

NASA

SECTION 26

42

STS-107 FLIGHT READINESS REVIEW



FLIGHT CREW OPERATIONS DIRECTORATE

January 9, 2003

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Space
Center



STS-107 Flight
Readiness Review

Name:

Robert D. Cabana

Date: January 9, 2003

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- FLIGHT CREW OPERATIONS LEVEL III FLIGHT READINESS REVIEW ON DECEMBER 2, 2002.
 - NO OPEN DCR CERTIFICATIONS, PREVIOUS READINESS REVIEW ACTIONS, OR COFR EXCEPTIONS.
 - NO UNPLANNED OPEN WORK OR KNOWN CONSTRAINTS TO LAUNCH.
- STS-107 CREW AND MISSION CONTROL SUPPORT PERSONNEL ARE TRAINED AND CERTIFIED FOR FLIGHT.
- ALL REQUIRED SUPPORT AIRCRAFT ARE CURRENT IN INSPECTION AND MAINTENANCE AND ALL PILOTS HAVE COMPLETED CERTIFICATION AND ARE CURRENT.
- PENDING COMPLETION OF PLANNED WORK, FLIGHT CREW OPERATIONS IS READY TO SUPPORT THE STS-107 MISSION AND THE SUBSEQUENT SHUTTLE FERRY OPERATIONS.

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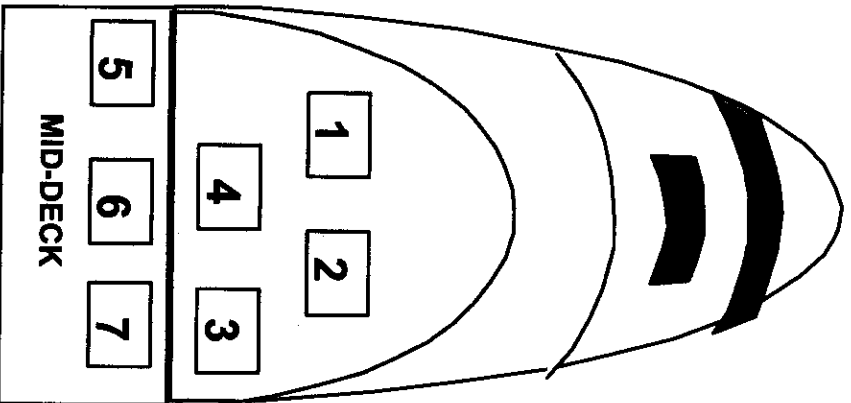
STS-107 Flight
Readiness Review

Name:
Robert D. Cabana

Date: January 9, 2003
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CREW CERTIFICATION

CDR: Husband, Rick
 PILOT: McCool, William "Willie"
 MS1: Brown, David
 MS2: Chawla, Kalpana
 MS3: Anderson, Michael
 MS4: Clark, Laurel
 PS1: Ramon, Ilan



	ASCENT	DESCENT
1	Husband	Husband
2	McCool	McCool
3	Brown	Clark
4	Chawla	Chawla
5	Anderson	Anderson
6	Clark	Brown
7	Ramon	Ramon

• FINAL STA TRAINING SCHEDULED AT EDWARDS ON 12/7/02; AT KSC ON L-2

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- STA'S NASA 945 AND 947 WILL SUPPORT PRELAUNCH CREW TRAINING AT KSC AND LAUNCH/LANDING WEATHER SUPPORT.
- IF NECESSARY, SCA NASA 911 WILL SUPPORT FERRY OPERATIONS.
- IF NECESSARY, NASA 931 WILL BE USED AS FERRY PATHFINDER.
- NASA 931 IS AVAILABLE, IF REQUIRED, FOR CREW RETURN FROM TAL SITE OR TRANSPORTATION OF EMCC PERSONNEL/EQUIPMENT

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CREW CERTIFICATION

FLIGHT READINESS STATEMENT

ALL FLIGHT CREW MEMBERS HAVE SUCCESSFULLY COMPLETED
REQUIRED TRAINING AND MEDICAL EXAMINATIONS.

A handwritten signature in black ink, appearing to read "Jon C. Harpold".

Jon C. Harpold
Acting Director, Mission
Operations (Training)

A handwritten signature in black ink, appearing to read "Jeffrey R. Davis, MD".

Jeffrey R. Davis, MD
Director, Space and Life Sciences

A handwritten signature in black ink, appearing to read "Charles R. Knarr".

Charles R. Knarr
APM, Flight Operations
United Space Alliance

A handwritten signature in black ink, appearing to read "Robert D. Cabana".

Robert D. Cabana
Director, Flight Crew Operations

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STS-107 Flight
Readiness Review

Name:
Robert D. Cabana

Date: January 9, 2003
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AIRCRAFT AND AIRCREW

FLIGHT READINESS STATEMENT

ALL AIRCRAFT ARE CURRENT IN INSPECTION AND MAINTENANCE AND ALL
FLIGHT CREW AND MAINTENANCE PERSONNEL HAVE COMPLETED
CERTIFICATION AND ARE CURRENT.


Robert J. Naughton
Chief, Aircraft Operations Division


Robert D. Cabana
Director, Flight Crew Operations

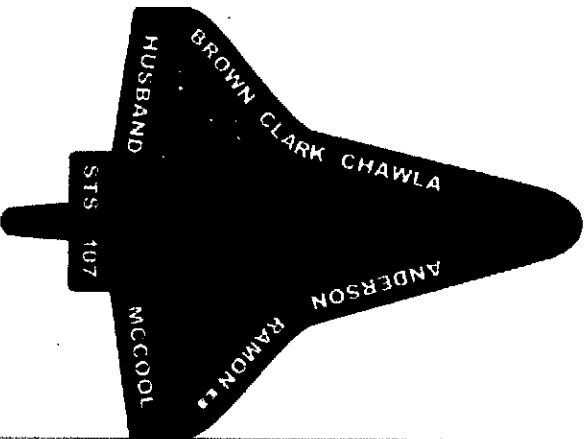


**Space and Life Sciences Directorate
Flight Readiness Review
STS-107**

S. L. Pool

Date: January 9, 2003

**STS-107
Flight Readiness Review
Space and Life Sciences Directorate**





**Space and Life Sciences Directorate
Flight Readiness Review
STS-107**

S. L. Pool

Date: January 9, 2003

Space and Life Sciences Agenda

- **Crew Health**
- **Open Items and In-flight Anomalies (IFAs)**
- **Radiation and Dosimetry Support**
 - **STS-107 Radiation Prediction**
- **Readiness Statement**



**Space and Life Sciences Directorate
Flight Readiness Review
STS-107**

S. L. Pool

Date: January 9, 2003

Crew Health

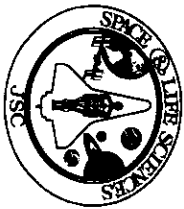
- **All Crew Physicals will be completed prior to flight**
 - **Applicable flight rules are in place**

STS-107 Crew Surgeon

Smith Johnston, M.D.

STS-107 Deputy Crew Surgeon

Steve Hart, M.D.



**Space and Life Sciences Directorate
Flight Readiness Review
STS-107**

S. L. Pool

Date: January 9, 2003

STS-107 Open Items and In-flight Anomalies (IFAs)

- All remaining open work is planned and scheduled
 - Open items for STS-107
 - Crew Physicals
 - L-3 day Space Weather Analysis
- Exercise Countermeasures are in place
- Shuttle Water Quality: L-15 day sample was collected on 1/3/03. The L-15 sample met all specifications for water quality.
- No open SSP, IFAs or constraints

STS-107 Radiation and Dosimetry Support

- Space Radiation: STS-107 Flight Specific Prediction:
 - Within Acceptable Limits



Certification of Flight Readiness Statement

The activities required to support Flight STS-107 have been accomplished except open work identified (Attachment 1). Space and Life Sciences Directorate (SLSD) is ready to support Flight STS-107.

There are no constraints to proceeding with the planned Flight STS-107 pending completion of scheduled open work.

[Signature]

SD/C. L. Fischer, M.D., Chief
Space Medicine and Health
Care System Office

[Signature]

SF/W. A. Langdoc, Chief
Habitability and Environmental
Factors Office

[Signature]

S/J.M. Anderson, Chief
Biological Systems Office

[Signature]

SIKW. Paloski, Ph.D., Chief
Human Adaptation and
Countermeasures Office

[Signature]

SX/G. J. Byrne, Ph.D., Assistant Mgr.
Office of Human Exploration Science

[Signature]

for S/UJ. Robinson, Ph.D., Chief,
Program Integration Office

[Signature]

S/MC. B. Lau, Chief, Mission and Project
Management Office

[Signature]

SAC. M. Stegemoller
Associate Director, Technical

Concurrence by: *[Signature]*

S/AJ. R. Davis, M.D.
Director, Space and Life Sciences
Directorate



Space and Life Sciences Directorate
Flight Readiness Review
STS-107

S. L. Pool

Date: January 9, 2003

Backup Charts

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**Space and Life Sciences Directorate
Flight Readiness Review
STS-107**

S. L. Pool

Date: January 9, 2003

Radiation Analysis and Dosimetry Support Backup Charts

STS-107 Flight Specific Predictions – Within Acceptable Limits

- Nominal mission (15 d 22 hr 11 m) IV crew exposure projection
 - Mission Exposure 111 mrad (307 mrem)
 - Daily Average Exposure: 7 mrad/day (19 mrem/day)

STS-107 Flight Specific Information

- Onboard Radioactivity (experiment name (# sources) – isotope – activity)
 - Orbiter fire detectors (all flights) -- orbiter (18) -- Am-241 ==> 6.12 µCi
 - Spacehab fire detectors -- Spacehab (4) -- Am-241 ==> 2.00 µCi
 - Operational TEPC (1) -- Cm-244 ==> 1.0 µCi
 - Biopack/FO-2 BONES (32) -- CA-45 ==> 0.13 µCi

SPACE WEATHER FORECAST

- Risk of additional exposure from solar particle events and trapped outer electron belt enhancements. Space Radiation Analysis Group will provide an updated forecast at L-7 days



SPACE SHUTTLE PROGRAM
Space Shuttle Program Integration
NASA Johnson Space Center, Houston, Texas



STS-107 Flight Readiness Review

January 9, 2003



SPACE SHUTTLE PROGRAM
Space Shuttle Program Integration
NASA Johnson Space Center, Houston, Texas



Agenda

Presenter		
Date	01/09/03	Page 2

- Program Integration - Flight Manager
 - Payload Overview
 - Key Program Considerations
 - Payload & System Safety
 - Orbital Debris Status *
 - Payload In-Flight Anomalies *
 - Launch Commit Criteria *
 - USA Program Integration *
 - Boeing Integration *
 - System Integration TMR
 - Requirements Waiver
 - Flight Readiness Statement
- Vanessa Ellerbe**
- No Issues
- No Issues
- No Issues
- No Issues
- No Issues
- Rod Wallace

* In Backup Charts

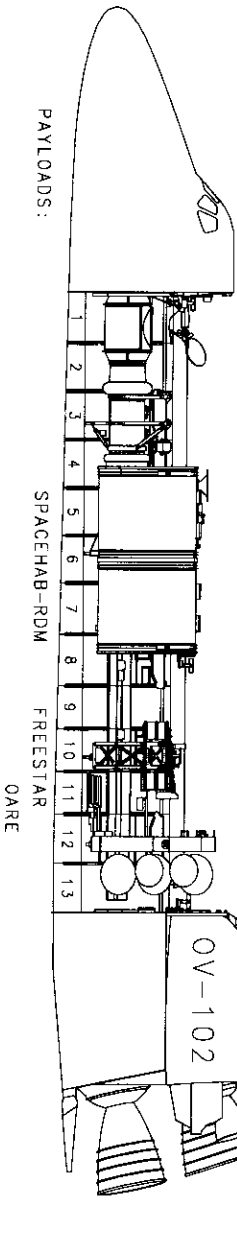
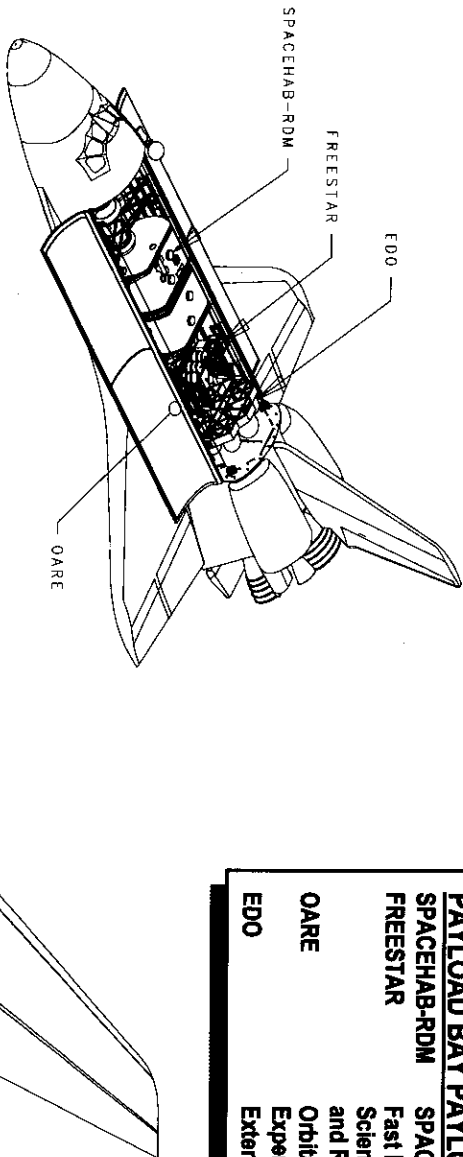


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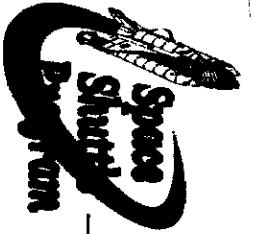


Cargo Bay Arrangement

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PAYLOAD BAY PAYLOADS:	
SPACEHAB-RDM	SPACEHAB-Research Double Module
FREESTAR	Fast Reaction Experiments Enabling Science, Technology, Applications and Research
OARE	Orbital Acceleration Research Experiment
EDO	Extended Duration Orbiter Pallet



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Payload Customers

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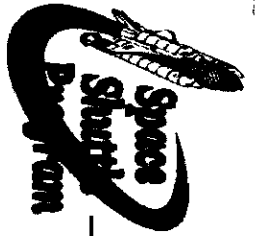
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Payload Overview

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- International Science/Research Mission
- SPACEHAB Complement – 30 Microgravity, Space, and Life Sciences Payloads
 - Commercial (SPACEHAB, Inc. customers)
 - European Space Agency
 - NASA ISS Risk Mitigation Experiment
 - NASA Code U Sponsored
- FREESTAR - 6 Earth, Space, & Microgravity Experiments
 - Mediterranean Israeli Dust Experiment (MEIDEX)
 - Shuttle Ozone Limb Sounding Experiment-2 (SOLSE-2)
 - Critical Viscosity of Xenon-2 (CVX-2)
 - Solar Constant Experiment-3 (SOLCON-3)
 - Space Experiment Module (SEM)
 - Low Power Transceiver (LPT)
- RAMBO – DOD Sponsored



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Module in Cargo Bay



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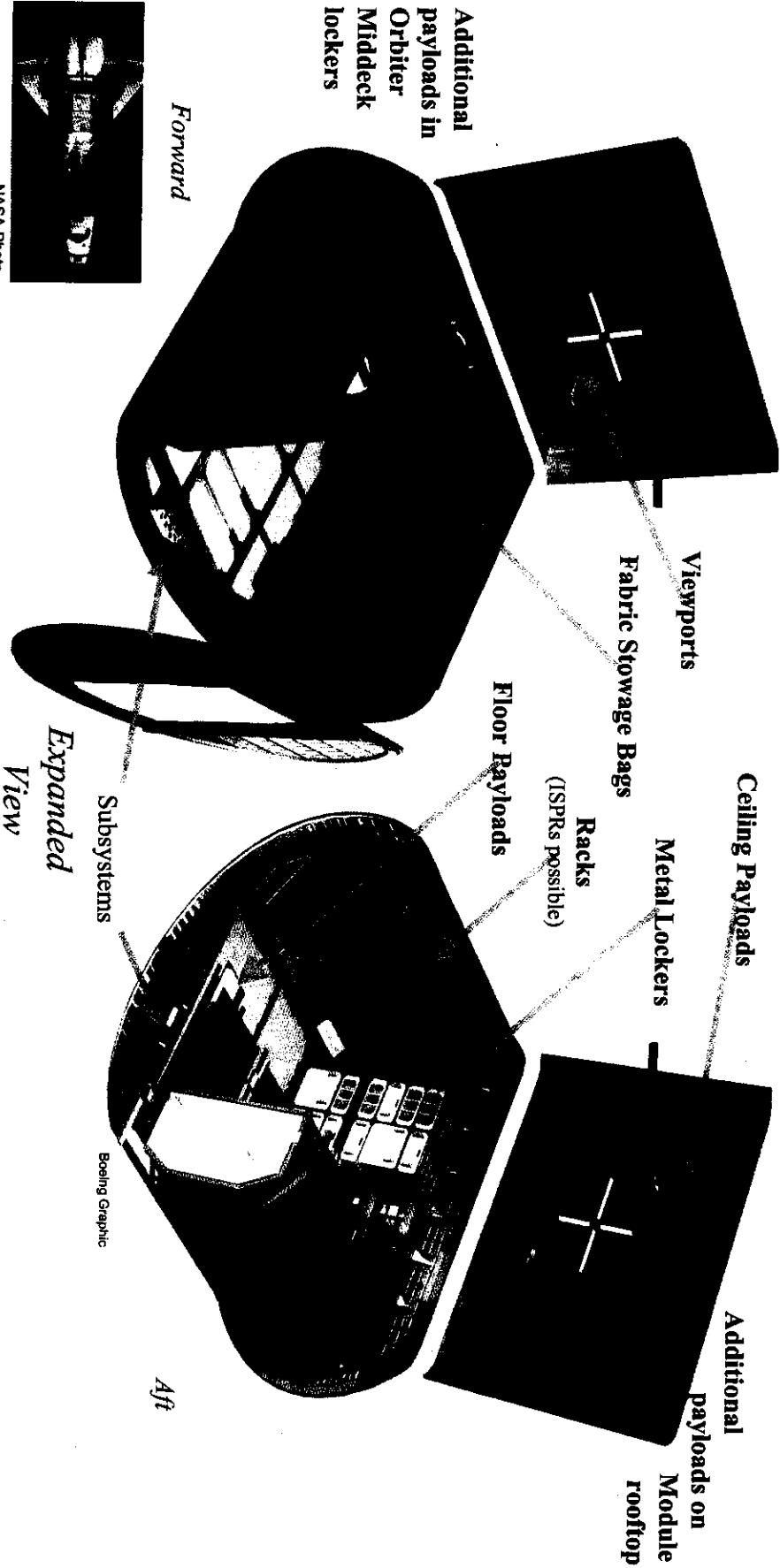


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Research Double Module

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Additional payloads in Orbiter Middeck lockers

Forward

NASA Photo

Viewports

Fabric Storage Bags

Floor Payloads (ISPRs possible)

Ceiling Payloads

Metal Lockers

Racks

Subsystems

Expanded View

Boeing Graphic

Aft

Additional payloads on Module rooftop

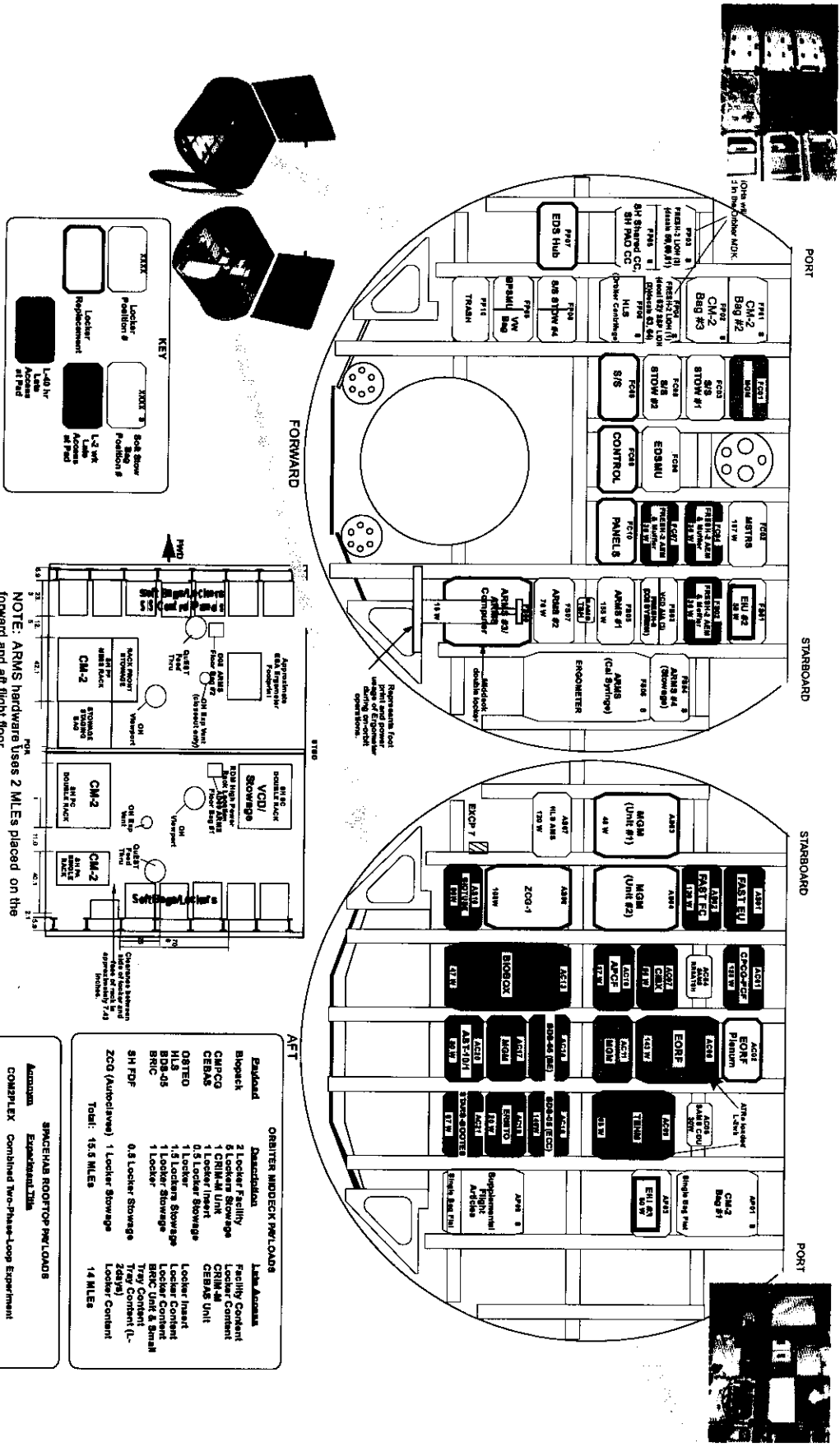


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Module Layout of Experiments

Presenter: **Vanessa Ellerbe**
Date: **01/09/03** Page **8**



10 May 2002

Standard	Description	Label Account
Blupeck	2 Locker Facility	Facility Content
CINRCG	1 CRIMINAL Unit	CRIMINAL
CERBAS	1 Locker Insert	CERBAS Unit
OSTED	1 Locker	Locker Insert
HLS	1.5 Locker Storage	Locker Content
BRIC	1 Locker	BRIC Unit & Burn
SH FDP	0.5 Locker Storage	Try Content (-Zdsj)
ZC0 (Autoclave)	1 Locker Storage	Locker Content
Total:	15.5 MILES	14 MILES

Account	Experiment/Item
COMPLEX	Combined Two-Phase-Loop Experiment
ISTRIS	Mission Science Thrust Reporting System
Shirley	CSCC & Texas A&M University Experiment



SPACE SHUTTLE PROGRAM

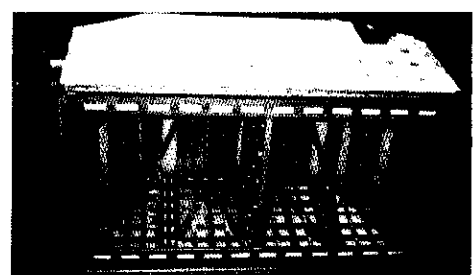
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Rack Layout of Experiments

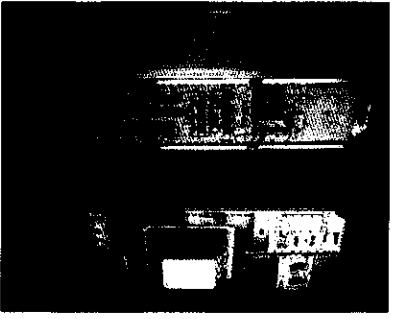
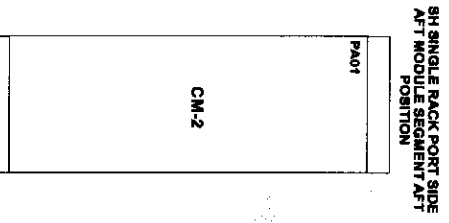
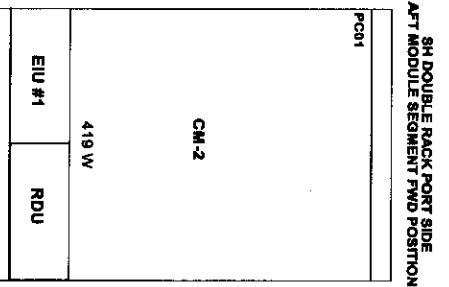
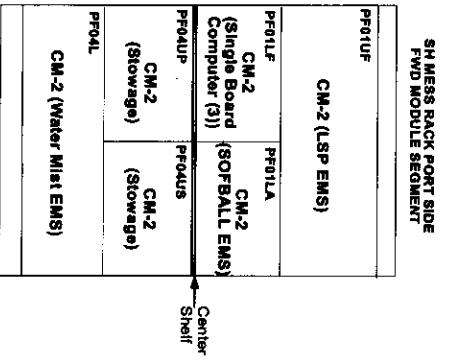
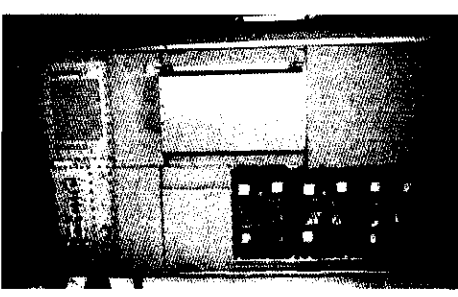
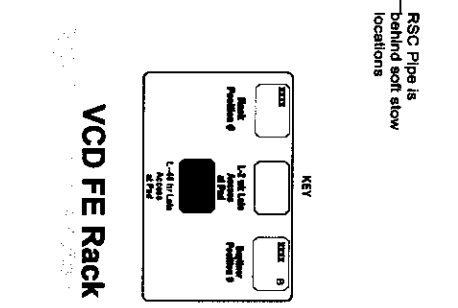
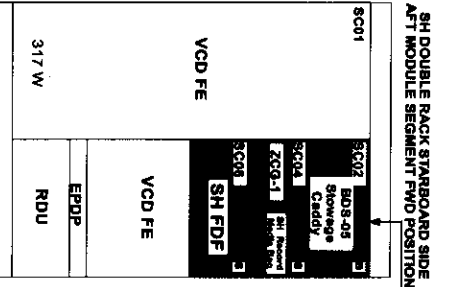
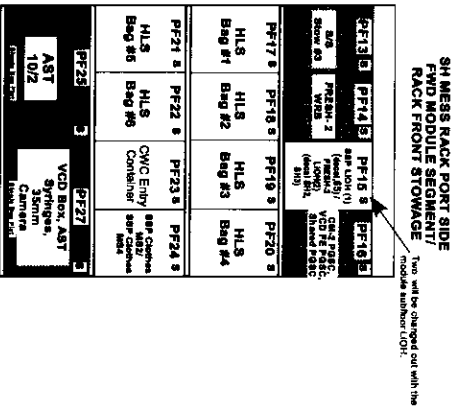
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Empty MESS Rack

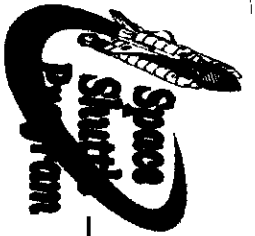


STS-106 MESS Rack



10 May 2002
CM-2 Double Rack

CM-2 Single Rack

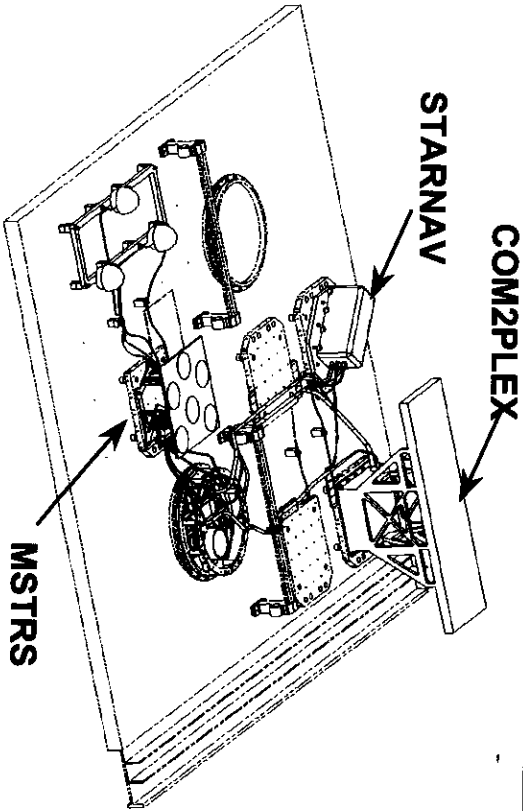


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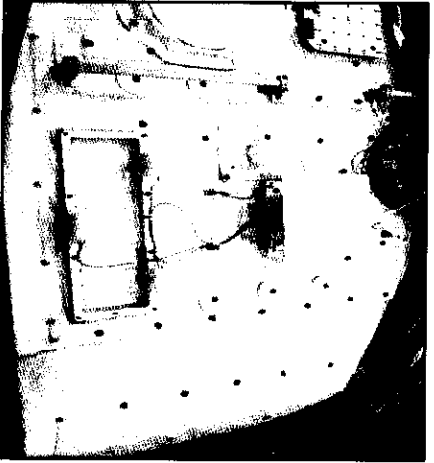
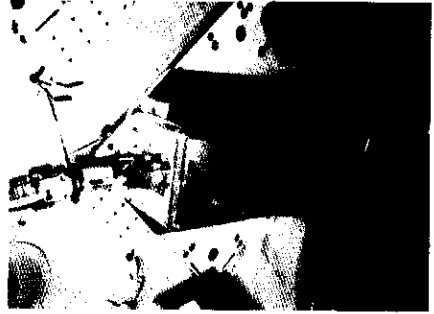
Module Rooftop Layout of Experiments

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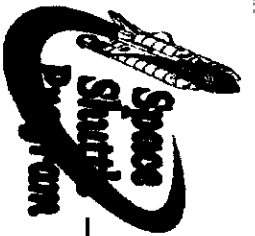
STARNAV

MSTRS



COM2PLEX





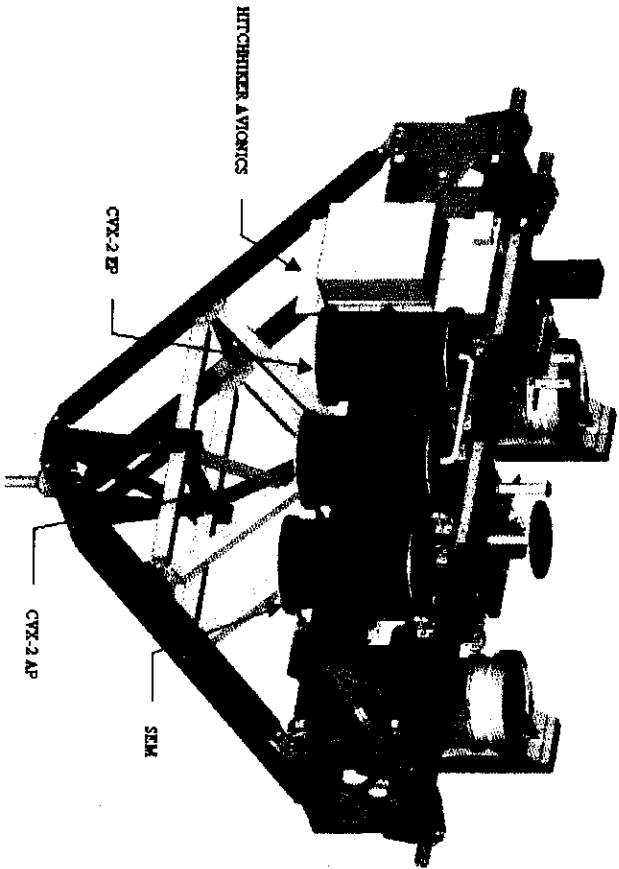
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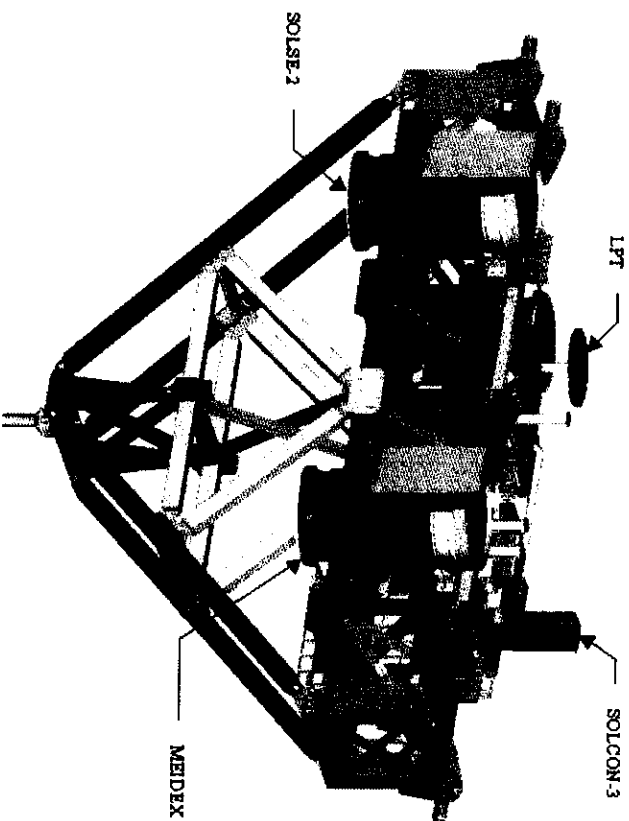
FREESTAR

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FREESTAR Forward View



FREESTAR Aft View





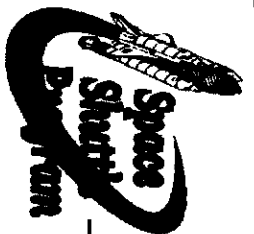
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Key Program Considerations

Presenter	Vanessa Ellerbe	
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- Dual Shift; 16 day mission; 39° Inclination
- Two Launch Attempts; Must Refurbish Module Payloads; 96-hour Scrub Turnaround
- First Flight Items
 - Research Double Module (RDM)
 - Ku-band (Commanding/Telemetry)
 - Upgraded Environmental System allows exercise in RDM
- First Extended Duration Orbiter (EDO) Mission Since STS-90 (April 17, 1998)
- 13 payload LCC's; 3 Safety and 10 Mission Success
- Launch window 2.5 hrs (crew on back constraint)
 - T-9 minute hold is 10 minutes (40 minutes for ISS flights)
- Early payload retrieval available starting at Launch +48 hours (prime and back-up) landing sites



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BRIC Sample Canisters

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- Late addition of 6 passive sample canisters (previously flown hardware) to BRIC Middeck locker per Code U request
- No crew activity required
- No payload integration issues
- Approved at January 7 Special PRCB, pending completion of PSRP analysis
- PSRP approval received 1/8/03



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Payload and System Safety

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- **Integrated Experiment Hazards Assessment - Complete**
- **Toxicology Process**
 - Verification 1: Complete
 - Verification 2: Standard open work for late load items
- **Payload Safety Review Process - Complete**
- **No Non-compliance Reports (NCR's)**



Systems Integration Requirements Waiver		Presenter	Rod Wallace
		Date	01/09/03

- STS-112 In-flight anomaly, IFA STS-112-K-01, "Ground PIC System A Failure at T-0", was dispositioned with mission-specific flight rationale for STS-113
 - Path A of SRB holddown posts pyros, and ET Vent Arm System pyros failed
 - Anomaly investigation has been completed – results scheduled to 1/16/03 PRCB
 - Previously-approved waiver, S050425AB, for STS-113 has expired--a waiver for STS-107 is necessary
- Waiver approved (Change Request S050425AD) for STS-107:
 - Waiver to NSTS 07700 Vol. V, "Information Management Requirements"
 - Failed to meet requirements of updates to hazard reports due prior to 30 days before FRR
 - Extends the STS-113 waiver for one more flight
- Hazard Report INTG-164 update will be submitted prior to 30 days before the STS-114 FRR



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STS-107 Flight Readiness Statement

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THIS CERTIFIES THAT ALL MISSION REQUIREMENTS HAVE BEEN MET AND SPACE SHUTTLE INTEGRATION IS READY FOR FLIGHT, PENDING COMPLETION OF THE DEFINED OPEN WORK AND NOTED EXCEPTION

/s/ R. Wallace for:

12/18/02

L. D. AUSTIN, JR., MANAGER
SPACE SHUTTLE SYSTEMS INTEGRATION

/s/ L. Miller for:

12/18/02

M. A. BREKKE, MANAGER
SPACE SHUTTLE CUSTOMER AND
FLIGHT INTEGRATION

/s/ F. R Hinson for:

12/18/02

H. N. HAMMOND, ASSOC. PROG. MGR
PROGRAM INTEGRATION
UNITED SPACE ALLIANCE

/s/ A. M. Larsen

12/18/02

A. M. LARSEN, MANAGER
PAYLOAD SAFETY

/s/ H. Kunkel for:

12/18/02

R. N. RICHARDS, PROGRAM DIRECTOR
SHUTTLE & SPACE STATION INTEGRATION
BOEING HUMAN SPACE FLIGHT &
EXPLORATION

/s/ R. L. Segert

12/18/02

R. L. SEGERT, MANAGER
SPACE SHUTTLE KSC INTEGRATION

/s/ R. Galvez for:

12/18/02

V. ELLERBE, FLIGHT MANAGER
SPACE SHUTTLE PROGRAM INTEGRATION

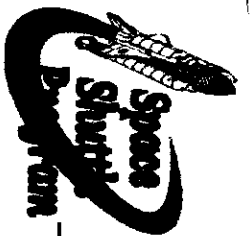


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STS-107 Flight Readiness Review

Backup Charts



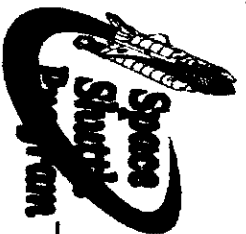
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Agenda

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- **Program Integration - Flight Manager** **Vanessa Ellerbe**
- **Orbital Debris Status** **No Issues**
- **Payload In-Flight Anomalies** **No Issues**
- **Launch Commit Criteria** **No Issues**
- **USA Program Integration** **No Issues**
- **Boeing Integration** **No Issues**



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Payload Summary

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- **Biology, Physiology, and Biomedical**
 - **Advanced Respiratory Monitoring System (ARMS)**
 - **Closed Equilibrated Biological Aquatic System (CEBAS)**
 - **Osteoporosis Experiment in Orbit (OSTEO)**
 - **European Research in Space and Terrestrial Osteoporosis (ERISTO)**
 - **Physiology and Biochemistry 4 (PHAB4)**
 - **Biopack**
 - **Biobox**
 - **Bioreactor Demonstration System-05 (BDS-05)**
 - **Microbial Physiological Flight Experiment (MPFE)**
 - **Sleep-3**
 - **Fundamental Rodent Experiments Supporting Health-2 (FRESH-2)**
 - **Grav sensing and Response Systems of Plans (Biotube/MFA)**
 - **Biological Research in Canisters (BRIC)**
 - **Student Experiment Module (SEM)**



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Payload Summary (Con't)

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- **Physical, Earth, and Space Sciences**
 - Facility for Adsorption and Surface Tension (FAST)
 - Combustion Module 2 (CM2)
 - Mechanics of Granular Materials (MGM)
 - Mediterranean Israeli Dust Experiment (MEIDEX)
 - Solar Constant Experiment-3 (SOLCON-3)
 - Shuttle Ozone Limb Sounding Experiment (SOLSE-02)
 - Critical Viscosity of Xenon-2 (CVX-2)



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Payload Summary (Concl)

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- **Space Product and Technology Development**
 - Miniature Satellite Threat Reporting System (MSTRS)
 - Commercial Macromolecular Protein Crystal Growth (CMPCG)
 - Combined 2 Phase Loop Experiment (COM2PLEX)
 - Space Technology and Research Students Bootes (STARTS Bootes)
 - Star Navigation (STARNAV)
 - Advance Protein Crystallization Facility (APCF)
 - Vapor Compression Distillation (VCD)
 - Astroculture Plant Growth Chamber and Glovebox
 - Commercial Protein Crystal Growth – Protein Crystallization Facility (CPCG-PCF)
 - Commercial ITA Biomedical Experiment (CIBX)
 - Zeolite Crystal Growth (ZCG)
 - Low Power Transceiver (LPT)



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STS-107 Orbital Debris Status

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- Orbital Debris / Micrometeoroid Risk Is Acceptable

<u>Criteria</u>	<u>Risk</u>	<u>Guideline</u>
Critical Penetration	1 in 370	1 in 200
Radiator Tube Penetration	1 in 315	1 in 61
Window Replacements	88%	N/A

Average number of expected window replacements = 2.1



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Approved Payload
Launch Commit Criteria for STS-107

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- STS-107 Minimum Equipment List (MEL) Mission Dependent (LCN 1100)
- SPACEHAB LCC

SSID Number	RDM Title	Mission Success/Safety	LCC Timeframe	Monitored By
RDM-01	SPACEHAB HFA Fan Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-02	SPACEHAB Emergency Bus Voltage Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-03	SPACEHAB Smoke/Fire Anomaly	Safety	T-6 hrs to T-31 sec	NASA/KSC
RDM-04	SPACEHAB DMU Interface/Power Failure	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-05	Payload Aft Main B Critical Power Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-06	SPACEHAB Main Power Anomaly	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-08	SPACEHAB Subsystem Water Loop Flow Rate Anomaly	Mission Success	T-6 hrs to T-31 sec	Customer from NASA/KSC console
RDM-09	SPACEHAB Water Pump Accumulator Quantity (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-10	SPACEHAB Water Pump Inlet Pressure (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-11	SPACEHAB Water Pump Outlet Pressure (high/low) Anomaly	Mission Success	T-6 hrs to T-5 min	Customer from NASA/KSC console
RDM-12	CEWPP Accumulator Quantity Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-13	CEWPP Inlet Pressure Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console
RDM-14	CEWPP Outlet Pressure Anomaly	Mission Success	T-6 hrs to T-9 min	Customer from NASA/KSC console



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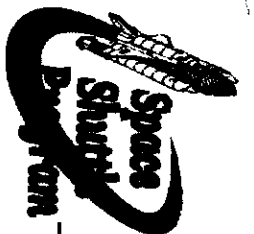


Approved Launch Commit Criteria for

STS-107

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- Approved LCNs Continued
 - FCP RV Nozzle Heater Controller Anomaly (LCN 1110)
 - Update of instrumentation functionality requirements for H₂O Relief Nozzle, Alternate Product H₂O line and H₂O Relief Nozzle temperatures.
 - Modifies procedures for RV Nozzle Temperature Controller violations to address multiple failure modes.
 - Completion Date: 12/06/02



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Approved LCNs Continued

- **APU Scrub Beyond Go/No Go (LCN 1082)**
 - Scrub of the APU section of the LCC
 - Completion Date: 12/12/02

- **New Requirements for ET/ORB Propellant Leak Visual Monitoring (LCN 1109)**
 - Creates new ICE-04 SSID requirements for visual monitoring of cryogenic propellant leakage at critical locations.
 - Deletes existing requirement in HAZ-12 to visually monitor ET/Orbiter disconnect for cryogenic leakage (now contained in new ICE-04).
 - Completion Date: 12/16/02



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Systems Integration

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- **All the Systems and Cargo Integration flight preparation activities have been completed except for planned open work – no issues identified**
- **Completed tasks include:**
 - Verification of compliance with generically certified requirements
 - Mission specific analyses
 - Documentation of vehicle and cargo requirements
 - Reconfiguration / installation of Payload Integration hardware
 - Payload bay clearance assessment
- **Light weight external tank (LWT) required mission-specific analyses to complete program certification (reference next page)**

Program Integration Is Ready to Support Flight



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Systems Integration

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- The Light Weight Tank was included in the Performance Enhancement (PE) Certification Activity
 - Approved via PRCBDs S052333CH & S052189DA and documented in NSTS 08209 Volume VII, Section 8.0
- Due to a limited number of LWTs in the inventory, the LWT was excluded from post-PE generic certification activities and therefore required mission specific analyses
- STS-107 mission-specific assessments with LWT have been successfully completed:
 - RTLS ET separation with 2-second mated coast extension
 - Launch probability with Ops High-q target
 - Thermal analysis for late TAL and 2-second mated coast
 - Liftoff loads analysis
 - Three liftoff load indicator exceedances cleared by elements
 - Integrated MPS pressurization analysis with Block II
 - GO₂ ullage pressure ICD exceedance cleared by ET Project; ICD waiver approved
- Certification Completed - No Constraints to Flight



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Integration CoFR Flight Product Status

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Cargo Integration



Last Updated: 12/04/02

System Integration



	GREEN: Primary and backup personnel in place to produce required products, or required products have been produced
	YELLOW: Single string exists for required products
	RED: Neither primary nor backup personnel in place for required products