

**SPACE LAUNCH SYSTEM (SLS) CYROGENIC LEVEL SENSOR SYSTEM (CLSS)
WORK BREAKDOWN STRUCTURE (WBS) DICTIONARY**

WBS Level										WBS Title	WBS Description	SSOW Section	
1	2	3	4	5	6	7	8	9	10				
.01											Space Launch System (SLS) Cryogenic Level Sensor System (CLSS)	The SLS CLSS WBS element includes the Non-Recurring Engineering (NRE) and recurring tasks associated with the SLS CLSS development. The SLS CLSS consists of one Electronics Box (EB) and twenty-four (24) point level sensors. One (1) EB with thirty-two (32) channels is provided per launch vehicle. The EB processes both LOX and LH2 type point sensors. Signals are generated for wet, dry, sensor health (i.e., voltage, current, open or short circuit) and health of electronics. These signals are processed with the EB and sent to the flight computer through two (2) independent, redundant, MIL-STD-1553 databus for control and monitoring purposes. The EB is energized from two (2) independent 28 VDC power supplies during checkout, propellant loading and the ascent portion of the flight.	1.1.1
.01	.15										Non-Recurring Engineering (NRE)	The NRE WBS element includes the NRE tasks for the EB design and development, the Point Level Sensor design and development, prototype material and parts procurement, manufacturing process development and equipment procurement, and the test verification and validation. This includes the detailed design, development, manufacture, acquisition, qualification and certification of the SLS CLSS EB and sensor.	1.0
.01	.15	.01									SLS NRE	The SLS NRE WBS element consists of the effort to change from the Ares contract to the SLS contract, including the technical Subcontractor Data Requirements List (SDRL) data items. The SLS NRE effort also includes inclusion of prototype changes into the flight documentation.	

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1	2	3	4	5	6	7	8	9	10			
.01	.15	.01	.01							Flight Documentation Update	The SLS NRE flight documentation update WBS element consists of incorporating the prototype changes into the flight documentation.	3.3.7.1
.01	.15	.01	.02							SLS Documentation Review	The SLS documentation review WBS element consists of reviewing the SLS documentation provided by Boeing.	4.3.7
.01	.15	.01	.03							Technical SDRLs	The technical SDRLs WBS element consists of the SLS technical data items.	3.3.7, 4.3.2, 4.3.3, 4.3.4.1, 4.3.4.2?, 4.3.4.3, 4.3.4.4?, 4.3.4.5, 4.3.4.6, 4.3.7, 4.3.12, 4.3.13, 4.3.144.3.1 5, 4.3.16, 4.3.17, 4.4, 4.4.1, 6.1, 6.2, 6.3, 6.3.1, 6.3.2, 7.3.4, 7.3.5
.01	.15	.01	.04							SLS NRE Planning Package	The SLS NRE planning package WBS element consists of future work packages.	4.3.6, 4.4.2
.01	.15	.02								EB Prototype	The EB prototype WBS element consists of the effort associated with the EB prototype.	
.01	.15	.02	.01							Not Used	This WBS element is not used.	

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.01	.15	.02	.02							Engineering Procedures	The EB Prototype Engineering Procedures WBS element consists of generating the informal, module engineering test procedures.	
.01	.15	.02	.03							Manufacturing NRE	The EB Prototype Manufacturing NRE WBS element consists of the manufacturing effort required for the EB. This includes the traveler generation, wiring fixture generation, module soldering build setup and programming.	7.3.2
.01	.15	.02	.04							Build Work Package	The EB prototype build work package WBS element consists of the effort required to build the EB which includes the power supply modules, the control modules and the sensor modules.	
.01	.15	.02	.05							Test Work Package	The EB prototype test work package WBS element consists of the effort required to test the EB prototype. Test activities are required to characterize each module, close and end item test.	
.01	.15	.03								EB Special Test Equipment (STE)	The EB STE WBS element consists of the effort required for the EB verification and validation.	
.01	.15	.03	.01							Hardware Development	The EB STE hardware development WBS element consists of the effort required to design and develop the EB STE hardware.	7.3.3
.01	.15	.03	.02							Software Development	The EB STE software development WBS element consists of the effort required to design and develop the EB STE software.	
.01	.15	.03	.03							Fabrication & Checkout	The EB STE fabrication & checkout WBS element consists of the effort required to fabricate, build, assemble and checkout the EB STE.	
.01	.15	.03	.04							Integration	The EB STE integration WBS element consists of the effort required to integrate the EB STE hardware and software. The integration of the EB STE to the EB is also included here.	

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1	2	3	4	5	6	7	8	9	10			
.01	.15	.03	.05							Tooling & Equipment	The EB STE tooling & equipment WBS element consists of any tooling & equipment required for the EB verification and validation. The tooling includes mass simulator, vibration fixtures and thermal fixtures.	
.01	.15	.04								Sensor Prototype	The sensor prototype WBS element consists of the effort associated with the sensor prototype.	
.01	.15	.04	.01							Not Used	This WBS element is not used.	
.01	.15	.04	.02							Engineering Procedures	The Sensor Prototype Engineering Procedures WBS element consists of generating the informal, module engineering test procedures.	
.01	.15	.04	.03							Manufacturing NRE	The Sensor Prototype Manufacturing NRE WBS element consists of the manufacturing effort required for the sensor. This includes the traveler generation, wiring fixture station development, wiring process development, laser marking process development, welding process development.	7.3.2
.01	.15	.04	.04							Build Work Package	The sensor prototype build work package WBS element consists of the effort required to build the sensor.	
.01	.15	.04	.05							Test Work Package	The sensor prototype test work package WBS element consists of the effort required to test the sensor prototype. Test activities are required to characterize each module, close and end item test.	
.01	.15	.05								Sensor STE	The sensor STE WBS element consists of the effort required for the sensor verification and validation.	
.01	.15	.05	.01							Hardware Development	The sensor STE hardware development WBS element consists of the effort required to design and develop the sensor STE hardware.	7.3.3
.01	.15	.05	.02							Software Development	The sensor STE software development WBS element consists of the effort required to design and develop the sensor STE software.	

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.01	.15	.05	.03							Fabrication & Checkout	The sensor STE fabrication & checkout WBS element consists of the effort required to fabricate, build, assemble and checkout the sensor STE.	
.01	.15	.05	.04							Integration	The sensor STE integration WBS element consists of the effort required to integrate the sensor STE hardware and software. The integration of the sensor STE to the sensors is also included here.	
.01	.15	.05	.05							Tooling & Equipment	The sensor STE tooling & equipment WBS element consists of any tooling & equipment required for the sensor verification and validation. The tooling includes mass simulator, vibration fixtures and thermal fixtures.	
.01	.15	.06								Not Used	This WBS element is not used. This WBS element was used during the negotiations for the Bridging Analysis, IBR, PRR and TRR meetings. These meetings are included in the Program Management Meetings, WBS .01.17.02, below.	
.01	.15	.07								EB Qualification Unit	The EB qualification unit WBS element consists of the effort required to test the EB qualification unit. The build of the EB qualification unit was combined with the SITF development unit EB build.	
.01	.15	.07	.01							Acceptance Test	The EB qualification unit acceptance test WBS element consists of the effort required to conduct the acceptance test for the EB qualification unit.	5.3.3
.01	.15	.07	.02							Qualification Test	The EB qualification unit qualification test WBS element consists of the effort required to conduct the qualification test for the EB qualification unit.	5.3.2
.01	.15	.08								Sensor Qualification Unit	The sensor qualification unit WBS element consists of the effort required to test the sensor qualification unit. The build of the sensor qualification units was combined with the SITF development unit sensor build.	

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1	2	3	4	5	6	7	8	9	10			
.01	.15	.08	.01							Acceptance Test	The sensor qualification unit acceptance test WBS element consists of the effort required to conduct the acceptance test for the sensor qualification units.	5.3.3
.01	.15	.08	.02							Qualification Test	The sensor qualification unit qualification test WBS element consists of the effort required to conduct the qualification test for the sensor qualification units.	5.3.2
.01	.15	.09								Flight Manufacturing NRE	The flight manufacturing NRE WBS element consists of the effort required for the flight units.	
.01	.15	.08	.01							Flight Unit Travelers	The flight manufacturing NRE flight unit travelers WBS element consists of the effort required to generate the travelers for the flight units.	
.01	.15	.08	.02							Clean Room	The flight manufacturing NRE clean room WBS element consists of the effort required for the sensor clean room.	
.01	.16									Recurring	The recurring WBS element consists of the recurring costs associated with building and testing various units.	
.01	.16	.01								EB SITF Development & Qualification Units	The EB SITF Development & Qualification Units WBS element consists of the effort required to build the EB SITF development and qualification units. It also includes the effort required to test the EB SITF development unit.	
.01	.16	.01	.01							Connectors, CPs and AIs	The EB SITF Development & Qualification Units connectors, CPs and AIs WBS element consists of the effort required to build the connectors, CPs and AIs for the EB SITF Development and qualification units. The effort includes kitting, subassembly build and subassembly test.	

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1	2	3	4	5	6	7	8	9	10			
.01	.16	.01	.02							AN64671-007-01 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-01 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-01. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.03							AN64671-007-02 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-02 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-02, 2 each. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.04							AN64671-007-03 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-03 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-03, 2 each. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.05							AN64671-007-04 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-04 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-04, 2 each. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	

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.01	.16	.01	.06							AN64671-007-05 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-05 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-05. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.07							AN64671-007-06 PWA/Connector Assembly	The EB SITF Development & Qualification Units AN64671-007-06 PWA/connector assembly WBS element consists of the effort required to build the PWA/connector assembly, part number AN64671-007-06. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.08							AN64671-130-01 Backplane PWA	The EB SITF Development & Qualification Units AN64671-130-01 Backplane PWA WBS element consists of the effort required to build the backplane PWA, part number AN64671-130-01. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.09							AN64671-005-01 Backplane Assembly	The EB SITF Development & Qualification Units AN64671-005-01 Backplane Assembly WBS element consists of the effort required to build the backplane assembly, part number AN64671-005-01. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	

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.01	.16	.01	.10							AN64671-101-01 Control Module PWA	The EB SITF Development & Qualification Units AN64671-101-01 control module PWA WBS element consists of the effort required to build the control module PWA, part number AN64671-101-01. The effort includes kitting, subassembly build and subassembly test. A total of 4 each are required for the SITF development and qualification units.	
.01	.16	.01	.11							AN64671-102-01 Sensor Module PWA	The EB SITF Development & Qualification Units AN64671-102-01 sensor module PWA WBS element consists of the effort required to build the sensor module PWA, part number AN64671-102-01. The effort includes kitting, subassembly build and subassembly test. A total of 16 each are required for the SITF development and qualification units.	
.01	.16	.01	.12							AN64671-002-01/-02 Filter Box Assembly	The EB SITF Development & Qualification Units AN64671-002-01/-02 filter box assembly WBS element consists of the effort required to build the filter box assembly, part numbers AN64671-002-01 and AN64671-002-02. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.13							AN64671-100-01 Power Supply A PWA	The EB SITF Development & Qualification Units AN64671-100-01 Power Supply A PWA WBS element consists of the effort required to build the power supply A PWA, part number AN64671-100-01. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	

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1	2	3	4	5	6	7	8	9	10			
.01	.16	.01	.14							AN64671-110-01 Power Supply B PWA	The EB SITF Development & Qualification Units AN64671-110-01 Power Supply B PWA WBS element consists of the effort required to build the power supply B PWA, part number AN64671-110-01. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.15							AN64671-003-01/-02 Power Supply Assembly	The EB SITF Development & Qualification Units AN64671-003-01/-02 Power Supply Assembly WBS element consists of the effort required to build the power supply assemblies, part numbers AN64671-003-01 and AN64671-003-02. The effort includes kitting, subassembly build and subassembly test. A total of 2 each are required for the SITF development and qualification units.	
.01	.16	.01	.16							AN64671-001-01/-02 CLSS EB	The EB SITF Development & Qualification Units AN64671-001-01/-02 CLSS EB WBS element consists of the effort required to build the CLSS EBs, part numbers AN64671-001-01 (for qual) and AN64671-001-02 (for SITF Dev). The effort includes kitting, subassembly build and subassembly test. A total of 2 each EBs are required (i.e., one each of the -02 for the SITF development and one each of the -01 for the qualification unit).	
.01	.16	.01	.17							Acceptance Test	The EB SITF Development & Qualification Units acceptance test WBS element consists of the effort required to conduct the acceptance test for the SITF Development EB unit.	5.3.3
.01	.16	.02								Sensor SITF Development & Qualification Units	The Sensor SITF Development & Qualification Units WBS element consists of the effort required to build the SITF development and qualification sensors. It also includes the effort required to test the SITF development sensors.	

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1	2	3	4	5	6	7	8	9	10				
.01	.16	.03									Not Used	This WBS element is not used.	
.01	.16	.04									Not Used	This WBS element is not used.	
.01	.16	.05									SITF Qualification EB	The SITF Qualification EB WBS element is a planning package for the SITF qualification EB unit. A total of 1 each EB is required.	
.01	.16	.06									SITF Qualification Sensors	The SITF Qualification Sensor WBS element is a planning package for the SITF qualification sensors. A total of 2 each sensors are required.	
.01	.16	.07									Flight 1 EB	The Flight 1 EB WBS element is a planning package for the Flight 1 EB unit. A total of 1 each EB is required.	
.01	.16	.08									Flight 1 Sensors	The Flight 1 sensors WBS element is a planning package for the Flight 1 sensors. A total of 24 each sensors are required.	
.01	.16	.09									Spare Sensors	The spare sensors WBS element is a planning package for the spare sensors. A total of 24 each sensors are required.	
.01	.16	.10									Flight 2 EB	The Flight 2 EB WBS element is a planning package for the Flight 2 EB unit. A total of 1 each EB is required.	
.01	.16	.11									Flight 2 Sensors	The Flight 2 sensors WBS element is a planning package for the Flight 2 sensors. A total of 24 each sensors are required.	
.01	.16	.12									SIL EB	The SIL EB WBS element is a planning package for the SIL EB unit. A total of 1 each EB is required.	
.01	.16	.13									SIL Sensors	The SIL sensors WBS element is a planning package for the SIL sensors. A total of 2 each sensors are required.	
.01	.16	.14									Flight Material	The flight material WBS element is for all of the flight material.	
.01	.17										Program Management	The Program Management WBS element consists of the program management activities.	

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.01	.17	.01								Program Management	The Program Management WBS element consists of the program management activities.	
.01	.17	.02								Meetings	The Program Management Meetings WBS element consists of the meetings required for the CLSS project. This WBS element includes the following meetings: weekly internal meeting, quarterly PMR, quarterly TIM, IBR, PRR and TRR (NOTE: The bridging analysis meeting is not included since it was conducted in CLIN 8. The CDR is not included since it was conducted under the Ares contract and completed under CLIN 8. The QRR is not included since it was conducted under CLIN 8.).	3.2.8, 3.2.11
.01	.17	.03								EVMS & Program Controls	The Program Management EVMS & Program Controls WBS element consists of the EVMS and program controls activities.	4.3.11, 4.3.11.1
.01	.17	.04								Programmatic SDRLs	The Program Management Programmatic SDRLs WBS element consists of the programmatic SDRL activities.	
.01	.17	.05								Program Management Planning Package	The Program Management Planning Package WBS element consists of the the planning package for future activities.	