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RESOURCE ALLOCATION DOCUMENT (RAD) FOR THE EOS CHEMISTRY AND SPECIAL FLIGHTS PROJECT

July 1, 1997

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

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FOR THE
EOS CHEMISTRY AND SPECIAL FLIGHTS PROJECT

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NASA Goddard Space Flight Center
Greenbelt, Maryland

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FOR THE
EOS CHEMISTRY AND SPECIAL FLIGHTS PROJECT

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CHANGE RECORD PAGE

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Acronym List

arcsec	arcsecond(s)
HIRDLS	High Resolution Dynamics Limb Sounder
Hz	Hertz
kbps	kilobits per sec
kg	kilogram
MLS	Microwave Limb Sounder
ODUS	Ozone Dynamics Ultraviolet Spectrometer
rms	root mean squared
sec	second(s)
TES	Tropospheric Emission Spectrometer
w	watts

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1.0 Scope

This document contains the allocations and contingencies for the mass, power and data rate of the instruments and bus subsystems on the EOS CHEM-1 Spacecraft. The purpose of this document is to control the allocations for mass, power and data rate of the instruments, and to publish allocations for mass, power and data rate of the spacecraft bus and subsystems that are being carried by the spacecraft contractor. In the early stages of the program these resource values will be based on best estimates. In the later stages of the program this document will contain the measured resource values of the aforementioned instruments and spacecraft bus. Changes to this document must be approved by the EOS Chemistry and Special Flights Project Configuration Control Board.

The document order of precedence is as follows:

EOS Common S/C Payload Definition Document (PDD)

This document is an attachment to the spacecraft contract and contains maximum mass and power allocations for the CHEM-1 instruments.

Unique Instrument Interface Document (UIID)

These documents are listed in Instrument working agreements and contracts and contain instrument resource allocations.

Interface Control Document (ICD)

These documents are controlled by the spacecraft contractor and contain Instrument resource allocations.

Resource Allocation Document (RAD)

This document is controlled by the Chemistry and Special Flights Project and contains CHEM-1 mission resources.

2.0 Applicable Documents

Document Number	Title	Dated
424-28-21-06	Unique Instrument Interface Document (UIID) for the HIRDLS	Latest revision
424-28-24-02	Unique Instrument Interface Document (UIID) for the MLS	Latest revision
424-28-27-02	Unique Instrument Interface Document (UIID) for the ODUS	Latest revision
424-28-26-02	Unique Instrument Interface Document (UIID) for the TES	Latest revision
TBD	Interface Control Document (ICD) for the HIRDLS	TBD
TBD	Interface Control Document (ICD) for the MLS	TBD
TBD	Interface Control Document (ICD) for the ODUS	TBD
TBD	Interface Control Document (ICD) for the TES	TBD
422-13-11-05	EOS Common S/C Payload Definition Document (PDD)	Latest revision

2.1 Reference Documents

Document Number	Title	Dated
422-11-12-01	General Interface Requirements Document (GIRD) for the Common Spacecraft	Latest revision

SPACECRAFT MASS ALLOCATION HISTORY

SYSTEM / SUBSYSTEM	DELTA +/-	New Allocation (kg)	Uncertainty +/-	DATE	Description
MELV Payload Capability		3,434.0		5/1/95	Delta 7920-10L Lift Capability
MELV Payload Capability:		3,189 0		11/13/96	Revised Delta 7920-10L Lift Capability

SPACECRAFT POWER ALLOCATION HISTORY

SYSTEM / SUBSYSTEM	DELTA +/-	New Allocation (w)	Uncertainty +/-	DATE	Description
Spacecraft Total Power with Margin:		2,361.0		5/1/95	System Engineering Estimate
Spacecraft Battery Capacity for 30% DOD:		2,384 0		3/17/97	TRW System Engineering Estimate

SPACECRAFT DATA RATE ALLOCATION HISTORY

SYSTEM / SUBSYSTEM	DELTA +/-	New Allocation (kbps)	Uncertainty +/-	DATE	Description
Spacecraft Total Data Rate					
Average:		3,456 0		5/1/95	Common S/C RFP Estimate
Peak:		19,876.0		5/1/95	Common S/C RFP Estimate
Spacecraft Total Data Rate					
Average:		5,116.0		3/17/97	System Engineering Estimate
Peak:		6,568.0		3/17/97	System Engineering Estimate

HIRDLS INSTRUMENT MASS ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kg)	Uncertainty +/-	DATE	Description
HIRDLS		169.4		5/1/95	Baseline
HIRDLS		164 0		3/17/97	Current Allocation

MLS INSTRUMENT MASS ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kg)	Uncertainty +/-	DATE	Description
MLS		467 6		5/1/95	Baseline
MLS		411 0		3/17/97	Current Allocation

ODUS INSTRUMENT MASS ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kg)	Uncertainty +/-	DATE	Description
ODUS		44.0		5/1/95	Baseline
ODUS		44.0		3/17/97	Current Allocation

TES INSTRUMENT MASS ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kg)	Uncertainty +/-	DATE	Description
TES		319 0		5/1/95	Baseline
TES		305.0		3/17/97	Current Allocation

HIRDLS INSTRUMENT POWER ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (w)	Uncertainty +/-	DATE	Description
HIRDLS					
Average Power (w/Contingency)·		169.4		5/1/95	Baseline
Peak Power.		230.0		5/1/95	Baseline
HIRDLS					
Average Power (w/Contingency)·		170.0		3/17/97	Current Allocation
Peak Power.		230.0		3/17/97	Current Allocation
HIRDLS					
Average Power (w/Contingency)·		220.0		5/20/97	Current Allocation; Increase due to design maturity
Peak Power.		230.0			

MLS INSTRUMENT POWER ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (w)	Uncertainty +/-	DATE	Description
MLS					
Average Power (w/Contingency)		453 6		5/1/95	Baseline
Peak Power:		453.6		5/1/95	Baseline
MLS					
Average Power (w/Contingency).		468.0		3/17/97	Current Allocation
Peak Power		468.0		3/17/97	Current Allocation

ODUS INSTRUMENT POWER ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (w)	Uncertainty +/-	DATE	Description
ODUS					
Average Power (w/Contingency):		44.0		5/1/95	Baseline
Peak Power:		70.0		5/1/95	Baseline
ODUS					
Average Power (w/Contingency).		77 0		3/17/97	Current Allocation
Peak Power:		77 0		3/17/97	Current Allocation

TES INSTRUMENT POWER ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (w)	Uncertainty +/-	DATE	Description
TES					
Average Power (w/Contingency)·		330.0		5/1/95	Baseline
Peak Power:		470 0 (for < 1 sec)		5/1/95	Baseline
TES					
Average Power (w/Contingency).		303.0		3/17/97	Current Allocation
Peak Power.		470.0 (for < 1 sec)		3/17/97	Current Allocation

HIRDLS INSTRUMENT DATA RATE ALLOCATION HISTORY

INSTRUMENT		DELTA +/-	New Allocation (kbps)	Uncertainty +/-	DATE	Description
HIRDLS						
	Average Data Rate		50.0		5/1/95	Baseline
	Peak Data Rate		100 0		5/1/95	Baseline
HIRDLS						
	Average Data Rate.		50 0		3/17/97	Current Allocation
	Peak Data Rate		100 0		3/17/97	Current Allocation

MLS INSTRUMENT DATA RATE ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kbps)	Uncertainty +/-	DATE	Description
MLS					
Average Data Rate.		100 0		5/1/95	Baseline
Peak Data Rate:		100 0		5/1/95	Baseline
MLS					
Average Data Rate:		100.0		3/17/97	Current Allocation
Peak Data Rate:		100.0		3/17/97	Current Allocation

ODUS INSTRUMENT DATA RATE ALLOCATION HISTORY

INSTRUMENT	DELTA +/-	New Allocation (kbps)	Uncertainty +/-	DATE	Description
ODUS					
Average Data Rate:		50.0		5/1/95	Baseline
Peak Data Rate:		160 0		5/1/95	Baseline
ODUS					
Average Data Rate:		50 0		3/17/97	Current Allocation
Peak Data Rate:		160.0		3/17/97	Current Allocation

TES INSTRUMENT DATA RATE ALLOCATION HISTORY

INSTRUMENT		DELTA +/-	New Allocation (kbps)	Uncertainty +/-	DATE	Description
TES						
	Average Data Rate		3,240 0		5/1/95	Baseline
	Peak Data Rate:		19,500 0		5/1/95	Baseline
TES						
	Average Data Rate:		4,900 0		3/17/97	Current Allocation
	Peak Data Rate:		6,200 0		3/17/97	Current Allocation

SPACECRAFT MASS ALLOCATION TABLE

	Estimated (kg)	Contingency (kg)	Contingency (%)	Budget (kg)	Comments
BUS SUBSYSTEMS·					
STRUCTURES AND MECHANISMS	553 0	76 0	14%	629 0	
THERMAL CONTROL	71 0	18.0	25%	89.0	
ELECTRICAL POWER	614 0	90 0	15%	704 0	
GUIDANCE, NAVIGATION & CONTROL	111.0	5.0	5%	116 0	
COMMAND & DATA HANDLING	65.0	8.0	12%	73.0	
COMMUNICATIONS	26.0	3.0	12%	29 0	
PROPULSION (DRY)	42 0	2.0	5%	44.0	
SPACECRAFT BUS TOTAL MASS	1,482 0	202.0	14%	1,684.0	
INSTRUMENTS TOTAL MASS	924.0	126 0	14%	1,050.0	
SPACECRAFT DRY MASS	2,406 0	328 0	14%	2,734 0	
PROPELLANT LOAD[1]	102 0				
UNALLOCATED CODE 424 MARGIN	150 0			150 0	
SPACECRAFT LAUNCH MASS	2,658.0	328.0	14%	2,986.0	
MELV PAYLOAD CAPABALITY				3,189.0	Revised Delta 7920-10L Lift Capability
UNALLOCATED SPACECRAFT BUS MARGIN				203.0	
UNALLOCATED BUS MARGIN / SPACECRAFT DRY MASS				12%	

Notes

[1] Propellant Load Changed (3/5/97) from 181 to 102 kg based on orbit maintenance.

SPACECRAFT POWER ALLOCATION TABLE

	Estimated (watts)	Contingency (watts)	Contingency (%)	Budget (watts)	Comments
BUS SUBSYSTEMS					
STRUCTURES AND MECHANISMS	0 0			0 0	
THERMAL CONTROL	65 0	16 0	25%	81 0	
ELECTRICAL POWER	44 0	3 0	7%	47 0	
GUIDANCE, NAVIGATION & CONTROL	156 0	8 0	5%	164 0	
COMMAND & DATA HANDLING	146 0	17 0	12%	163 0	
COMMUNICATIONS	110 0	13 0	12%	123 0	
PROPULSION (DRY)	55 0	14 0	25%	69 0	
SPACECRAFT BUS TOTAL POWER	576 0	71 0	12%	647 0	
INSTRUMENTS TOTAL POWER	1,068 0	132 0	11%	1,200 0	
UNALLOCATED CODE 424 MARGIN	0 0			0 0	
SPACECRAFT LOAD	1,644 0	203 0	12%	1,847 0	
SUNLIGHT OPERATION					
EPS & HARNESS LOSSESS (EDI)				557 0	
BATTERY CHARGE POWER				1,679 0	
SOLAR ARRAY LOAD				4,083 0	
SOLAR ARRAY CAPABILITY (EOL)				4,740 0	
ARRAY MARGIN (CAPABILITY - LOAD)				657 0	
ARRAY MARGIN (%)[1]				16%	
ECLIPSE OPERATION					
EPS & HARNESS LOSSESS (EDI)				312 0	
BATTERY LOAD				2,159 0	
BATTERY CAPABILITY FOR 30% DOD				2,384 0	TRW System Engineering Estimate
BATTERY MARGIN (MAX LOAD - S/C LOAD)				225.0	
BATTERY MARGIN / SPACECRAFT LOAD (%)				12%	

Notes

[1] Computed from Array Margin (Capability-Load) / Solar Array Load

SPACECRAFT DATA RATE ALLOCATION TABLE

	Allocated		*Estimated*		*Measured*		*Actual*		Comments
	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	
SUBSYSTEM									
STRUCTURES AND MECHANISMS									
THERMAL CONTROL									
ELECTRICAL POWER									
GUIDANCE, NAVIGATION & CONTROL									
COMMAND & DATA HANDLING									
COMMUNICATIONS									
PROPULSION (DRY)									
SUBSYSTEM SUM	16 0	16 0							TRW System Engin. Estim.
INSTRUMENTS DATA RATE	5100 0	6560 0							Instrument Allocations
SPACECRAFT DATA RATE	5116.0	6576.0							

INSTRUMENTS MASS ALLOCATION TABLE

INSTRUMENT	Allocated (kg)	Estimated (kg)	Measured (kg)	Actual (kg)	Comments
HIRDLS					
SUBSYSTEMS SUM	150 0				
CONTINGENCY*	14 0				
INSTRUMENT TOTAL	164 0				Current Allocation
MLS					
SUBSYSTEMS SUM	374.0				
CONTINGENCY*	37 0				
INSTRUMENT TOTAL	411 0				Current Allocation
ODUS					
SUBSYSTEMS SUM	40 0				
CONTINGENCY*	4.0				
INSTRUMENT TOTAL	44.0				Current Allocation
TES					
SUBSYSTEMS SUM	277.0				
CONTINGENCY*	28.0				
INSTRUMENT TOTAL	305.0				Current Allocation
INSTRUMENTS SUM	924 0				
UNALLOCATED INSTRUMENT MARGIN[1]	126 0				CODE 424 CONTROLLED
INSTRUMENTS TOTAL MASS	1050.0				

Notes
* Held by Instrument Developer's Program Management
[1] Requires Instrument Systems Manager Approval to Allocate

INSTRUMENTS POWER ALLOCATION TABLE

	Allocated		*Estimated*		*Measured*		*Actual*		Comments
	Average (w)	Peak (w)	Average (w)	Peak (w)	Average (w)	Peak (w)	Average (w)	Peak (w)	
HIRDLS									
SUBSYSTEMS SUM	203 7								
CONTINGENCY*	16 3								
INSTRUMENT TOTAL	220 0	230 0							Current Allocation
MLS									
SUBSYSTEMS SUM	425.0								
CONTINGENCY*	43.0								
INSTRUMENT TOTAL	468.0	468.0							
ODUS									
SUBSYSTEMS SUM	70 0								
CONTINGENCY*	7.0								
INSTRUMENT TOTAL	77.0	77 0							Current Allocation
TES									
SUBSYSTEMS SUM	275.0								
CONTINGENCY*	28.0								
INSTRUMENT TOTAL	303.0	470 0 (for < 1 sec)							Current Allocation
INSTRUMENTS SUM	1,068.0	1,245.0							
UNALLOCATED INSTRUMENT MARGIN[1]	132.0								
INSTRUMENTS TOTAL POWER	1,200.0	1,245 0							

Notes

* Held by Instrument Developer's Program Management

[1] Requires Instrument Systems Manager's Approval to Allocate

INSTRUMENTS DATA RATE ALLOCATION TABLE

	Allocated		*Estimated*		*Measured*		*Actual*		Comments
	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	Average (kbps)	Peak (kbps)	
HIRDLS									
SUBSYSTEMS SUM	50 0	100 0							
INSTRUMENT TOTAL	50 0	100.0							Current Allocation
MLS									
SUBSYSTEMS SUM	100 0	100.0							
INSTRUMENT TOTAL	100 0	100.0							Current Allocation
ODUS									
SUBSYSTEMS SUM	50 0	160 0							
INSTRUMENT TOTAL	50.0	160.0							Current Allocation
TES									
SUBSYSTEMS SUM	4,900.0	6,200.0							
INSTRUMENT TOTAL	4,900 0	6,200.0							Current Allocation
INSTRUMENTS SUM	5,100 0	6,560.0							
INSTRUMENTS DATA RATE	5,100.0	6,560 0							