ICESat-2

RAPID III OBSERVATORY DO

ATTACHMENT G

MODIFICATION OF RAPID III MAJOR PAYMENT EVENTS, PERFORMANCE-BASED PAYMENT SCHEDULE, AND COMPLETION CRITERIA

1. Clause H.15 Performance-Based Payment Events and Completion Criteria modification:

Modification of Payment Events

Payment Event No.	Payment Event	Percent	Month (ARO+)
A	Spacecraft Kickoff Meeting		
B	Spacecraft Requirements Review		
C	Spacecraft Preliminary Design Review (PDR)		
C.1	Spacecraft Interface Simulator (SIS) #1 Delivered		
C.2	Major Subcontracts Placed		
C.3	C&DH and EPS Pre-CDR Engineering Peer Reviews		
D	Spacecraft Critical Design Review (CDR)		
D.1	Engineering Model IEM Integrated to Hotbench		
D.2	Spacecraft Primary Structure Delivered to I&T		
D.3	Flight Integrated Electronics Module (IEM) Integrated		
D.4	Flight Power Distribution Unit (PDU) Integrated		
E	Instrument Integration Readiness Review (IIRR)		
F	Observatory Pre-Environmental Review (PER)		
F.1	Completed Observatory Vibration Test		
G	Observatory Pre-Shipment Review (PSR)		
G.1	Completed Launch Site Comprehensive Performance Test		
H	Final Acceptance (Per Clause H.16) with 60 day on-orbit checkout		
	Total		
*The payment events occur after satisfactory completion of these reviews, including completion of actions/RFAs resulting from these reviews.			

ARO = After Receipt of Order

The percents are based on the total value of the order. All ICESat-2 Spacecraft DO Major Payment Events are denoted by alphabetic characters (e.g., A,B,C etc). All interim payment events are denoted by alphanumeric designations (e.g., B.1). Completion Criteria for each payment event are as indicated in the Payment Event Completion Criteria section below.

The Contracting Officer shall unilaterally determine the Contractor's completion of each event. The Contracting Officer's determination of event completion will include, but is not limited to, the completion criteria listed below for the above major events and the applicable completion criteria listed in Section J, Attachment B. Generally, payment events shall be paid in succession. All preceding payment events shall be successfully completed before payment will be made for the next payment event, unless the prior written consent of the Contracting Officer is obtained.

2. Payment Events Completion Criteria modification:

A. Spacecraft Kickoff Meeting

1. The kick-off meeting was completed with the major sub-contractors in attendance.

2. The Contractor thoroughly described the organizational approach to managing the spacecraft build, described the facilities required to perform the ICESat-2 Program effort and their availability and described any modifications required to accommodate the program. The Contractor identified any government resource dependencies where reliance on availability of Government Furnished Property (GFP), facilities, personnel, etc are inline to achieve mission success. The Contractor showed a staffing plan identifying the description and general qualifications for the principal positions required for the duration, approximate level of effort for each position (¼, ½, ¾, full time), and named all key individuals already on board.

3. The Contractor described in detail the systems engineering effort in the analyses of technical requirements and allocation of derived spacecraft, and lower level requirements. The Contractor discussed the establishment and the maintenance of requirements traceability between all levels of the spacecraft and maintenance of all interfaces. The Contractor presented the approach for the support of the on-going risk management program, trending of appropriate technical parameters, plan for conducting the program formal and informal reviews, development and maintenance of spacecraft and launch vehicle performance budgets, and verification and validation of all defined and derived requirements.

4. The Contractor presented the detailed Integrated Master Schedule (IMS) showing the critical path and addressing areas of risk through acceptance on orbit. The schedule was presented at the subsystem level and included the internal relationships between events within the overall schedule, definition of the time duration of all tasks. Provided the planned start and completion date for all events and the target date for all milestones.

B. Spacecraft System Requirements Review

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the Data Requirements Document (DRDs) and Data Item Descriptions (DIDs) have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Spacecraft System Requirements Review in accordance with the Statement of Work (SOW) and demonstrated compliance with the SDR success criteria of GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has demonstrated to the satisfaction of the Government, a complete and thorough understanding of the spacecraft requirements and the allocation of requirements to each subsystem has been completed and the requirements are verifiable. In addition, action items have been closed or an approved action item closure plan is in place. The contractor has generated a resolution plan (item, responsibility, closure date) for all open items (e.g. TBD, TBR, TBS, etc), and submitted any change requests needed.

3. All previous milestones have been met and payment has been approved by the Contracting Officer.

C. Spacecraft Preliminary Design Review

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Spacecraft Preliminary Design Review in accordance with the SOW and demonstrated compliance with the PDR success criteria of GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has conveyed a credible and tractable design solution that meets all mission requirements and is prepared to proceed with the detailed design. In addition, the Contractor has conveyed that the project is on-track to complete the system development within the identified schedule. The Contractor has provided an overview of implementation issues, their potential impact, and risk mitigation plan, specifically, any and all heritage issues from previous similar missions. In addition, action items have been closed or an approved action item closure plan is in place. The contractor has generated a resolution plan (item, responsibility, closure date) for all open items (e.g. TBD, TBR, TBS, etc), and submit any change requests needed.

3. All previous milestones have been met and payment has been approved by the Contracting Officer.

C.1 Spacecraft Interface Simulator (SIS) #1 Delivered

1. The Contractor has met all requirements of the SIS #1 in accordance with the SOW and has delivered the SIS #1 to the specified GSFC location per the DIL.

2. The Contractor has successfully completed its acceptance test of the delivered SIS#1.

3. All previous milestones have been met and payment has been approved by the Contracting Officer.

C.2 Major Subcontracts Placed

1. The following subcontracts have been definitized and placed on order:

   A. Star Tracker

   B. Solar Array

   C. Battery

   D. Hydrazine Thrusters

   E. Solar Array Drive Assembly

   F. Reaction Wheel Assemblies

   G. Hydrazine Propellant Tank

   H. S-band Transceivers

   I. X-band Transmitters

   J. Solid State Recorder

   K. Global Positioning System (GPS) Receiver

   L. Scalable Space Inertial Reference Unit (SIRU)

   M. RAD750 Processors

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

C.3 C&DH and EPS Subsystem Pre-CDR Engineering Peer Reviews

1. The Contractor held the Pre-CDR C&DH and EPS subsystem Engineering Peer Reviews. In addition, any critical action items generated as a result of this review have been completed by the contractor prior to the Spacecraft CDR.

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

D. Spacecraft Critical Design Review

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Spacecraft Critical Design Review in accordance with the SOW and demonstrated compliance with the CDR success criteria in

accordance with GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has established that the maturity of the design and the development effort are appropriate to support proceeding with full-scale fabrication activities and that the project is on-track to complete the system's development to meet mission performance requirements within the identified schedule constraints. The Contractor has identified any areas of significant implementation or operational risk to the program. For each identified risk, the contractor has identified methods to be used to mitigate the overall risk to the program. Open issues have been identified and plans for resolving these issues have been documented and subsequently tracked through the program review process. The Contractor has provided an update of implementation issues, their potential impact, and risk mitigation plan, specifically any and all heritage issues from previous similar missions. The Contractor has identified all performance margins and metrics. In addition, action items have been closed or an approved action item closure plan is in place.

3. All previous milestones have been met and payment has been approved by the Contracting Officer.

D.1 Engineering Model (EM) Integrated Electronics Module (IEM) Integration to Hotbench

1. The contractor has successfully completed its unit testing of the IEM Engineering Model, and the EM has been integrated into the Hotbench EGSE.

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

D.2 Spacecraft Primary Structure Delivered to I&T

1. The contractor has successfully completed the assembly, static load testing, and modal testing of the spacecraft primary flight structure, and has delivered the hardware to I&T.

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

D.3 Flight Integrated Electronics Modules (IEM) Integration

3. The contractor has successfully completed its acceptance test of the flight IEM, and the IEM has been mechanically integrated onto the spacecraft.

4. All previous milestones have been met and payment has been approved by the Contracting Officer.

D.4 Flight Power Distribution Unit (PDU) Integration

1. The contractor has successfully completed its acceptance test of the flight PDU, and the PDU has been mechanically integrated onto the spacecraft.

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

E. Instrument Integration Readiness Review (IIRR)

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Instrument Integration Readiness Review in accordance with the SOW and demonstrated compliance with the SIR success criteria of GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. In addition, action items have been closed or an approved action item closure plan is in place.

3. The ICESat-2 spacecraft bus is completely assembled, tested, and ready for instrument integration, and the Contractor is ready to receive the instrument and all necessary procedures are in place. The Contractor has demonstrated through I&T records the successful completion of bus module and sub-system integration & testing. The bus I&T program has verified through testing that the bus design met all of the requirements, specifications, and interfaces as documented in the DO. The Contractor has demonstrated a successful completion of a bus comprehensive performance test (CPT). Plans and procedures for integration of the payload module have been reviewed and approved by the applicable organizations. All anomaly / problem failure reports and action items from the bus I&T program have been closed or have an approved plan for closure. The Contractor has presented the plan and procedures for the integration of the ATLAS instrument. All exceedances have been documented in the I&T records with supplied working dispositions.

4. All previous milestones have been met and payment has been approved by the Contracting Officer.

F. Observatory Pre-Environmental Review (PER)

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Pre-Environmental Review in accordance with the SOW and demonstrated compliance with the PER success criteria as defined in GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has provided a plan for the environmental test/calibration program and environmental test flow that meets the program needs and assures the proper baseline of performance of the observatory to be tested. Also, the contractor has demonstrated that the observatory is ready to begin a qualification test program to validate end-to-end system performance. The Contractor has provided the test verification matrix, including measurement tolerances, stimuli, contamination control; and results from the Comprehensive Performance Tests (CPT) along with the final results of any life tests. The Contractor has identified all performance margins and metrics. The contractor has demonstrated the

readiness of all required environmental facilities and essential MGSE & EGSE to support operations. In addition, any action items generated as a result of this review have been closed to the satisfaction of the Government or an approved action item closure plan is in place.

3. All previous milestones have been met and payment has been approved by the Contracting Officer.

F.1 Completed Observatory Vibration Test

1. The integrated ICESat-2 Observatory has completed vibration testing in accordance with the Environmental Requirements Document and as defined by the ICESat-2 I&T Test Plan.

2. All previous milestones have been met and payment has been approved by the Contracting Officer

G. Observatory Pre-Ship Review:

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables for which delivery is required prior to this milestone have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the Pre-Ship Review in accordance with the SOW and demonstrated compliance with the PSR success criteria in accordance with GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has demonstrated, with verification and I&T records, that the design of the spacecraft has been validated through the environmental qualification. The contractor has demonstrated that the S/C is compliant with NASA-STD-1000 guidelines. The contractor has demonstrated successful completion of all verification activities including functional performance testing as well as ground system and network compatibility testing. The results of system testing, alignment, calibration and end item performance have been demonstrated and documented. The solutions to all problems encountered during the environmental test and validation program and the solution rationale have been presented. The Contractor demonstrated that the spacecraft, along with all the required documentation, operation procedures, etc., is ready for shipment. The contractor has demonstrated from test data records, the development and completion of the Observatory Performance and Verification Matrix and the System Environment Verification Matrix (MAR DID 9-3 and 9-4). The Contractor has provided a plan for the shipment, launch site preparations and launch vehicle integration and test that meets the program needs.

3. All anomaly reports (AR's), problem failure reports (PFR's), malfunction reports, deviations, waivers and open items have been satisfactorily dispositioned.

4. In addition, any action items generated as a result of this review have been closed to the satisfaction of the Government or an approved action item closure plan is in place.

5. All previous milestones have been met and payment has been approved by the Contracting Officer.

G.1 Completed Launch Site Comprehensive Performance Test

1. The ICESat-2 Observatory has completed the Comprehensive Performance Test (CPT) at the launch site in accordance with the SOW and as defined by the ICESat-2 I&T Test Plan.

2. All previous milestones have been met and payment has been approved by the Contracting Officer.

H. Final Acceptance:

1. All Contract Data Requirements List (CDRL) data item and MAR deliverables have been delivered and the requirements of the DRDs and DIDs have been met, and the Contracting Officer has approved those data items requiring Government approval.

2. The Contractor has met all requirements of the On-Orbit Acceptance Review in accordance with the SOW and demonstrated compliance with the OAR success criteria in accordance with GSFC-STD-1001, Criteria for Project Flight Critical Milestone Reviews. The Contractor has demonstrated on-orbit acceptance of the spacecraft, using on-orbit test data and supporting analyses, to validate and verify spacecraft health, performance, and functionality. Specifically, this shall include demonstration of: successful and complete activation and calibration, deployment of all appendages, and demonstration of specification compliance.

3. All anomaly reports (AR's), problem failure reports (PFR's), malfunction reports, deviations, waivers and open items have been satisfactorily dispositioned.

4. In addition, any action items generated as a result of this review have been closed to the satisfaction of the Government or an approved action item closure plan is in place.

5. All previous milestones have been met and payment has been approved by the Contracting Officer.

3. Clause J.1 List of Attachments (Modification of Performance-Based Payment Schedule):

Modification of the GD-300HP Payment Schedule

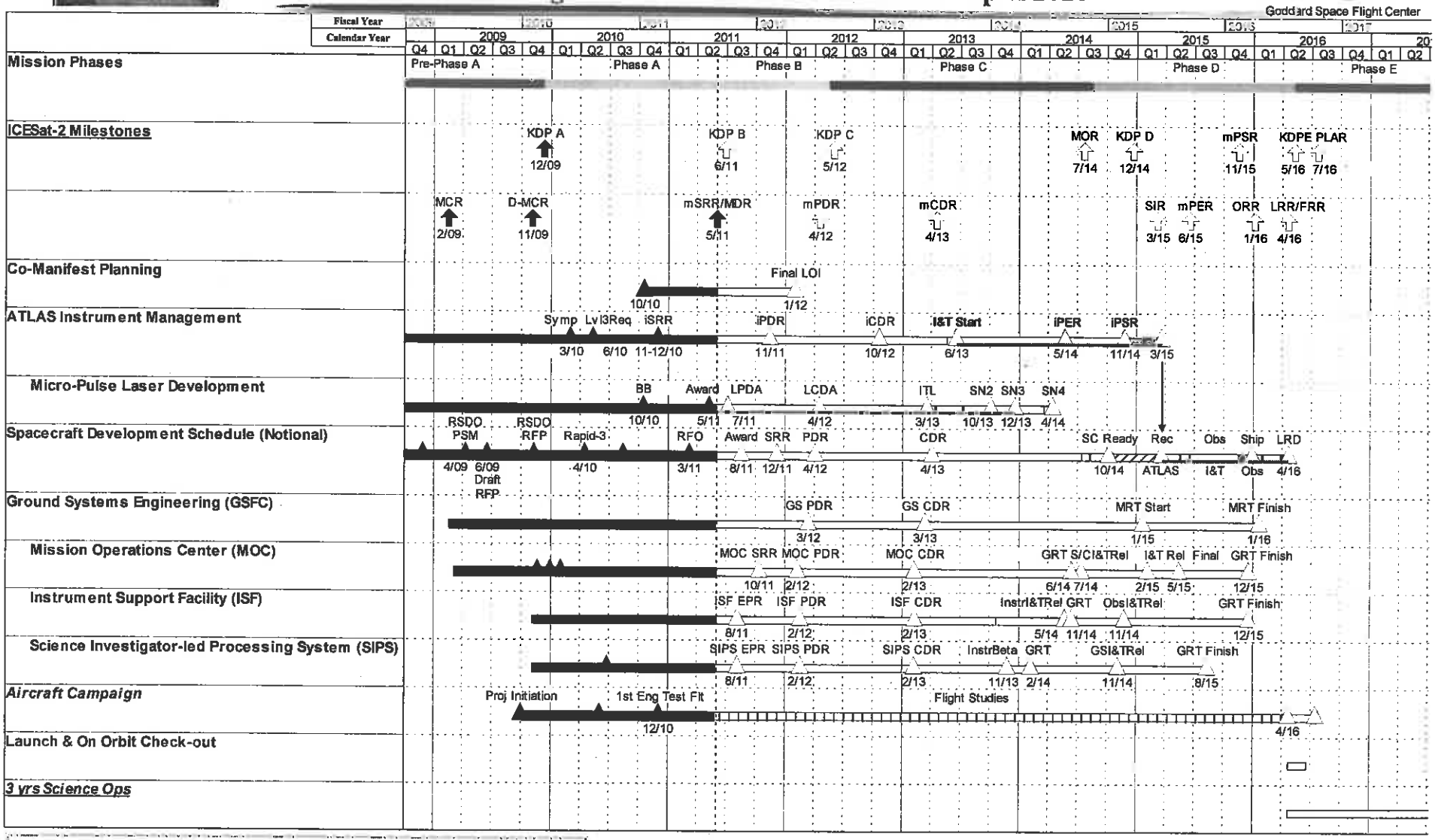
Months ARO	Payment Event Number	Payment Percent	Payment Amount	Cumulative Percent	Cumulative Payment	Cumulative Funding	Cumulative Expenditure
0	A						
2	B						
6	C						
12	C.1						

15	C.2	
18	C.3	
19	D	
22	D.1	
25	D.2	
28	D.3	
32	D.4	
37	E	
43	F	
46	F.1	
49	G	
53	G.1	
Launch + 60 days	H	

ICESat-2 Mission Master Schedule

Photon Counting Multibeam Instrument -- LRD = April 2016

Goddard Space Flight Center



DIRECTIVE NO: [illegible]
EFFECTIVE DATE: [illegible]
EXPIRATION DATE: [illegible]

- From Confirmation to the beginning of Observatory Integration and Test (I&T): 1 month of funded schedule reserve per year
- From start of I&T to shipment to launch site (or to planned storage): 2 months of funded schedule reserve per year
- From delivery to launch site to launch: 1 week of funded schedule reserve per month

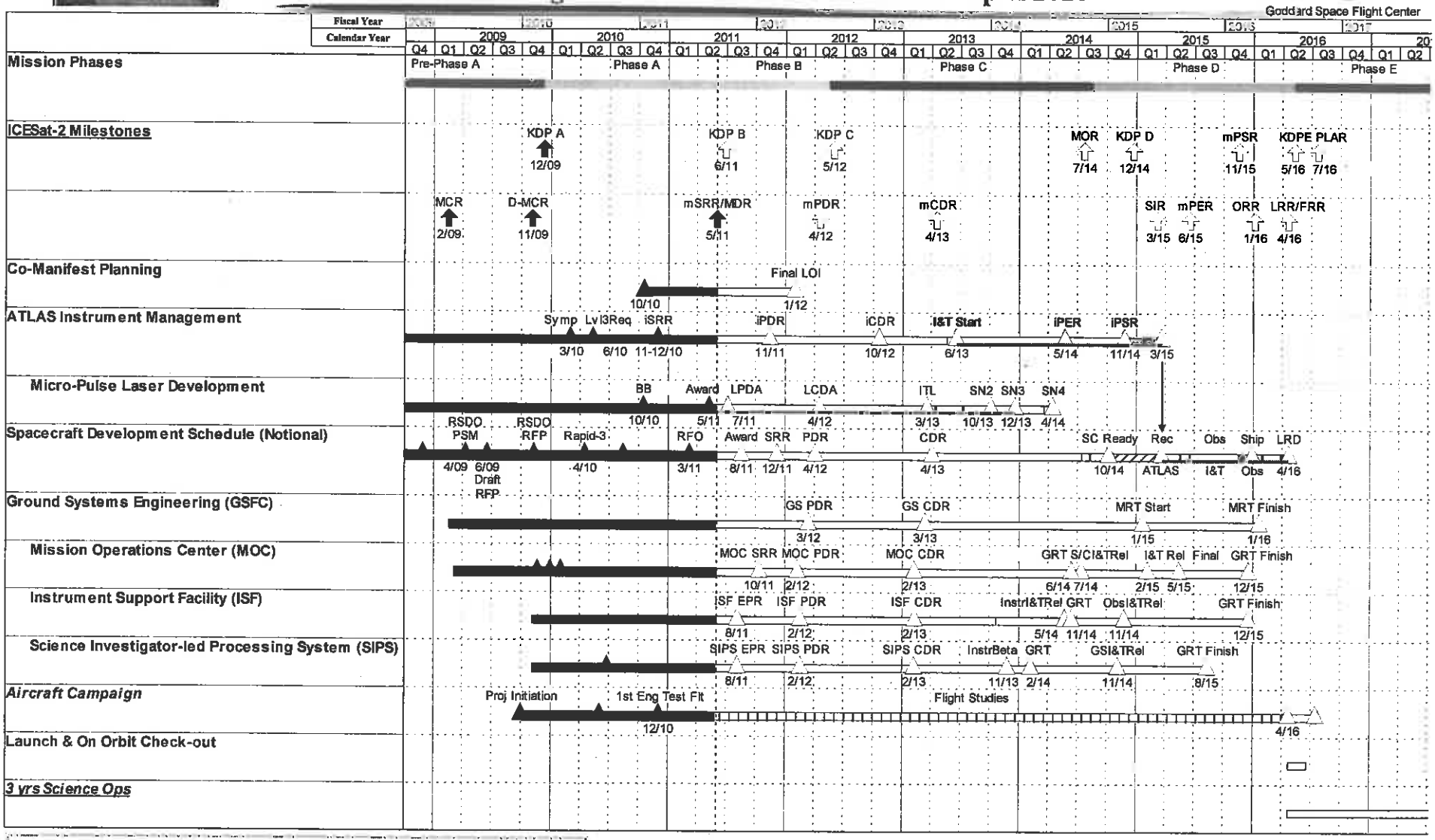
Key:
Funded Schedule Reserve

Revision Date: 06/10/11

ICESat-2 Mission Master Schedule

Photon Counting Multibeam Instrument -- LRD = April 2016

Goddard Space Flight Center



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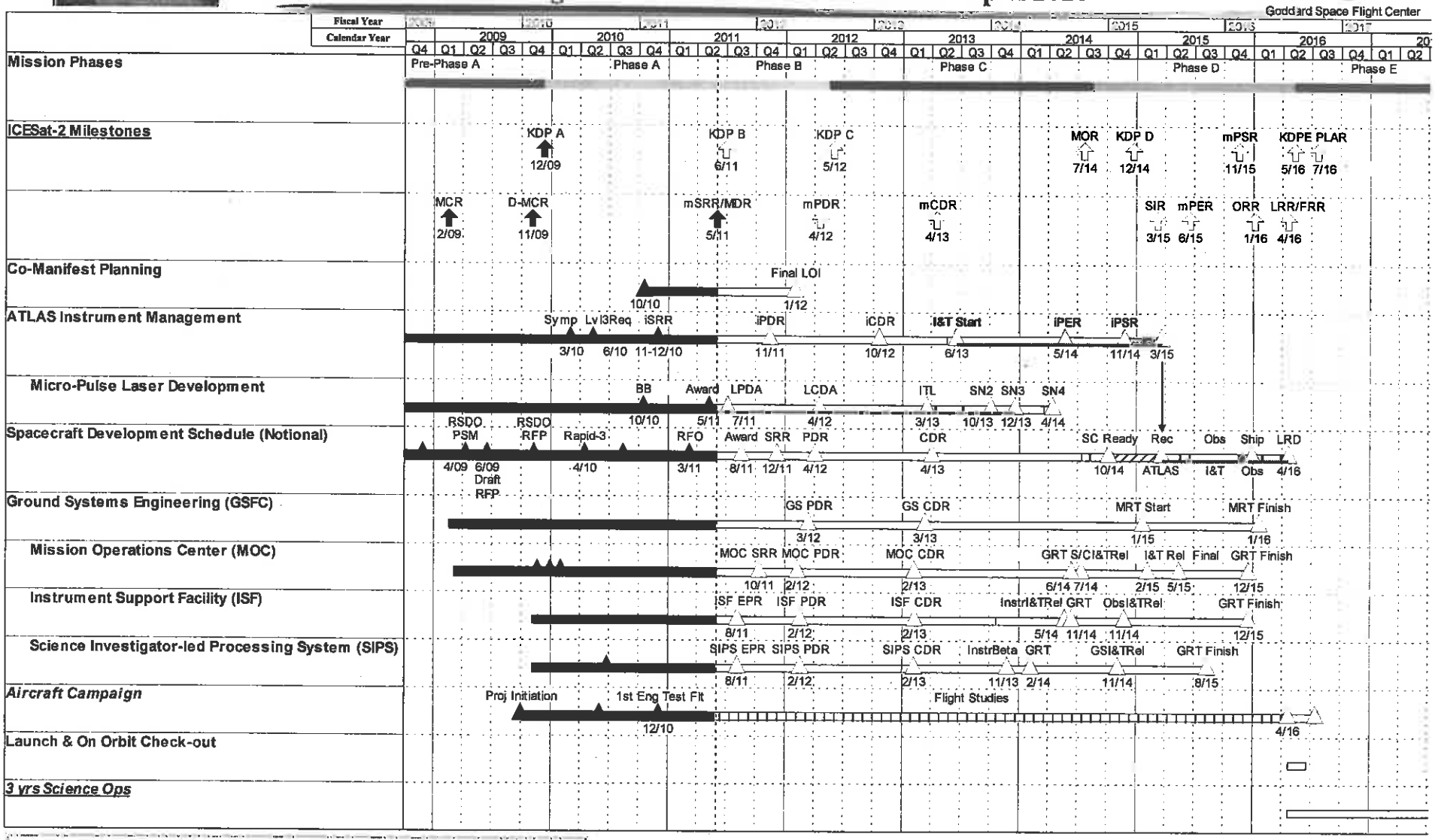
Key:
Funded Schedule Reserve

Revision Date: 06/10/11

ICESat-2 Mission Master Schedule

Photon Counting Multibeam Instrument -- LRD = April 2016

Goddard Space Flight Center



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- From Confirmation to the beginning of Observatory Integration and Test (I&T): 1 month of funded schedule reserve per year
- From start of I&T to shipment to launch site (or to planned storage): 2 months of funded schedule reserve per year
- From delivery to launch site to launch: 1 week of funded schedule reserve per month

Key:
Funded Schedule Reserve

Revision Date: 06/10/11