board/FPGA initialization requirements, and RFA 11 decision.
- Continue support of weekly project status meetings at Swales.
- Continue support of the THEMIS issue tracking system on Hammers web site.
- Continue support of initial design plans.
- Finalize Probe event format

10.0 WBS 2.2.2.3 MECHANICAL SYSTEMS (PROBE)

- Support Power subsystem lead in the selection of battery configuration
- Continue to collect interface information
- Proceed on detailed design and analysis of structure
- Manufacturing NRE and tooling design
- Release ICDs as required

11.0 WBS 2.2.2.4 THERMAL

- Research/Develop implementation of Gold plating/bonding/depositing on composite panels.
- Integrate second set of detailed instrument models with s/c model.
- Perform shunt resistor placement analyses
- Perform battery placement analysis trade
- Create RCS thermal ICD for Aerojet
- Perform Load Shed Case to answer RFA 15

- Create probe heat flow map to answer RFA 16
- Work on Probe Thermal Spec

12.0 WBS 2.2.2.5 PROBE BUS I&T

- Further develop I&T flow and EGSE requirements / configuration

13.0 WBS 2.2.4 PROBE CARRIER

- Define harness / electronics accommodation
- Continue detailed design and analysis
- Place NSI order
- Detailed separation system stress analysis
- Complete ring drawings
- Order long lead items for development testing of separation system

14.0 WBS 2.2.5 MISSION INTEGRATION & TEST

- Issue draft of I&T plan for internal review
- Further develop resource planning documentation

Enclosure 1 Current Mass and Power Allocations (February 05, 2004)

Enclosure 2a Major Milestone Schedule (February XX, 2004)

Enclosure 2b Integrated Probe and Probe Carrier Schedule (February XX, 2004)
(Note generated in Welcom Home Open Plan and converted to MS Project)

Enclosure 3a Risk management Data Base Stoplight Report (February 05, 2004)

Enclosure 3b Risk management Data Base Risk Exposure Report (February 05, 2004)

Enclosure 4 Instrument ICD/Thermal Model/System Document Status (February 10, 2004)

Note 533Ms supplied under separate cover

cc:
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