

STS31

NASA Photo ID: Title:

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underwater simulation

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S90-32805 [image](#) [text](#) STS-31 T-30 preflight press conference with FD William D. Reeves in Bldg 2

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S90-34385 [image](#) [text](#) MSFC Technical Support Team in the Huntsville Support Operations Center

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S90-34975 [image](#) [text](#) STS-31 crewmembers, wearing LESs, in M113 tracked vehicle during TCDT at KSC

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S90-35094 [image](#) [text](#) Artist concept titled "STS-31 Deorbit & Reentry Track" produced by Rockwell

S90-38627 [image](#) [text](#) STS-31 Discovery, OV-103, auxiliary power unit 1 (APU-1) controller

S90-38829 [image](#) [text](#) Double star images taken by HST WFPC and Las Campanas Observatory

S90-44867 [image](#) [text](#) STS-31 Discovery, OV-103, liftoff from KSC

S90-46425 [image](#) [text](#) HUBBLE SPACE TELESCOPE (HST) IMAGERY OF THE 30 DORADUS NEBULA

S90-47925 [image](#) [text](#) Hubble Space Telescope (HST) imagery of galaxy NGC 7457 and Supernova 1987A

S90-47926 [image](#) [text](#) Hubble Space Telescope (HST) imagery of galaxy NGC 7457 and Supernova 1987A

S90-48729 [image](#) [text](#) HST image of Gravitational Lens G2237 + 305 or "Einstein Cross"

S90-50868 [image](#) [text](#) HST image of Pluto - the "Double Planet"

S90-53462 [image](#) [text](#) HST image of Saturn's "white spot"

S91-32389 [image](#) [text](#) Composite image of the planet Mars taken by Hubble Space Telescope (HST)

S92-52109 [image](#) [text](#) HST image of the Orion's Great Nebula "window-curtain" structure

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STS031(S)064 [image](#) [text](#) STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from KSC LC Pad 39B

STS031(S)073 [image](#) [text](#) STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from KSC LC Pad 39B

STS031(S)074 [image](#) [text](#) STS-31 Discovery, OV-103, begins its roll maneuver after liftoff from KSC

STS031(S)075 [image](#) [text](#) STS-31 Discovery, OV-103, rockets through low-lying clouds after KSC liftoff

STS031(S)076 [image](#) [text](#) STS-31 Discovery, OV-103, is hidden in low-lying clouds after KSC liftoff

STS031(S)077 [image](#) [text](#) STS-31 Discovery, Orbiter Vehicle (OV) 103, heads skyward after KSC liftoff

STS031(S)129 [image](#) [text](#) STS-31 crew egresses Discovery, OV-103, via stairway after EAFB landing

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STS031(S)131 [image text](#) STS-31 Discovery, Orbiter Vehicle (OV) 103, glides toward EAFB landing

STS031(S)135 [image text](#) STS-31 Discovery, Orbiter Vehicle (OV) 103, lands on EAFB concrete runway 22

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STS031-03-009 [image text](#) STS-31 Hubble Space Telescope (HST) (SAs & HGAs deployed) is grappled by RMS

STS031-03-014 [image text](#) STS-31 Hubble Space Telescope (HST) appendage deploy aboard OV-103

STS031-03-024 [image text](#) STS-31 MS McCandless in LCVG removes EMU lower torso on OV-103's middeck

STS031-03-025 [image text](#) STS-31 MS McCandless in LCVG removes EMU lower torso on OV-103's middeck

STS031-03-027 [image text](#) STS-31 Mission Specialist (MS) Sullivan dons EMU in OV-103's airlock

STS031-03-030 [image text](#) STS-31 MS Sullivan wearing EMU prepares for contingency EVA in OV-103 airlock

STS031-04-002 [image text](#) STS-31 MS Sullivan, MS McCandless, DSO 462 medical device on OV-103 middeck

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STS031-05-002 [image text](#) STS-31 crew activity on the middeck of the Earth-orbiting Discovery, OV-103

STS031-05-008 [image text](#) STS-31 Earth observation of western United States, Salton Sea, Imperial Valley

STS031-06-008 [image text](#) STS-31 Commander Shriver with HASSELBLAD camera on OV-103's aft flight deck

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STS031-07-021 [image text](#) STS-31 MS Sullivan conducts DSO 473 test on Pilot Bolden on OV-103's middeck

STS031-08-010 [image text](#) STS-31 MS McCandless and MS Sullivan set up PCG-III on OV-103's middeck

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STS031-10-016 [image text](#) STS-31 pre-deployment checkout of the Hubble Space Telescope (HST) on OV-103

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STS031-10-019 [image text](#) Hubble Space Telescope (HST) grappled by OV-103's RMS during STS-31 checkout

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STS031-10-027 [image](#) [text](#) STS-31 crew monitors Hubble Space Telescope (HST) from OV-103's flight deck

STS031-10-035 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) solar array panel deploy aboard OV-103

STS031-101-053 [image](#) [text](#) STS-31 MS Sullivan and Commander Shriver work on the OV-103's flight deck

STS031-11-033 [image](#) [text](#) STS-31 MS Sullivan poses next to stowed EMU in OV-103's airlock

STS031-12-031 [image](#) [text](#) STS-31 Discovery, OV-103, onboard (in-space) crew portrait

STS031-151-008 [image](#) [text](#) Hubble Space Telescope Deploy, Eastern Cuba, Haiti

STS031-151-010 [image](#) [text](#) Hubble Space Telescope Deploy, Cuba, Bahamas and Gulf of Mexico

STS031-151-113 [image](#) [text](#) Southern Appalachia, USA

STS031-151-164 [image](#) [text](#) Namib Desert, Namibia, Africa

STS031-152-000DL [image](#) [text](#) Hammersley Range, northern Western Australia

STS031-152-000FN [image](#) [text](#) Sahara Desert Sand Storm, Mali, Africa

STS031-152-000HS [image](#) [text](#) Deforestation, Madagascar

STS031-29-029 [image](#) [text](#) STS-31 closeup of crystals developing in Protein Crystal Growth III module

STS031-71-095 [image](#) [text](#) STS-31 pre-deploy check of the Hubble Space Telescope (HST) in OV-103's PLB

STS031-72-017 [image](#) [text](#) Lake Chad, Chad, Africa

STS031-76-016 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) solar array (SA)

deploy aboard OV-103

STS031-76-023 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) pre-deployment procedures aboard OV-103

STS031-76-026 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) (SA & HGA deployed) is grappled by RMS

STS031-76-034 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) is grappled by OV-103 RMS

STS031-76-039 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) drifts away from OV-103's RMS

STS031-76-040 [image](#) [text](#) STS-31 Hubble Space Telescope (HST) is released by RMS over Andes Mountains

STS031-76-074 [image](#) [text](#) Desert Landscape, Mauritania, Africa

STS031-77-078 [image](#) [text](#) Thunderstorm, Texas Gulf Coast, USA

STS031-77-087 [image](#) [text](#) Thunderstorm, Florida, Bahamas and Cuba

STS031-78-000C [image](#) [text](#) Sunlint and Florida Peninsula, USA

STS031-78-017 [image](#) [text](#) West Coast, United States and Mexico

STS031-79-015 [image](#) [text](#) Eastern Egypt, Red Sea and Saudi Arabia

STS031-79-063 [image](#) [text](#) Indian Ocean, Maldiv Islands, India, and Sri Lanka

STS031-80-088 [image](#) [text](#) Island of Luzon, Philippines

STS031-81-000AT [image](#) [text](#) Thunderstorm, Texas Gulf Coast, USA

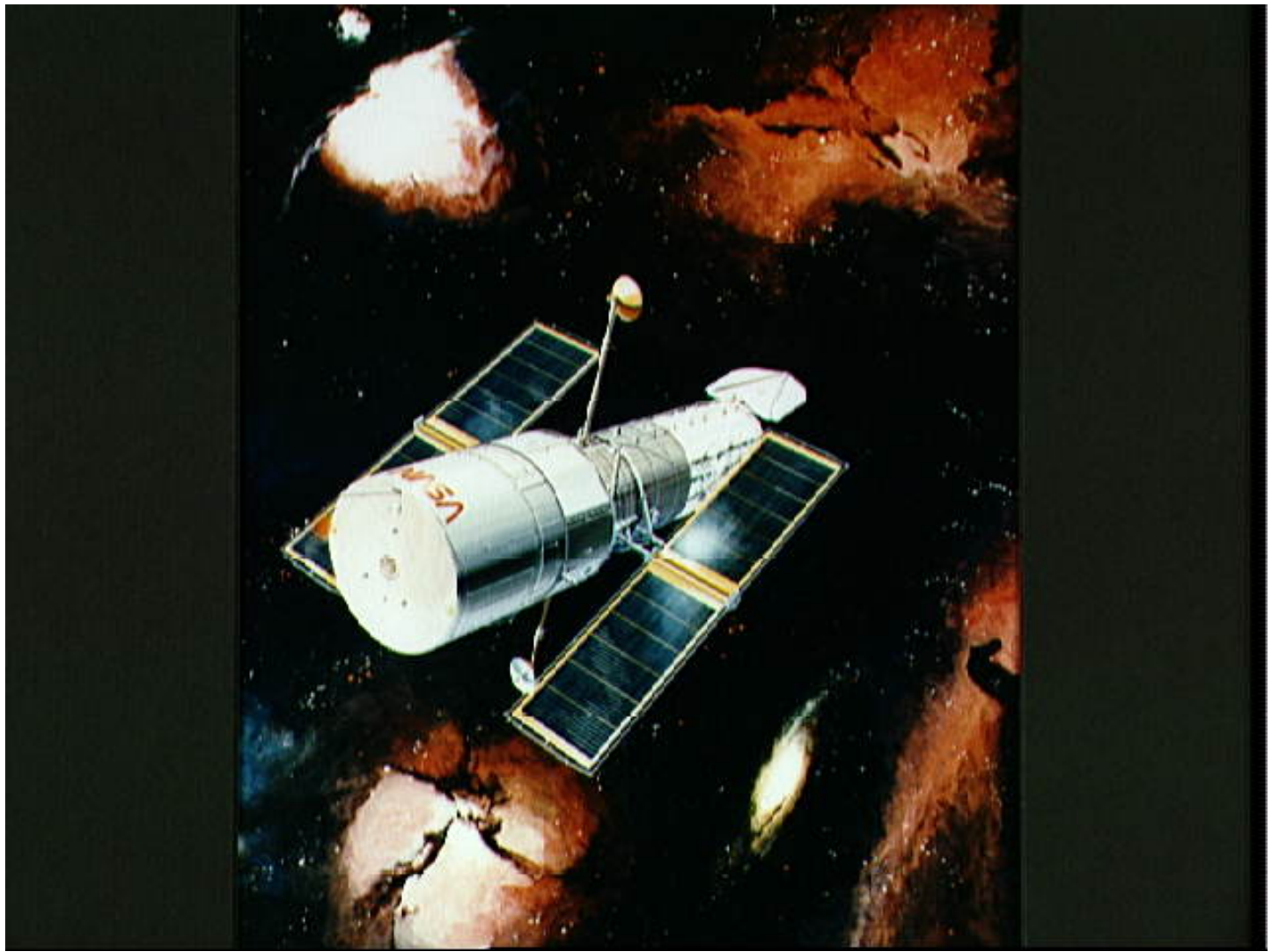
STS031-83-090 [image](#) [text](#) STS-31 Earth observation of the Andes Mountains

STS031-86-010 [image](#) [text](#) Egypt and Sudan, Africa

STS031-91-080 [image](#) [text](#) Chiapas Forest, Mexico and Guatemala border

STS031-92-045 [image](#) [text](#) Agriculture, Rio Sao Francisco, Brazil

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NASA Photo ID: S78-23051

File Name: 10063488.jpg

Film Type: 4x5

Date Taken: 01/19/78

Title: Artists concept of the space telescope

Description:

Artists concept of the space telescope against a starry background.

Subject terms:

GRAPHIC ARTS

SPACEBORNE TELESCOPES

TELESCOPES

VISUAL AIDS

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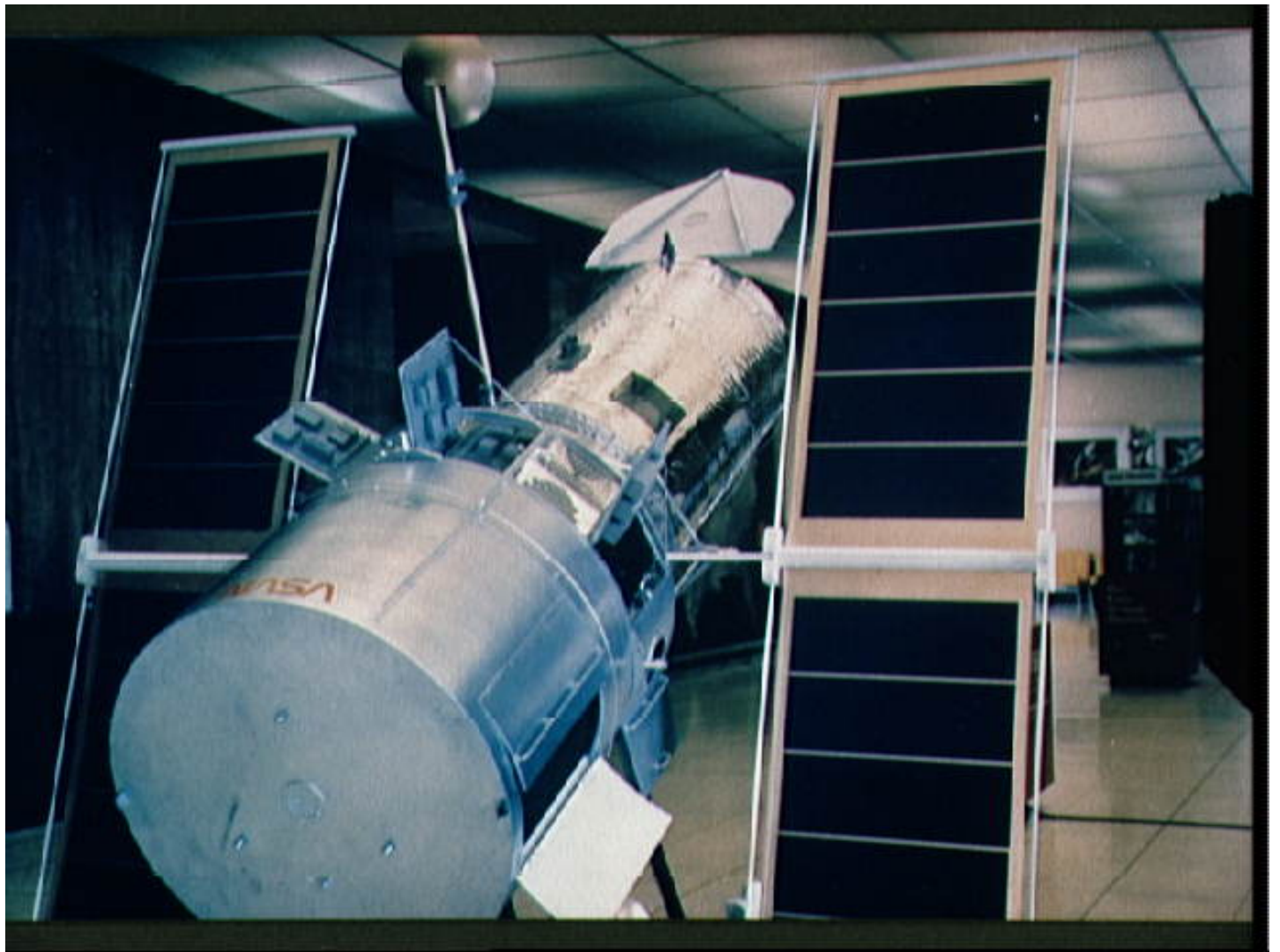
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NASA Photo ID: S80-38945

File Name: 10063482.jpg

Film Type: 4x5

Date Taken: 09/15/80

Title: 1980 Spinoff view of the Space Telescope

Description:

Computer representation in the 1980 Spinoff of the Space Telescopeto be deployed in 1983.

Subject terms:

GRAPHIC ARTS

SPACEBORNE TELESCOPES

SPINOFFS

VISUAL AIDS

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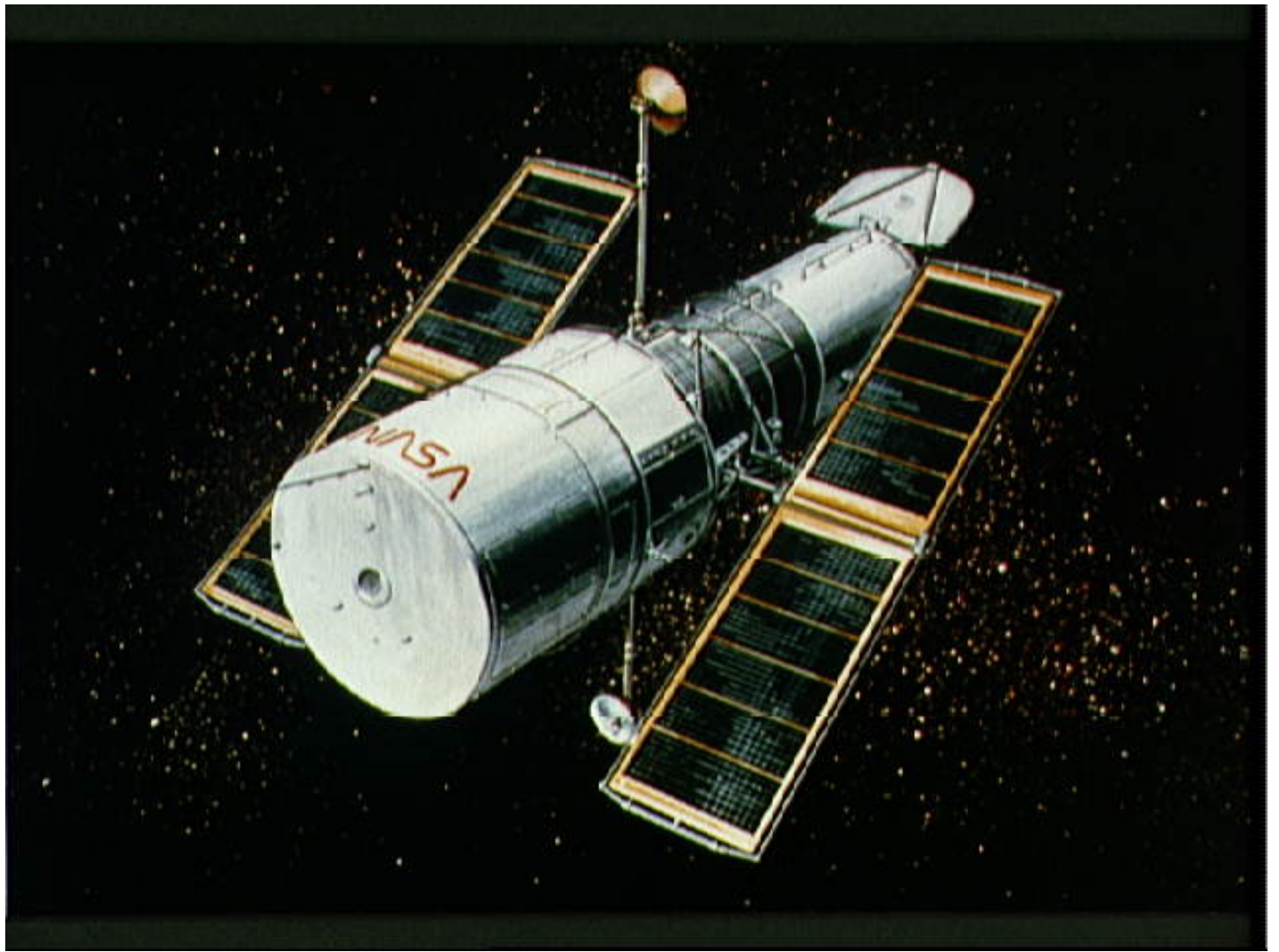
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NASA Photo ID: S80-40781

File Name: 10063489.jpg

Film Type: 4x5

Date Taken: 10/27/80

Title: Artists concept of Space Telescope

Description:

Artists concept of Space telescope with solar panels deployed.

Subject terms:

GRAPHIC ARTS

SOLAR ARRAYS

SPACEBORNE TELESCOPES

VISUAL AIDS

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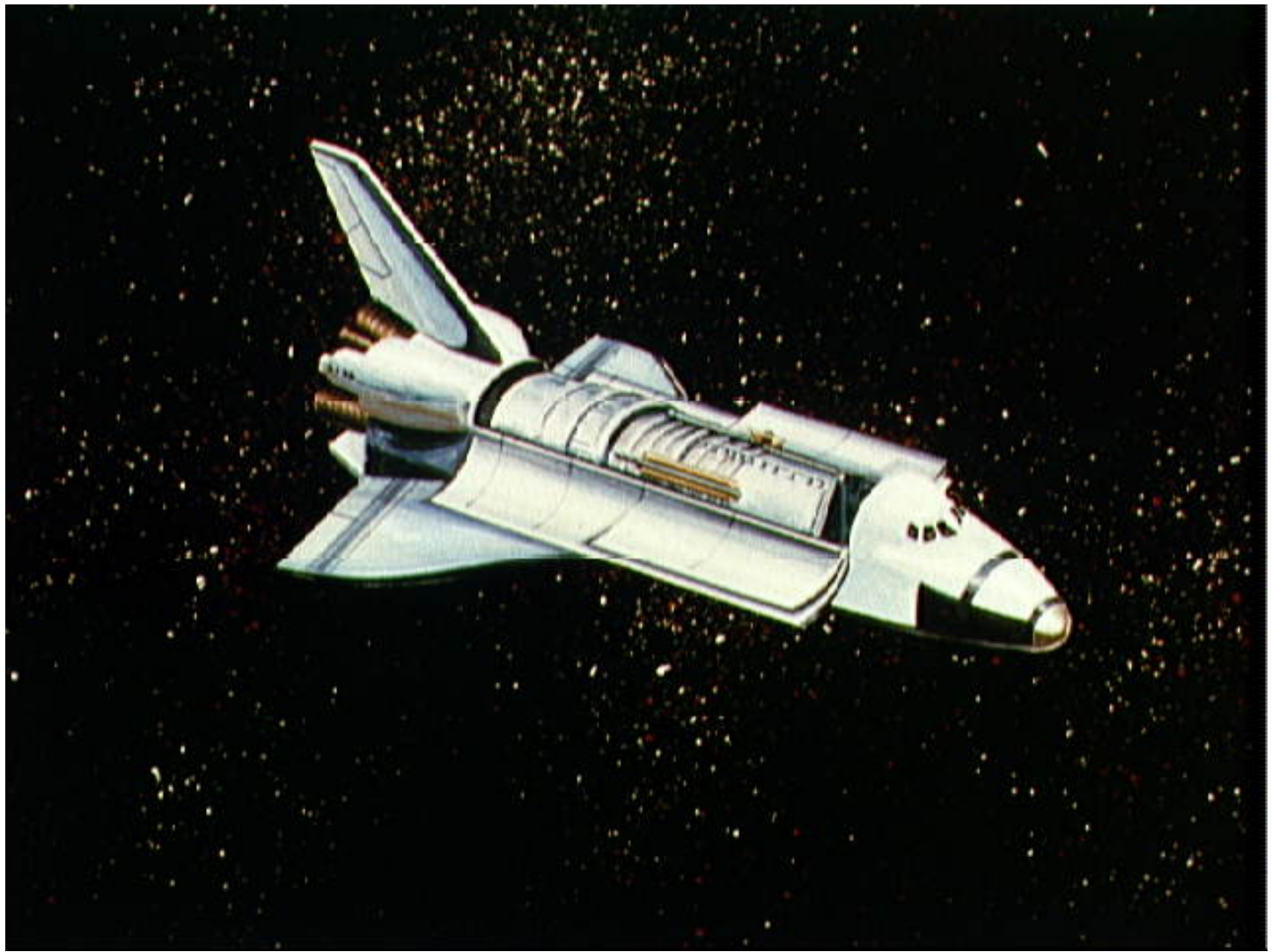
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NASA Photo ID: S80-40782

File Name: 10063483.jpg

Film Type: 4x5

Date Taken: 10/27/80

Title: Space Shuttle related interaction with the Space telescope

Description:

Artists concept of Space Shuttle related interaction with the Space telescope. Views include the shuttle in orbit with its payload bay open (40782); shuttle using remote manipulator to deploy space telescope (40783).

Subject terms:

GRAPHIC ARTS

SPACE SHUTTLES

SPACEBORNE TELESCOPES

VISUAL AIDS

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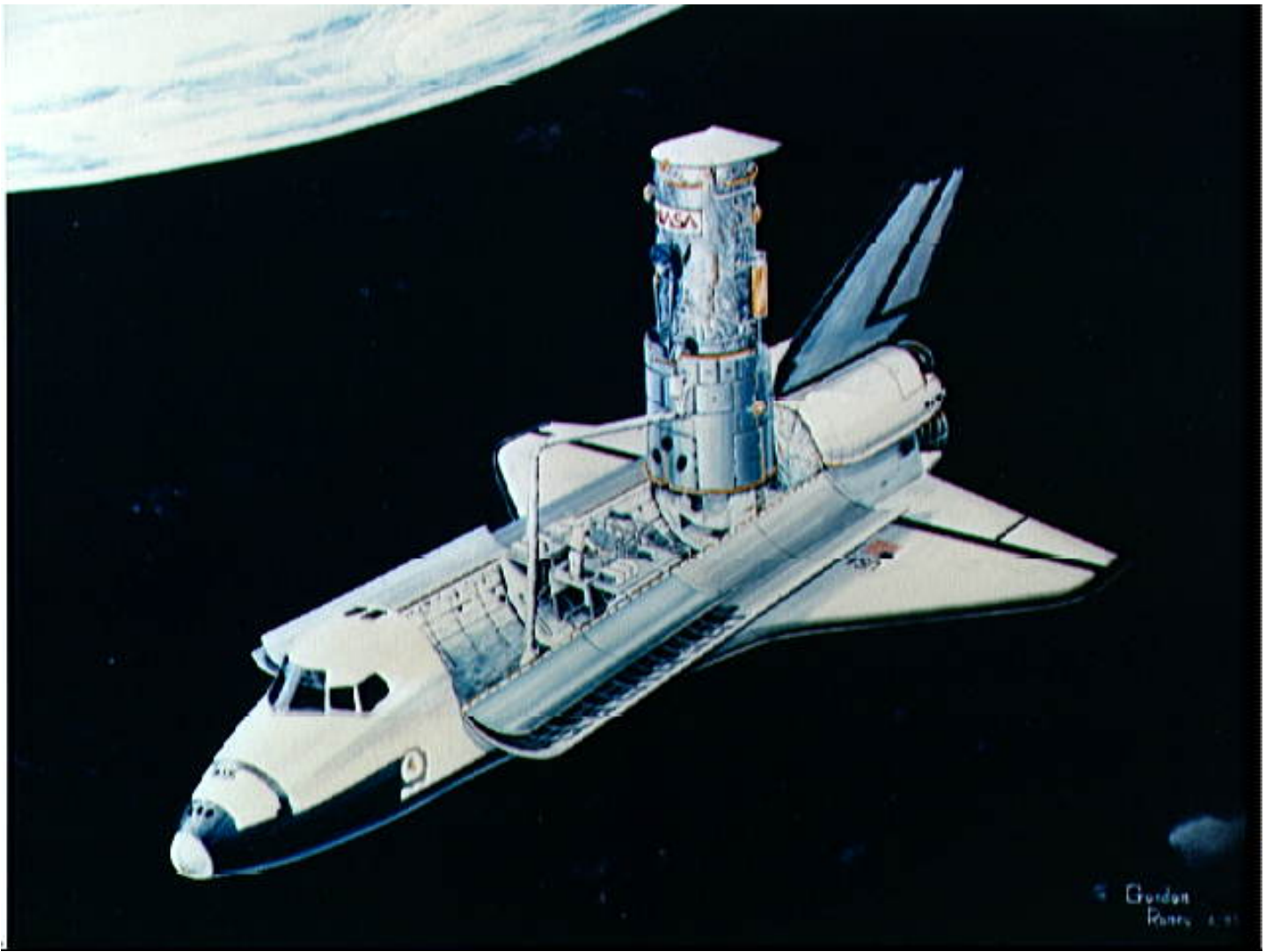
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NASA Photo ID: S80-40783

File Name: 10063484.jpg

Film Type: 4x5

Date Taken: 10/27/80

Title: Space Shuttle related interaction with the Space telescope
Description:

Artists concept of Space Shuttle related interaction with the Space telescope. Views include the shuttle in orbit with its payload bay open (40782); shuttle using remote manipulator to deploy space telescope (40783).

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NASA Photo ID: S82-36442

File Name: 10063479.jpg

Film Type: 4x5

Date Taken: 09/02/82

Title: Official portrait of Astronaut Bruce McCandless

Description:

Official Space Shuttle portrait of Astronaut Bruce McCandless, II., attired in the Shuttle Extravehicular activity (EVA) suit with the manned maneuvering unit (MMU) attached and the American flag in the background.

Subject terms:

ASTRONAUTS

EXTRAVEHICULAR MOBILITY UNITS

MANNED MANEUVERING UNITS

PORTRAIT

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NASA Photo ID: S84-38498

File Name: 10063481.jpg

Film Type: 4x5

Date Taken: 07/27/84

Title: Official portrait of Astronaut Steven A. Hawley

Description:

Official portrait of Astronaut Steven A. Hawley, with flag and Space Shuttle model .

Subject terms:

ASTRONAUTS

PORTRAIT

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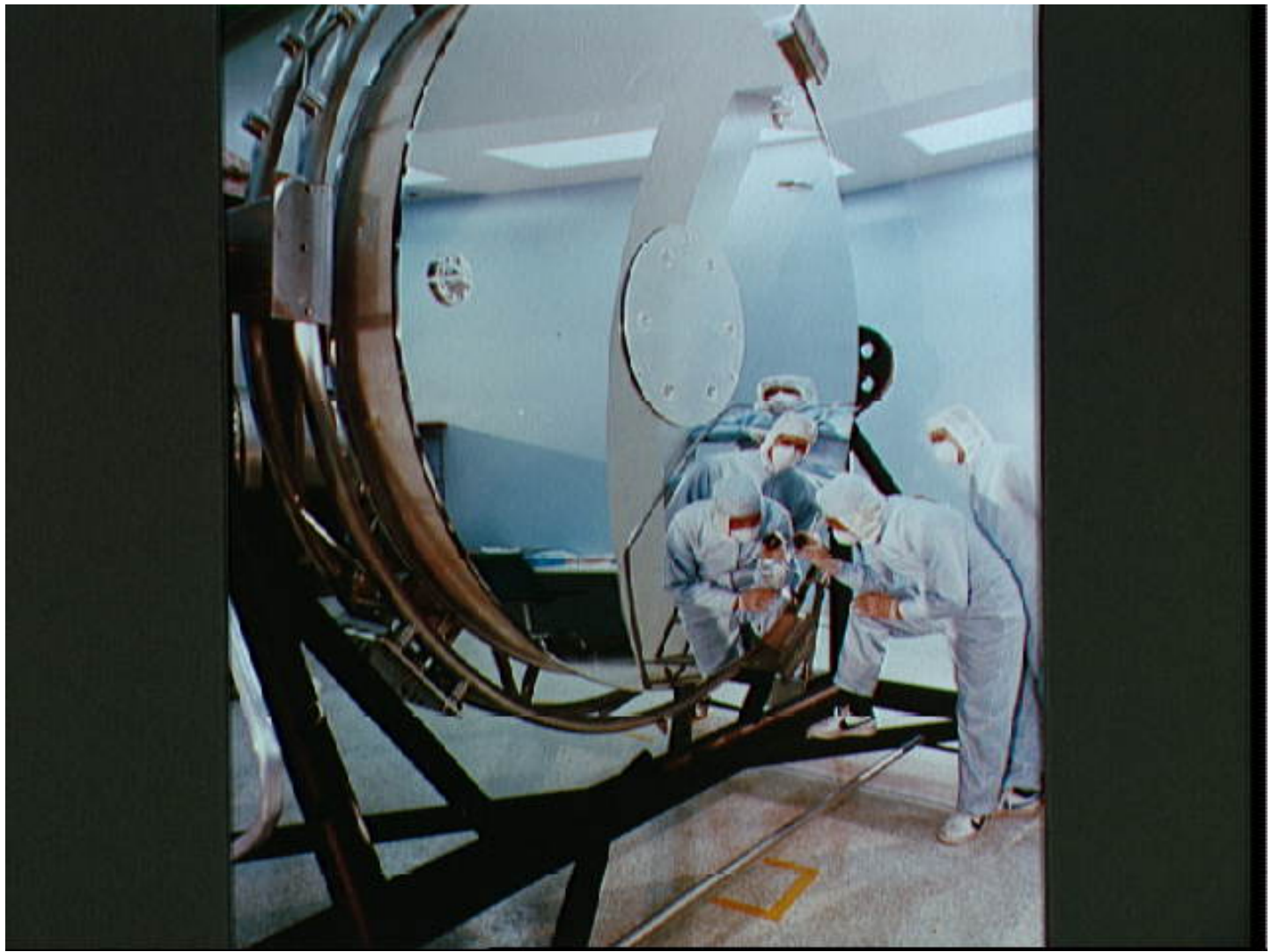
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NASA Photo ID: S84-39912

File Name: 10063507.jpg

Film Type: 4x5 BW

Date Taken: 08/14/84

Title: Inspection of the Space Telescope at Perkin-Elmers Optical facilities

Description:

Inspection of the 94 inch primary mirror for NASA's Hubble Space Telescope at Perkin-Elmers Optical facilities in Wilton, CT. The NASA Headquarters alternative photo number is NASA 84-HC-8.

Subject terms:

FACILITIES

SPACE SHUTTLE PAYLOADS

SPACEBORNE EXPERIMENTS

TELESCOPES

TESTING

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NASA Photo ID: S84-44219

File Name: 10063480.jpg

Film Type: 4x5

Date Taken: 11/01/84

Title: Official portrait of Astronaut Kathryn D. Sullivan

Description:

Official portrait of Astronaut Kathryn D. Sullivan dressed in blue flight suit with a flag in the background. She is holding a helmet.

Subject terms:

ASTRONAUTS

PORTRAIT

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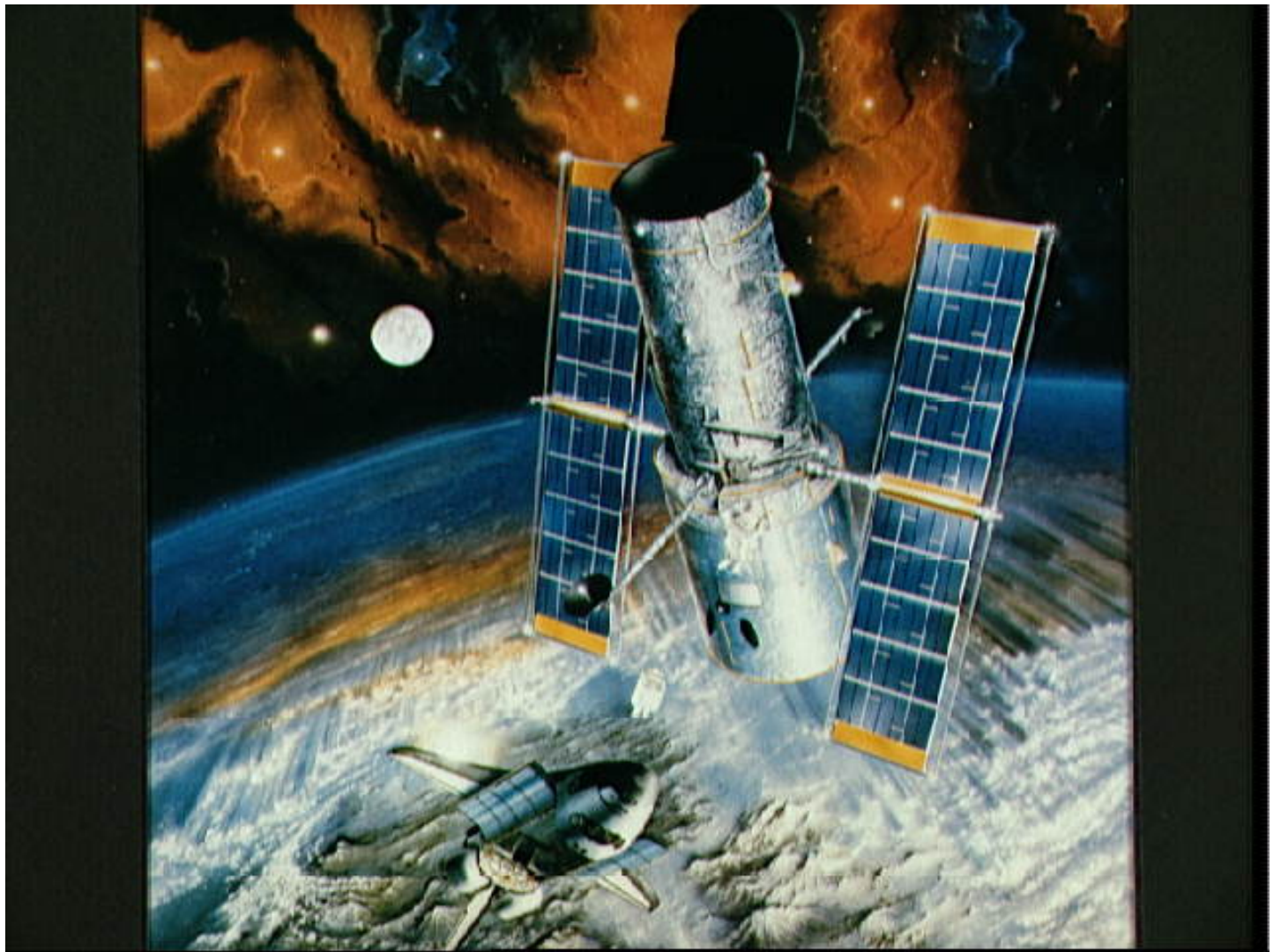
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NASA Photo ID: S86-30462

File Name: 10063491.jpg

Film Type: 4x5

Date Taken: 04/15/86

Title: Art concept of the Hubble Space Telescope

Description:

Art concept of the Hubble Space Telescope in orbit above the earth with a Space Shuttle approaching and an astronaut performing an extravehicular activity (EVA) (30462); Art concept of the Hubble Space Telescope with the interior design exposed (30463).

Subject terms:

GRAPHIC ARTS

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SOLAR ARRAYS

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NASA Photo ID: S86-30463

File Name: 10063487.jpg

Film Type: 4x5

Date Taken: 04/15/86

Title: Art concept of the Hubble Space Telescope

Description:

Art concept of the Hubble Space Telescope in orbit above the earth with a Space Shuttle approaching and an astronaut performing an extravehicular activity (EVA) (30462); Art concept of the Hubble Space Telescope with the interior design exposed (30463).

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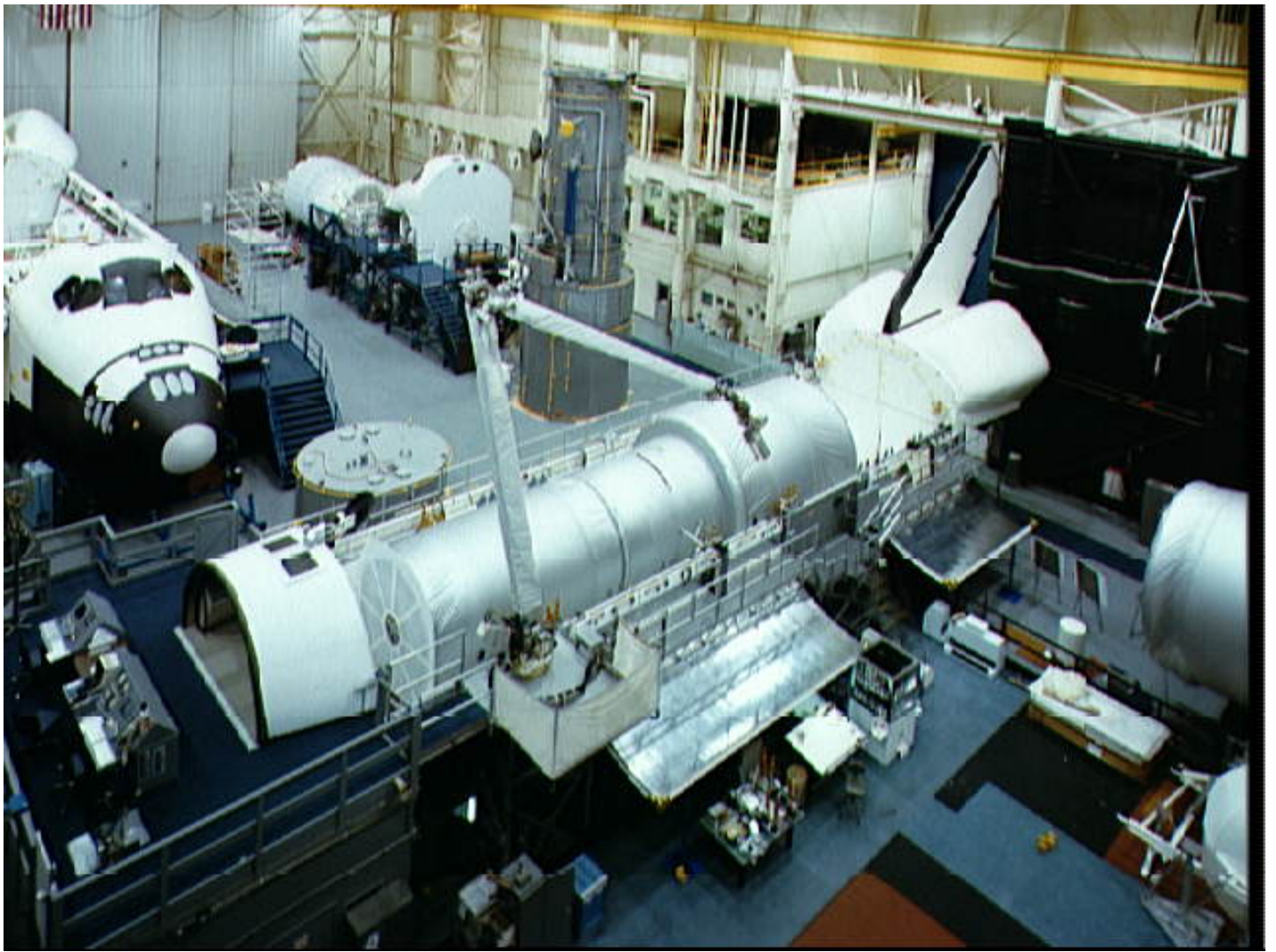
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NASA Photo ID: S86-31547

File Name: 10063497.jpg

Film Type: 4x5

Date Taken: 05/09/86

Title: Overall view of Building 9A Training Facility

Description:

High angle view of Building 9A Training Facilities including the Space Shuttle Full Fuselage trainer and the remote manipulator system (RMS) mock-up. Also visible is a mock-up of the Hubble Space Telescope for use in training with the RMS.

Subject terms:

FACILITIES

MOCK-UP

REMOTE MANIPULATOR SYSTEM

SIMULATORS

SPACEBORNE TELESCOPES

TRAINING

TRAINING DEVICES

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NASA Photo ID: S86-31548

File Name: 10063498.jpg

Film Type: 4x5

Date Taken: 05/09/86

Title: Overall view of Building 9A Training Facility

Description:

High angle view of Building 9A Training Facilities including the Space Shuttle Full Fuselage trainer and the remote manipulator system (RMS) mock-up. Also visible is a mock-up of the Hubble Space Telescope for use in training with the RMS.

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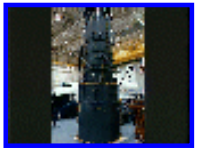
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NASA Photo ID: S86-32875

File Name: 10063493.jpg

Film Type: 35mm

Date Taken: 06/20/86

Title: Views of the Hubble Space Telescope mock-up

Description:

Several views of the Hubble Space Telescope mock-up, showing all sides of the training device.

Subject terms:

FACILITIES

HUBBLE SPACE TELESCOPE

MOCK-UP

TRAINING DEVICES

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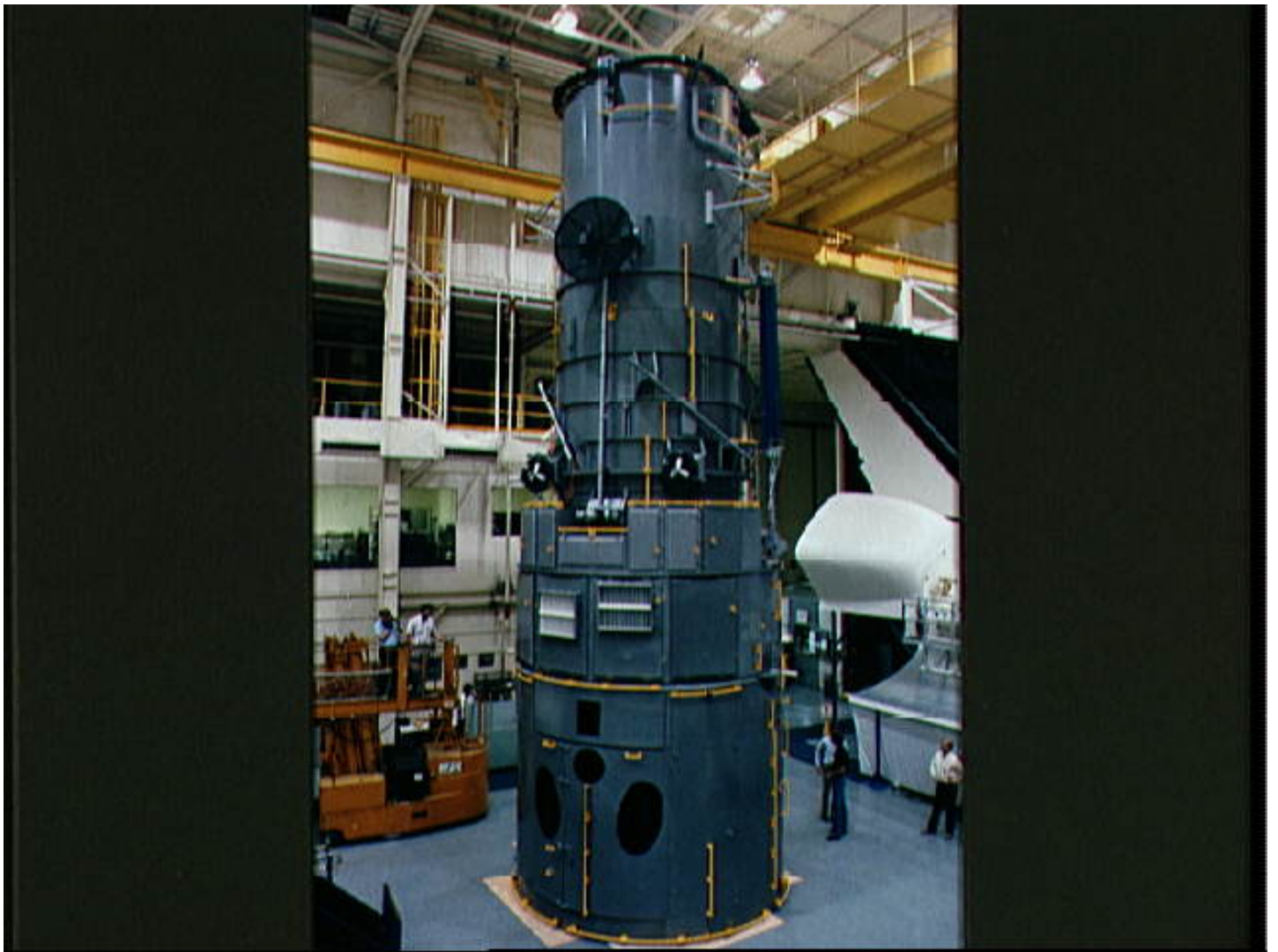
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NASA Photo ID: S86-32876

File Name: 10063494.jpg

Film Type: 35mm

Date Taken: 06/20/86

Title: Views of the Hubble Space Telescope mock-up

Description:

Several views of the Hubble Space Telescope mock-up, showing all sides of the training device.

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NASA Photo ID: S86-32877

File Name: 10063495.jpg

Film Type: 35mm

Date Taken: 06/20/86

Title: Views of the Hubble Space Telescope mock-up

Description:

Several views of the Hubble Space Telescope mock-up, showing all sides of the training device.

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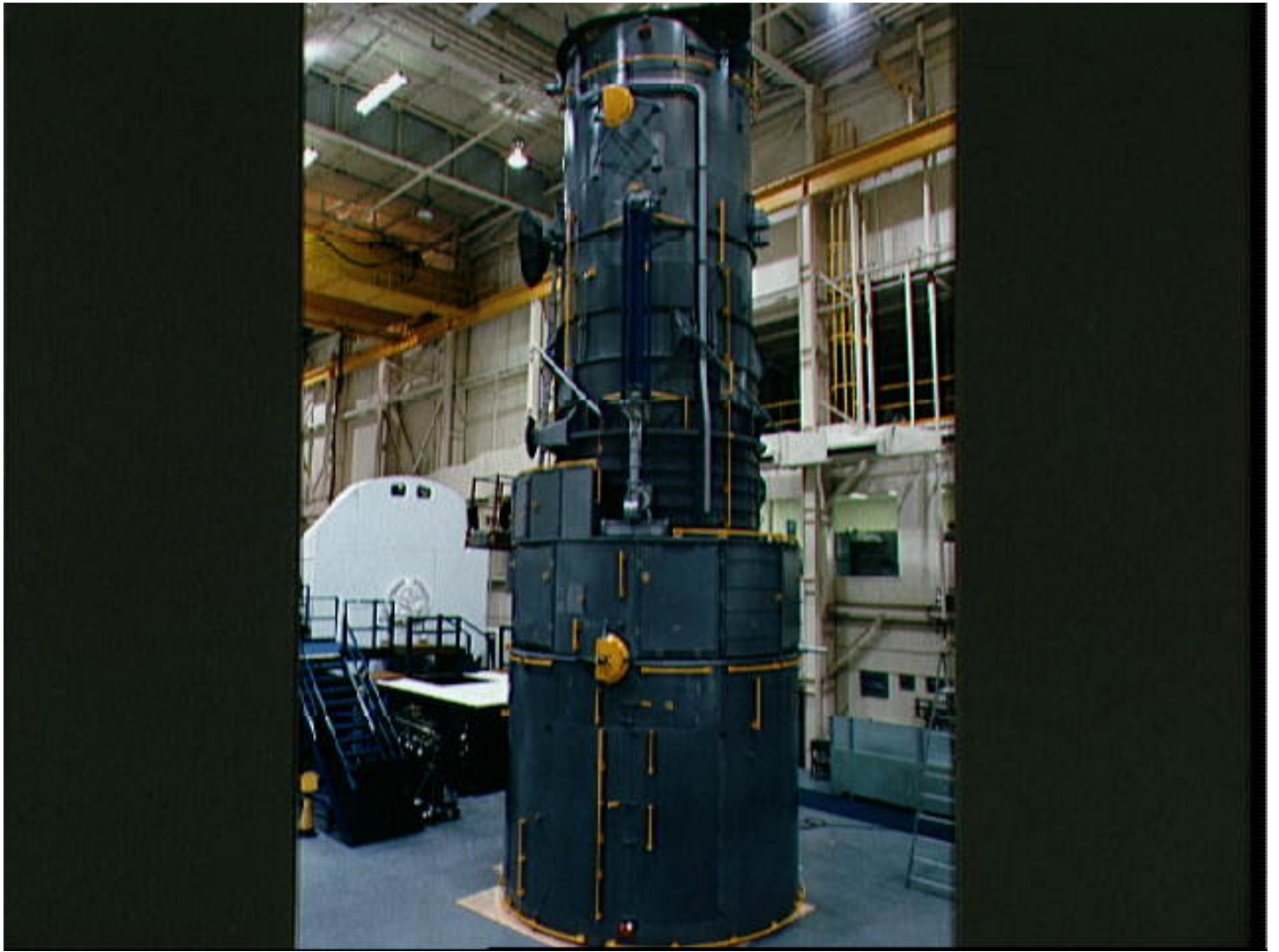
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NASA Photo ID: S86-32878

File Name: 10063496.jpg

Film Type: 35mm

Date Taken: 06/20/86

Title: Views of the Hubble Space Telescope mock-up

Description:

Several views of the Hubble Space Telescope mock-up, showing all sides of the training device.

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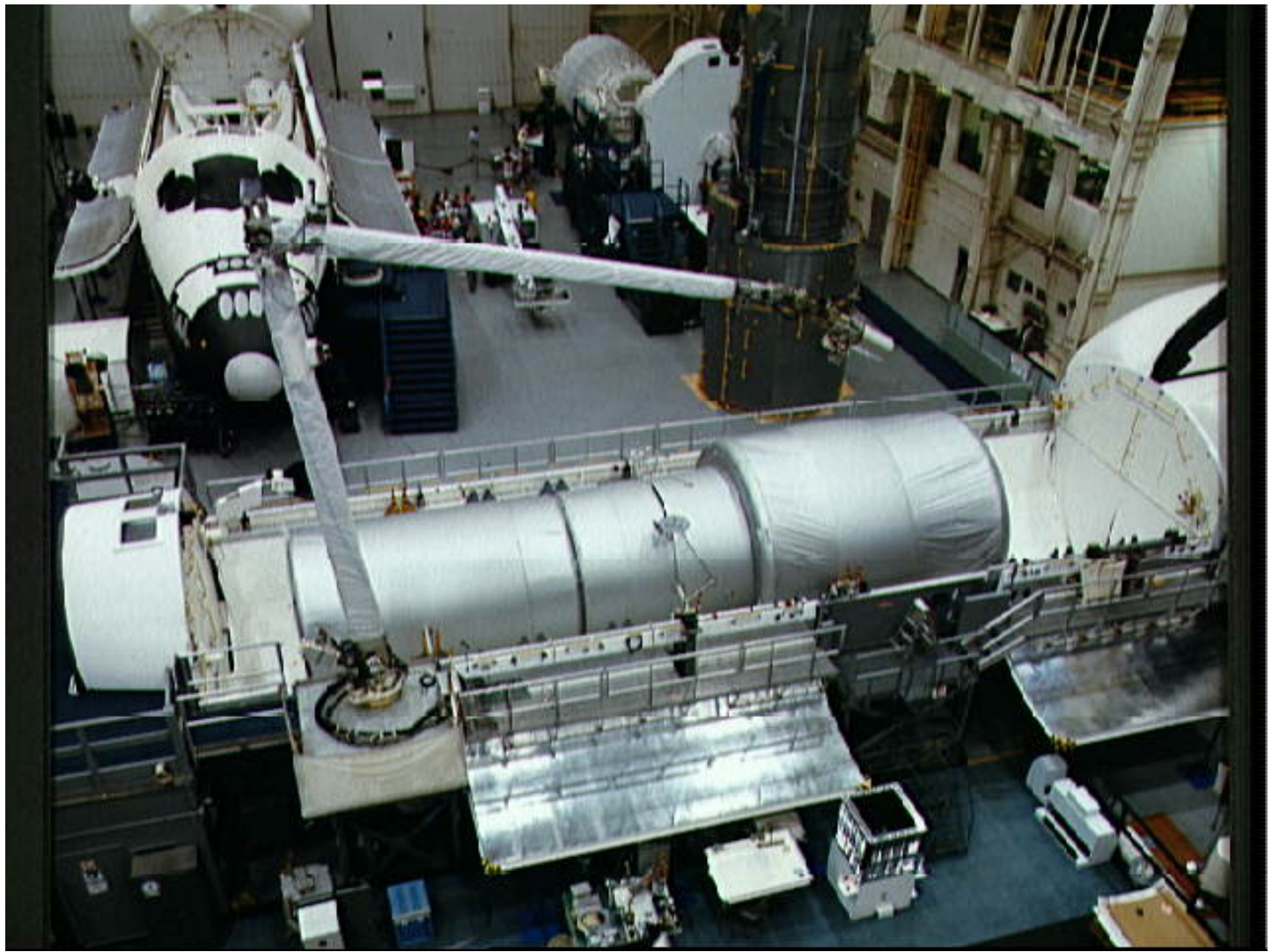
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NASA Photo ID: S86-33419

File Name: 10063499.jpg

Film Type: 120mm

Date Taken: 06/30/86

Title: Hubble Space Telescope mock-up in use in the MDF

Description:

View of helium filled mock-up of the Hubble Space Telescope in use in the Manipulator Development Facility (MDF) in bldg 9A. The mock-up is being maneuvered on the end of the remote manipulator system (RMS) arm. The Space Shuttle full fuselage trainer is seen in the background, to the left.

Subject terms:

FACILITIES

HUBBLE SPACE TELESCOPE

MOCK-UP

REMOTE MANIPULATOR SYSTEM

SIMULATORS

TRAINING

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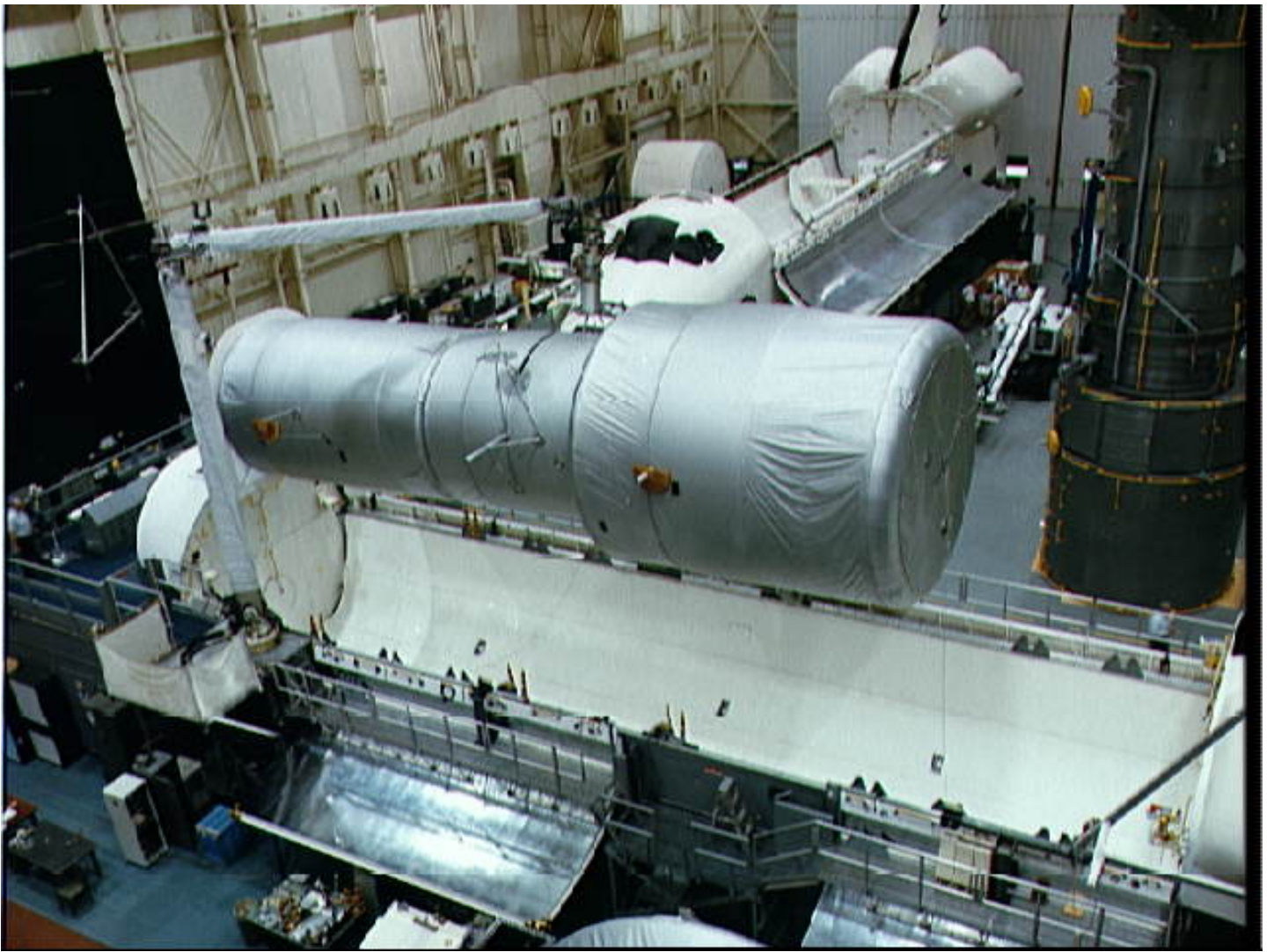
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NASA Photo ID: S86-33422

File Name: 10063500.jpg

Film Type: 120mm

Date Taken: 06/30/86

Title: Hubble Space Telescope mock-up in use in the MDF

Description:

View of helium filled mock-up of the Hubble Space Telescope in use in the Manipulator Development Facility (MDF) in bldg 9A. The mock-up is being maneuvered into a mock-up of the Shuttle payload bay on the end of the remote manipulator system (RMS) arm. The Space Shuttle full fuselage trainer is seen in the background, to the left. To the right is another simulation of the Hubble Telescope.

Subject terms:

FACILITIES

HUBBLE SPACE TELESCOPE

MOCK-UP

REMOTE MANIPULATOR SYSTEM

SIMULATORS

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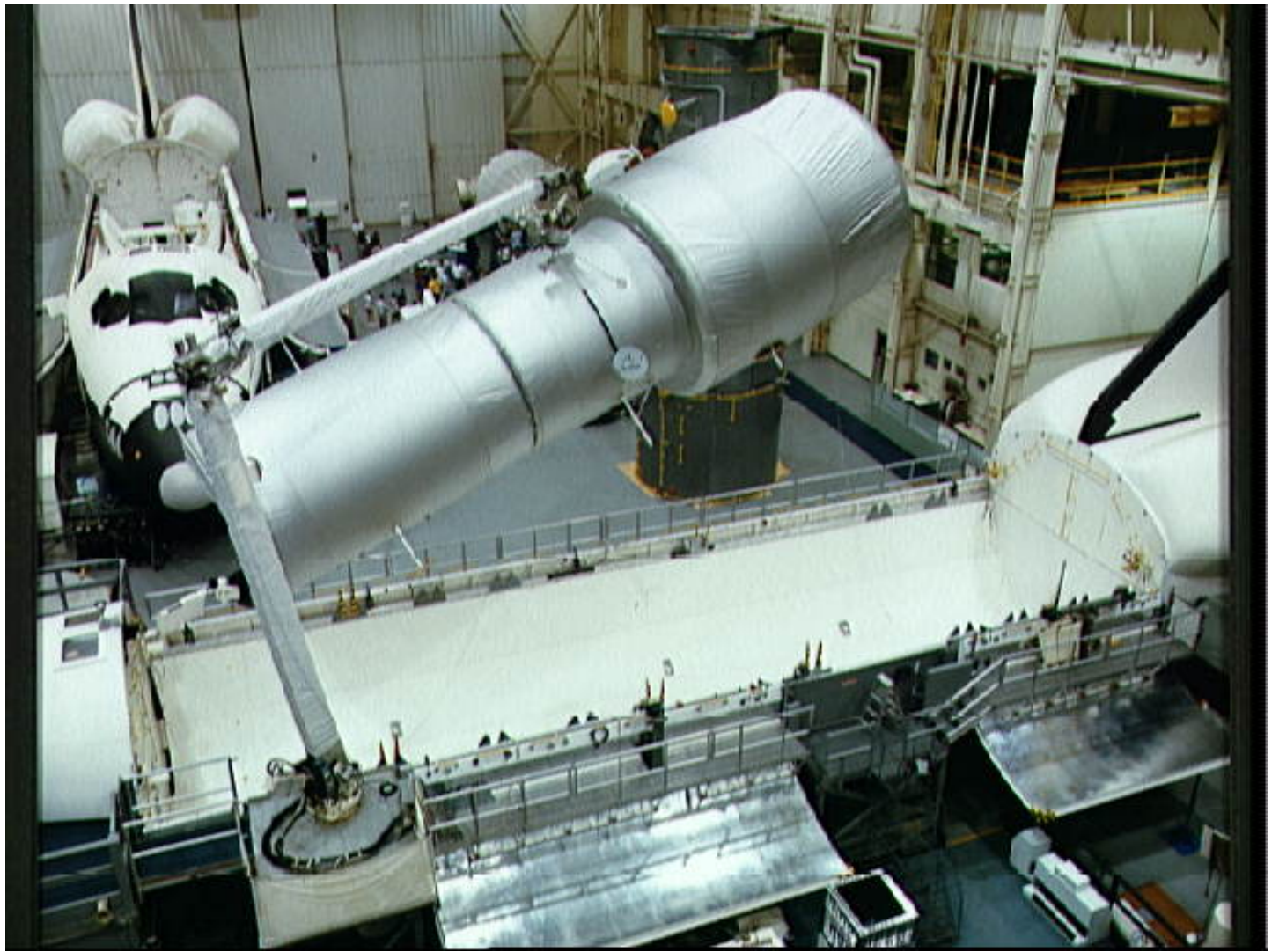
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NASA Photo ID: S86-33424

File Name: 10063501.jpg

Film Type: 120mm

Date Taken: 06/30/86

Title: Hubble Space Telescope mock-up in use in the MDF

Description:

View of helium filled mock-up of the Hubble Space Telescope in use in the Manipulator Development Facility (MDF) in bldg 9A. The mock-up is being maneuvered into a mock-up of the Shuttle payload bay on the end of the remote manipulator system (RMS) arm. The Space Shuttle full fuselage trainer is seen in the background, to the left. To the right is another simulation of the Hubble Telescope.

Subject terms:

FACILITIES

HUBBLE SPACE TELESCOPE

MOCK-UP

REMOTE MANIPULATOR SYSTEM

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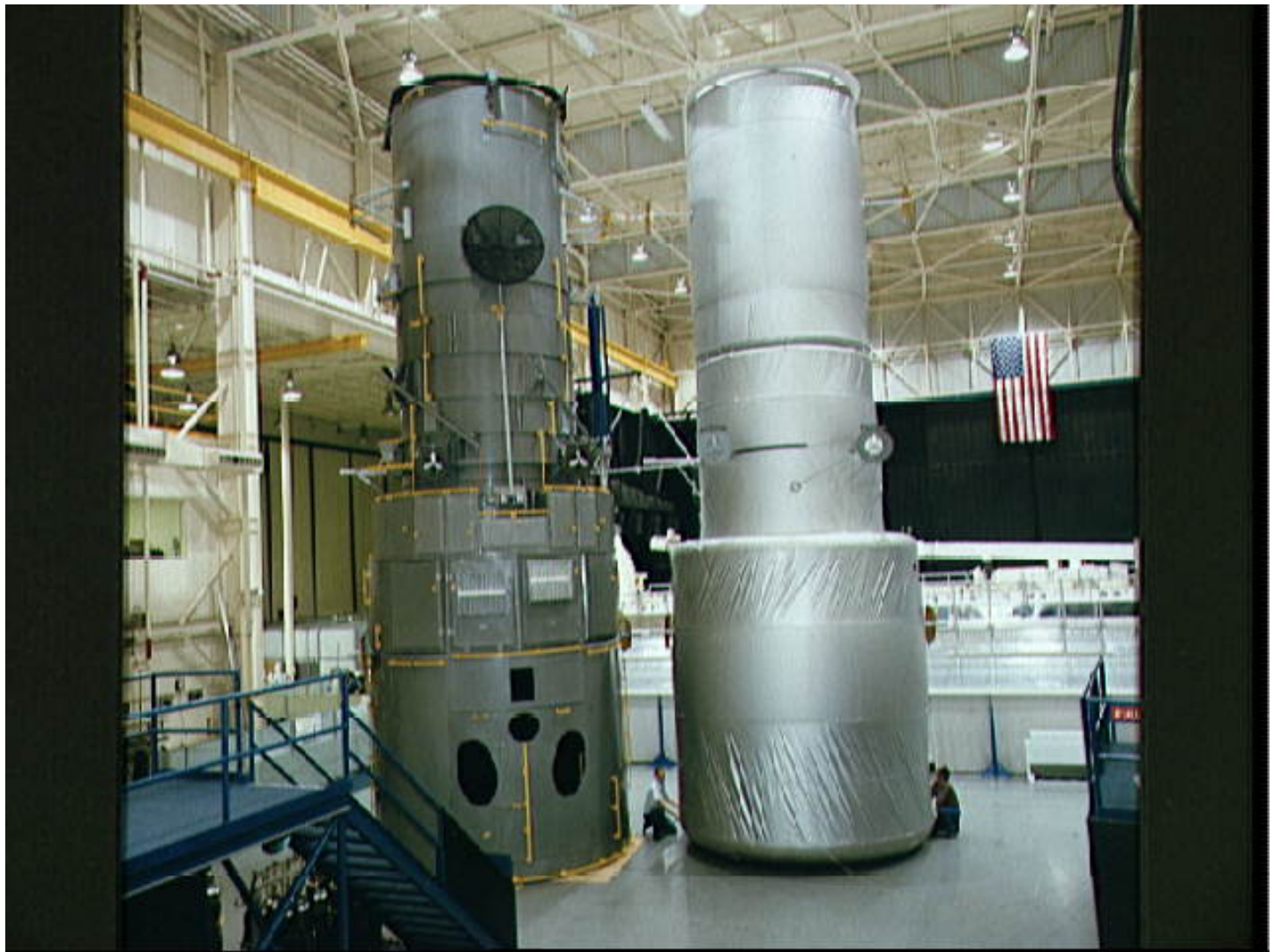
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NASA Photo ID: S86-33429

File Name: 10063502.jpg

Film Type: 120mm

Date Taken: 06/30/86

Title: Hubble Space Telescope mock-up in use in the MDF

Description:

View of helium filled mock-up of the Hubble Space Telescope next to a more accurate simulation of the Hubble Telescope in the Manipulator Development Facility (MDF) in bldg 9A.

Subject terms:

FACILITIES

HUBBLE SPACE TELESCOPE

MOCK-UP

REMOTE MANIPULATOR SYSTEM

SIMULATORS

TRAINING

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NASA Photo ID: S86-36394

File Name: 10063477.jpg

Film Type: 4x5

Date Taken: 08/26/86

Title: Official Portrait Astronaut Loren Shriver

Description:

Official Portrait Astronaut Loren Shriver in blue shuttle flight suit with model of shuttle on table next to him. Behind and to the left of Shriver is an American flag.

Subject terms:

ASTRONAUTS

PORTRAIT

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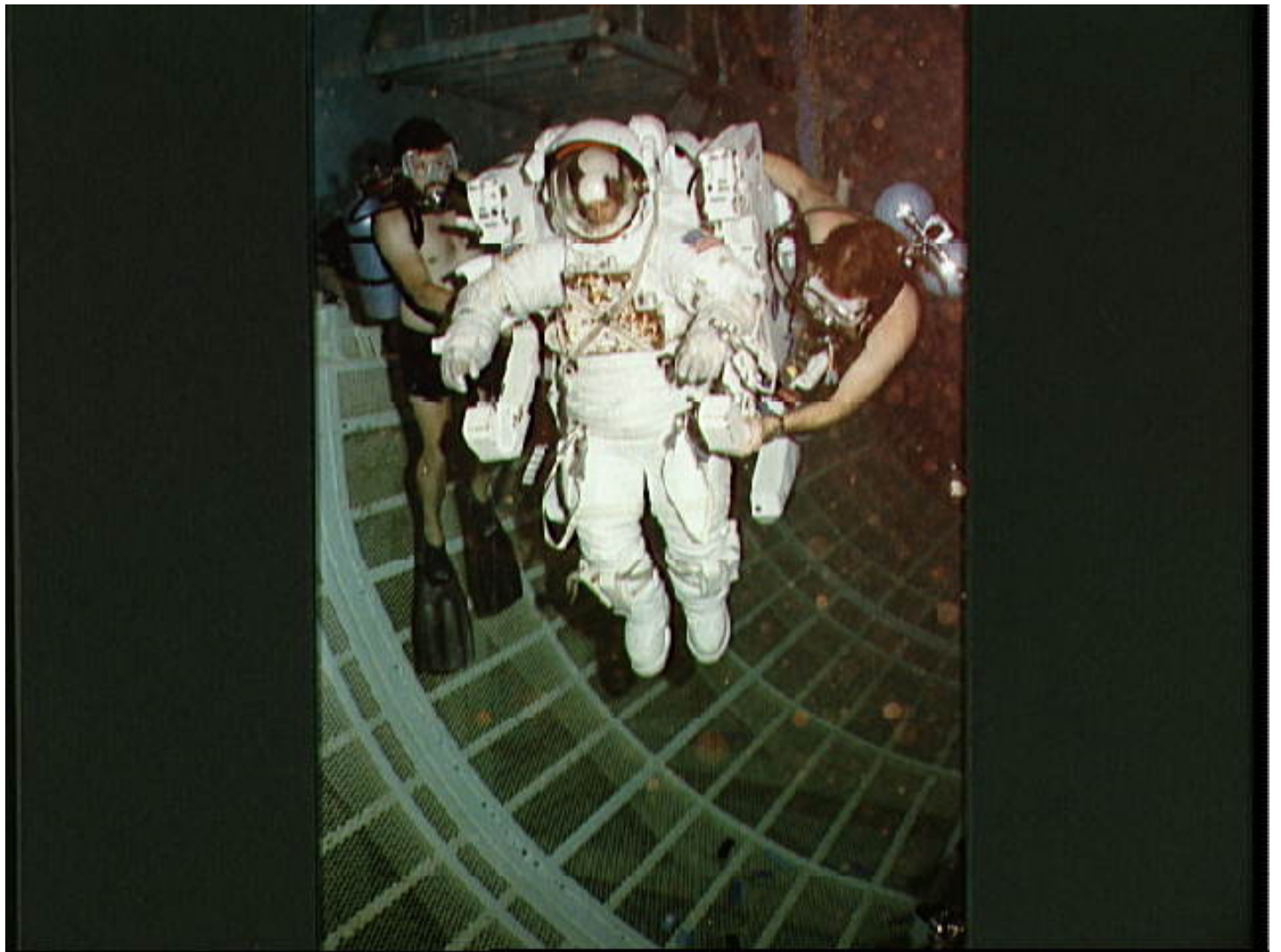
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NASA Photo ID: S86-36727

File Name: 10063503.jpg

Film Type: 35mm

Date Taken: 09/04/86

Title: Astronaut Kathryn Sullivan in WETF for evaluation of PTK

Description:

Astronaut Kathryn D. Sullivan is assisted by two SCUBA-equipped divers in JSC's Weightless Environment Training Facility (WETF) during an evaluation of the propellant tank kit (PTK). The PTK, almost totally obscured in this view, attaches to the manned maneuvering unit (MMU). This equipment is actually a dummy representation for feasibility study purposes.

Subject terms:

ASTRONAUTS

EXTRAVEHICULAR ACTIVITY

EXTRAVEHICULAR MOBILITY UNITS

HARDWARE

MANNED MANEUVERING UNITS

TESTING

WEIGHTLESS ENVIRONMENT TRAINING

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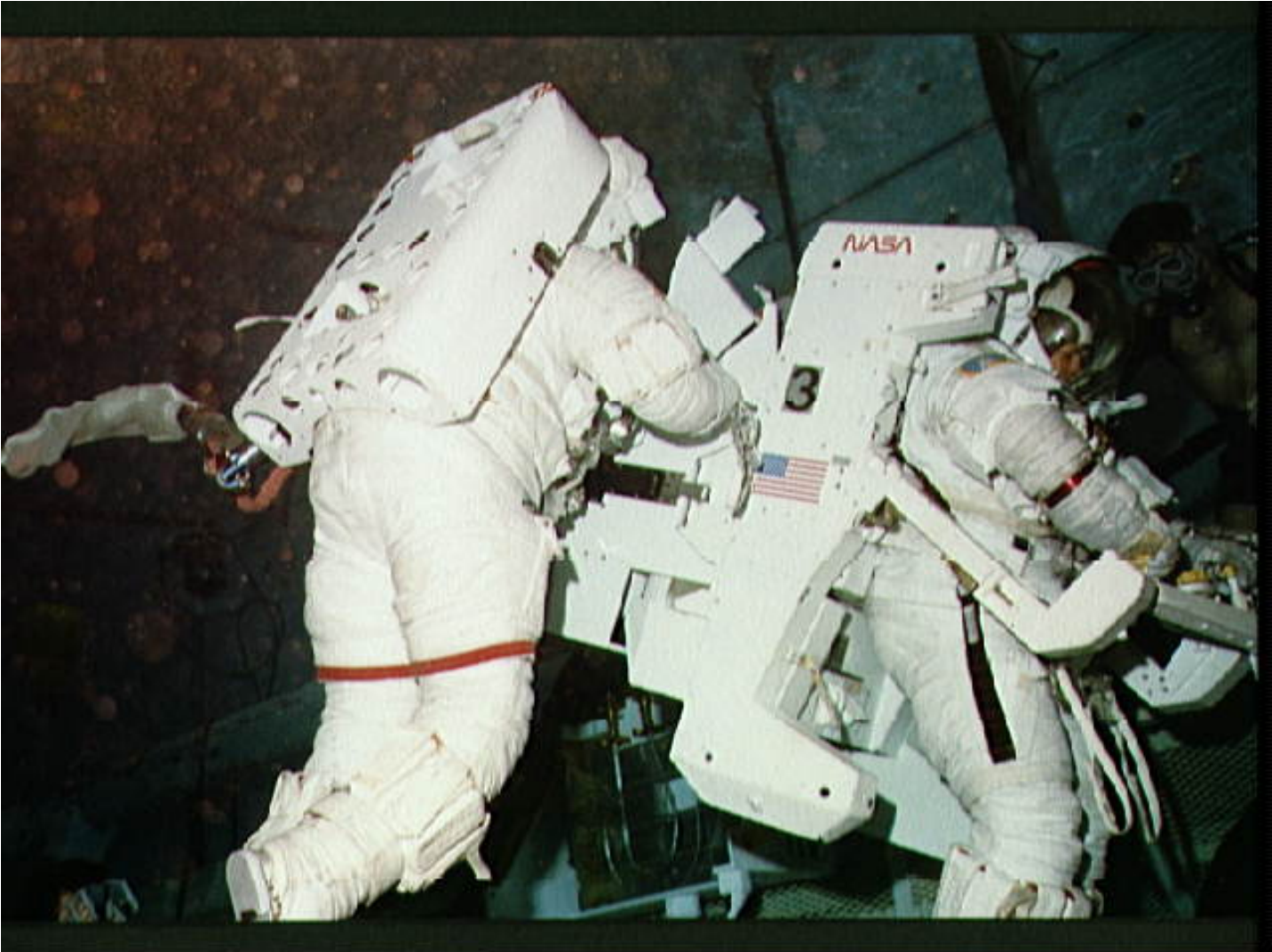
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NASA Photo ID: S86-36730

File Name: 10063504.jpg

Film Type: 35mm

Date Taken: 09/04/86

Title: Astronaut Kathryn Sullivan and Bruce McCandless in WETF for evaluation of PTK

Description:

Astronaut Kathryn D. Sullivan is assisted by Astronaut Bruce McCandless II in JSC's Weightless Environment Training Facility (WETF) during an evaluation of the propellant tank kit (PTK). The PTK, almost totally obscured in this view, attaches to the manned maneuvering unit (MMU). A SUBA-equipped diver monitors the activity. This equipment is actually a dummy representation for feasibility study purposes (36730); Astronaut Sullivan is monitored by a diver in JSC's WETF during PTK evaluation (36731).

Subject terms:

ASTRONAUTS
EXTRAVEHICULAR ACTIVITY
EXTRAVEHICULAR MOBILITY UNITS
HARDWARE
MANNED MANEUVERING UNITS
TESTING
WEIGHTLESS ENVIRONMENT TRAINING

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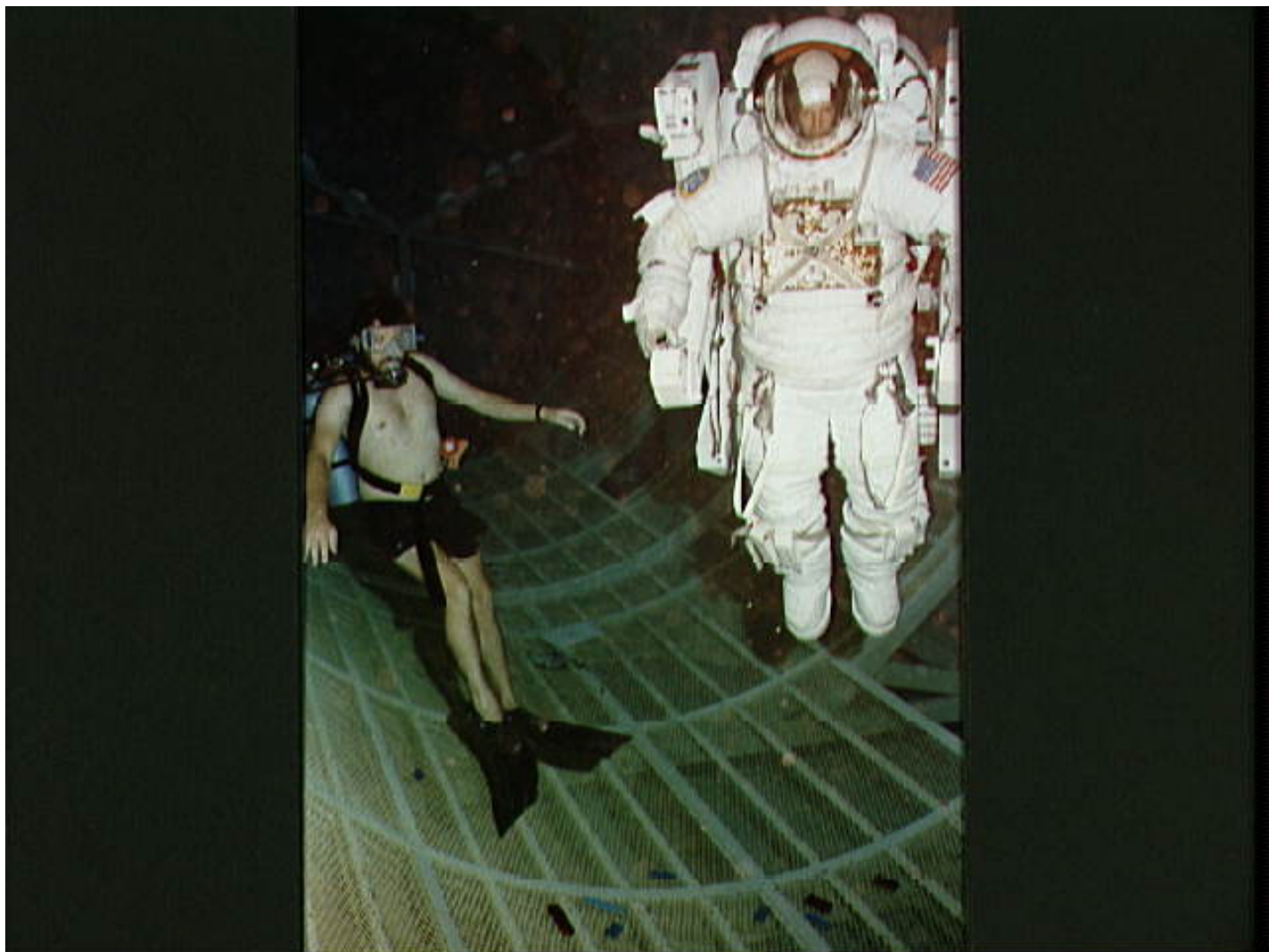
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NASA Photo ID: S86-36731

File Name: 10063505.jpg

Film Type: 35mm

Date Taken: 09/04/86

Title: Astronaut Kathryn Sullivan and Bruce McCandless in WETF for evaluation of PTK

Description:

Astronaut Kathryn D. Sullivan is assisted by Astronaut Bruce McCandless II in JSC's Weightless Environment Training Facility (WETF) during an evaluation of the propellant tank kit (PTK). The PTK, almost totally obscured in this view, attaches to the manned maneuvering unit (MMU). A SUBA-equipped diver monitors the activity. This equipment is actually a dummy representation for feasibility study purposes (36730); Astronaut Sullivan is monitored by a diver in JSC's WETF during PTK evaluation (36731).

Subject terms:

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NASA Photo ID: S86-37233

File Name: 10063478.jpg

Film Type: 4x5

Date Taken: 09/10/86

Title: Official portrait of Astronaut Charles F. Bolden, Jr.

Description:

New official portrait of Astronaut Charles F. Bolden Jr. Bolden is in the blue shuttle flight suit with his helmet under his arm and an American flag behind him. Above and to the right of his head is a view of the shuttle flying.

Subject terms:

ASTRONAUTS

PORTRAIT

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NASA Photo ID: S86-42360

File Name: 10063485.jpg

Film Type: 4x5

Date Taken: 12/15/86

Title: Art concept of the Hubble Space Telescope

Description:

Art concept of the Hubble Space Telescope in orbit above the earth with a Space Shuttle approaching.

Subject terms:

GRAPHIC ARTS

HUBBLE SPACE TELESCOPE

SOLAR ARRAYS

SPACE SHUTTLES

VISUAL AIDS

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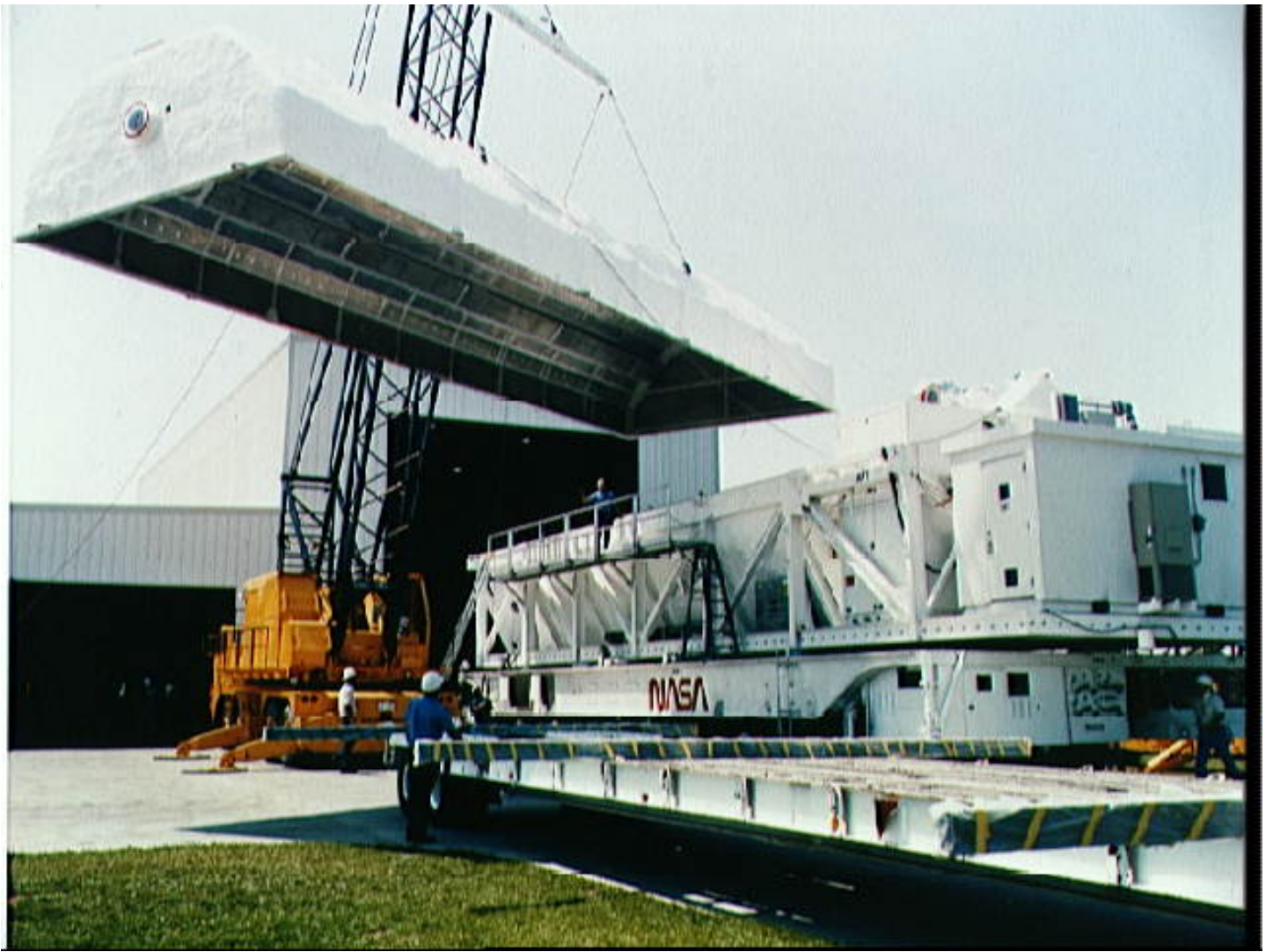
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NASA Photo ID: S87-33954

File Name: 10063506.jpg

Film Type: 4x5

Date Taken: 05/14/87

Title: Hubble Space Telescope (HST) shipping container test operations at KSC
Description:

Ground crews look on as a crane lifts the 11,500 pound aluminum cap from the Hubble Space Telescope (HST) shipping container in front of the Multiuse Mission Support Equipment (MMSE) Building at the Kennedy Space Center (KSC). KSC workers continue to test and checkout the container which will be used to transport the 43 foot long, 14 foot diameter telescope from Lockheed in Sunnyvale, California to KSC next year. The telescope is scheduled for launch aboard the space shuttle in November 1988. View provided by KSC with alternate KSC number KSC-87PC-502.

Subject terms:

CONTAINERS

CRANES

FLORIDA

HUBBLE SPACE TELESCOPE

KENNEDY SPACE CENTER

PERSONNEL

PREFLIGHT OPERATIONS

STS-31

TRANSPORT VEHICLES

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NASA Photo ID: S88-31630

File Name: 10063510.jpg

Film Type: 4x5

Date Taken: 03/31/88

Title: Hubble Space Telescope (HST) at Lockheed Facility during preflight assembly
Description:

This high angle view looks down on the Hubble Space Telescope's (HST's) Support System Module (SSM) forward shell to the SSM equipment section. Clean-suited technicians examine HST from the multi-tiered platforms encircling the telescope. HST assembly and testing are being completed at the Lockheed Facility in Sunnyvale, California.

Subject terms:

ASSEMBLING

CALIFORNIA

HUBBLE SPACE TELESCOPE

MANUFACTURING

PERSONNEL

PREFLIGHT OPERATIONS

PROTECTIVE CLOTHING

STS-31

TESTING

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NASA Photo ID: S88-31631

File Name: 10063509.jpg

Film Type: 4x5

Date Taken: 03/31/88

Title: Hubble Space Telescope (HST) at Lockheed Facility during preflight assembly
Description:

A mechanical arm positions the axial scientific instrument (SI) module (orbital replacement unit (ORU)) just outside the open doors of the Hubble Space Telescope (HST) Support System Module (SSM) as clean-suited technicians oversee the process. HST assembly is being completed at the Lockheed Facility in Sunnyvale, California.

Subject terms:

ASSEMBLING

CALIFORNIA

DOORS

HUBBLE SPACE TELESCOPE

MANUFACTURING

ORBITAL REPLACEMENT UNIT

PERSONNEL

PREFLIGHT OPERATIONS

PROTECTIVE CLOTHING

STS-31

TESTING

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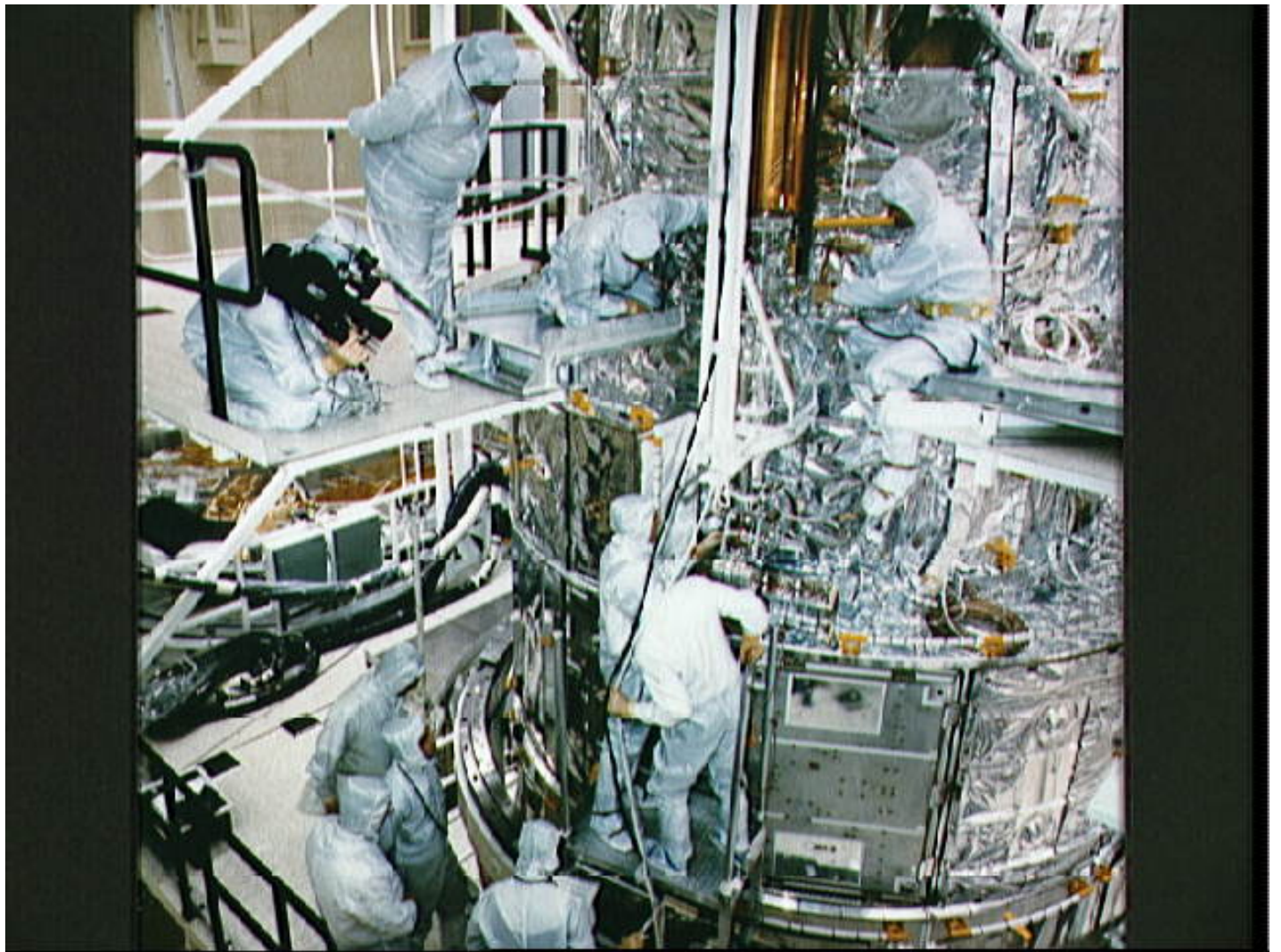
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NASA Photo ID: S88-31632

File Name: 10063508.jpg

Film Type: 4x5

Date Taken: 03/31/88

Title: Hubble Space Telescope (HST) at Lockheed Facility during preflight assembly
Description:

Clean suited technicians, positioned on platforms, secure a solar array (SA) on the Hubble Space Telescope (HST) Support System Module (SSM) forward shell during assembly and testing procedures at the Lockheed Facility in Sunnyvale, California. Other technicians look on and one records the activity using a motion picture camera.

Subject terms:

ASSEMBLING

CALIFORNIA

HUBBLE SPACE TELESCOPE

MANUFACTURING

PERSONNEL

PREFLIGHT OPERATIONS

PROTECTIVE CLOTHING

SOLAR ARRAYS

STS-31

TESTING

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NASA Photo ID: S88-41980

File Name: 10063517.jpg

Film Type: 35mm

Date Taken: 07/14/88

Title: STS-31 Pilot Bolden with beverages on the FB-SMS middeck during JSC training

Description:

STS-31 Pilot Charles F. Bolden holds three beverage containers while in front of the galley on the middeck of the fixed based (FB) shuttle mission simulator (SMS) during a training simulation at JSC's Mission Simulation and Training Facility Bldg 5. From the middeck, Bolden, wearing lightweight headset, simulates a communications link with ground controllers and fellow crewmembers.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

BEVERAGES

CREWS

HEADSETS

MIDDECK

SHUTTLE MISSION SIMULATOR

SPACE FLIGHT TRAINING

STS-31

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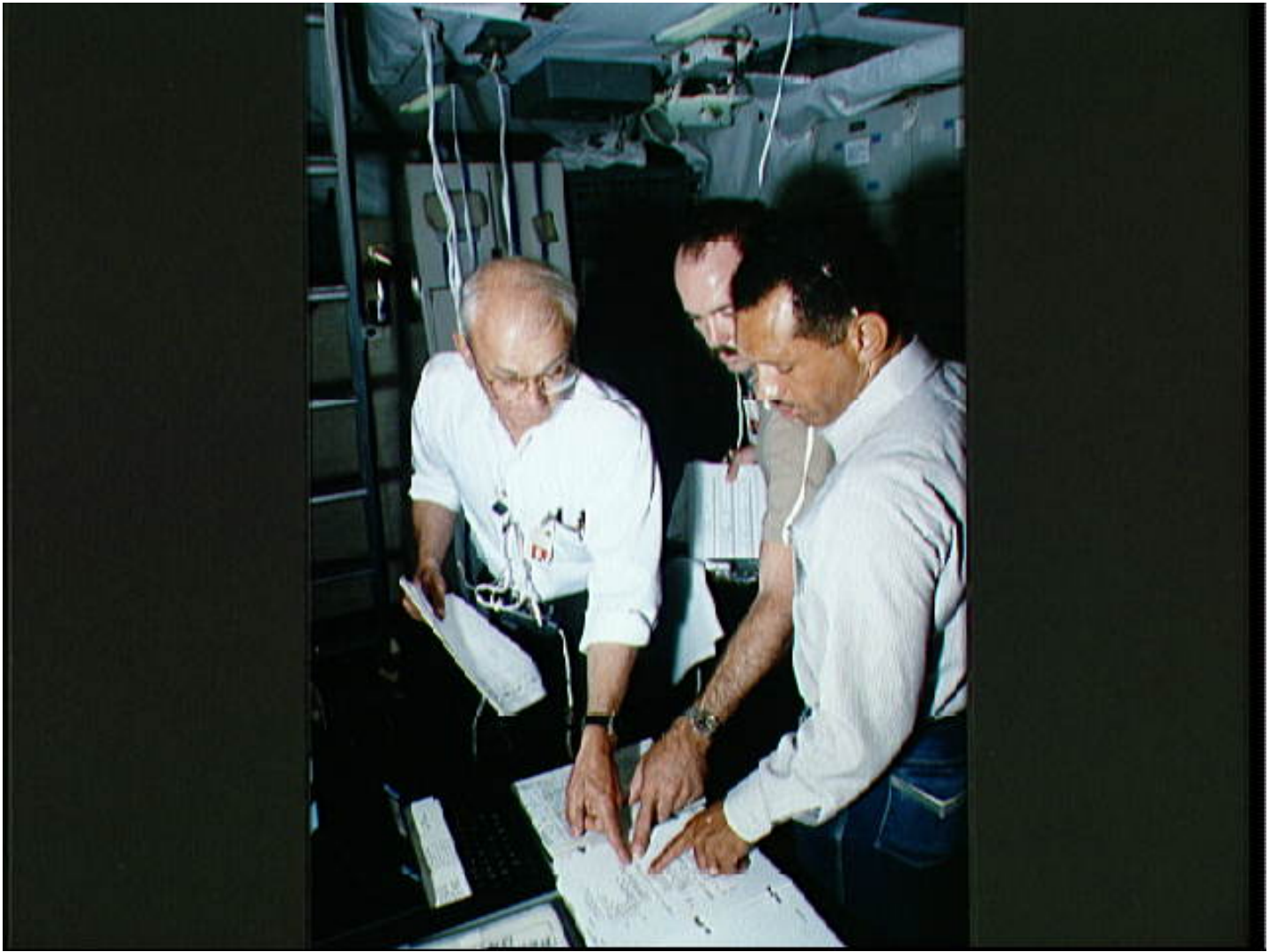
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NASA Photo ID: S88-41981

File Name: 10063518.jpg

Film Type: 35mm

Date Taken: 07/14/88

Title: STS-31 crewmembers review checklist with instructor on JSC's FB-SMS middeck
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Mission Specialist (MS) Bruce McCandless II (left) and Pilot Charles F. Bolden (right) discuss procedures with a training instructor on the middeck of JSC's fixed-based (FB) Shuttle Mission Simulator (SMS). The three are pointing to a checklist during this training simulation in the Mission Simulation and Training Facility Bldg 5.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

INSTRUCTORS

MIDDECK

PERSONNEL

SHUTTLE MISSION SIMULATOR

SPACE FLIGHT TRAINING

STS-31

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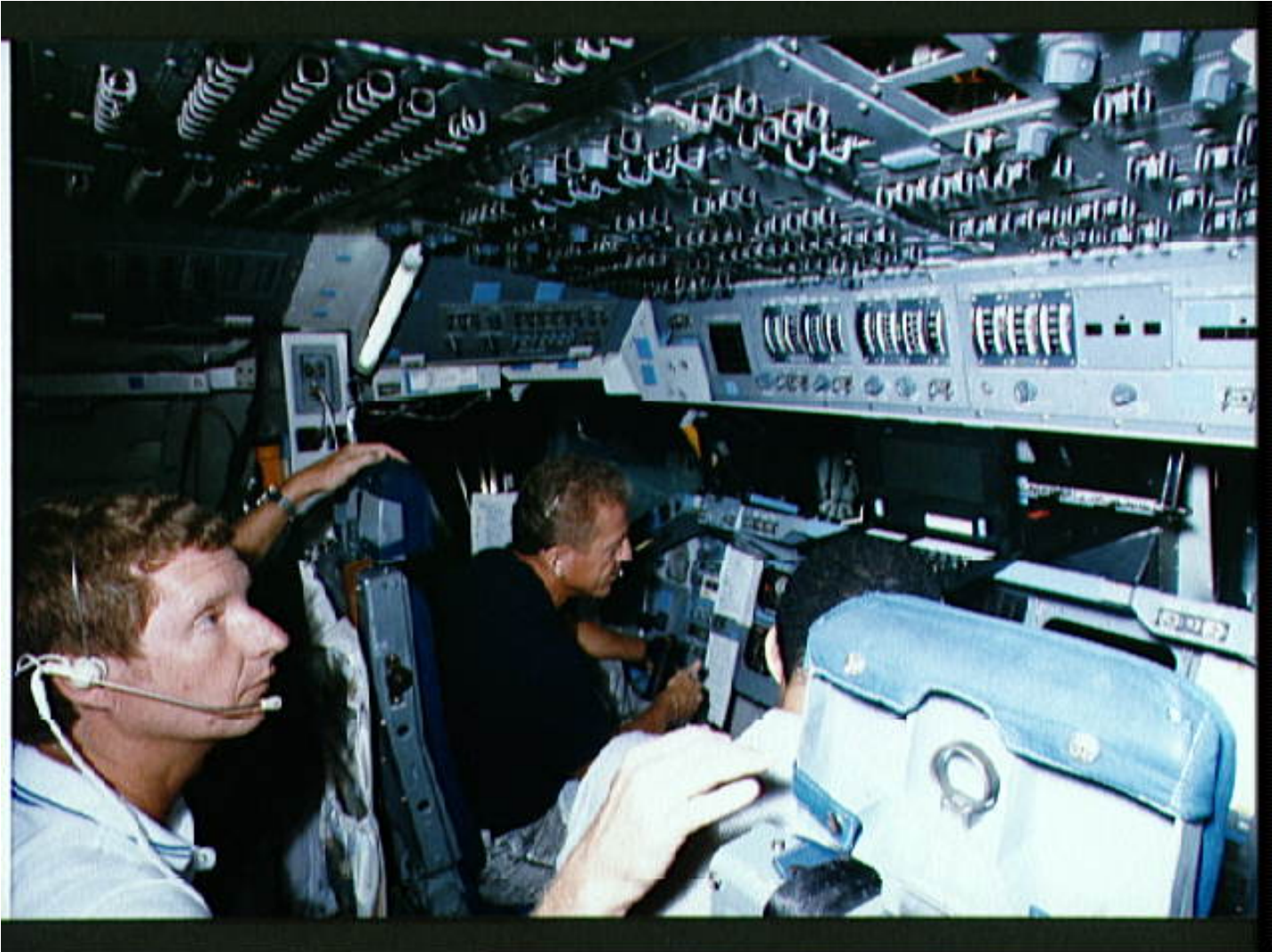
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NASA Photo ID: S88-41988

File Name: 10063519.jpg

Film Type: 35mm

Date Taken: 07/14/88

Title: STS-31 crewmembers during simulation on the flight deck of JSC's FB-SMS

Description:

On the flight deck of JSC's fixed based (FB) shuttle mission simulator (SMS), Mission Specialist (MS) Steven A. Hawley (left), on aft flight deck, looks over the shoulders of Commander Loren J. Shriver, seated at the commanders station (left) and Pilot Charles F. Bolden, seated at the pilots station and partially blocked by the seat's headrest (right). The three astronauts recently named to the STS-31 mission aboard Discovery, Orbiter Vehicle (OV) 103, go through a procedures checkout in the FB-SMS. The training simulation took place in JSC's Mission Simulation and Training Facility Bldg 5.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CONTROL BOARDS

CREWS

FLIGHT DECK

HEADSETS

SHUTTLE MISSION SIMULATOR

SIMULATION

SPACE FLIGHT TRAINING

STS-31

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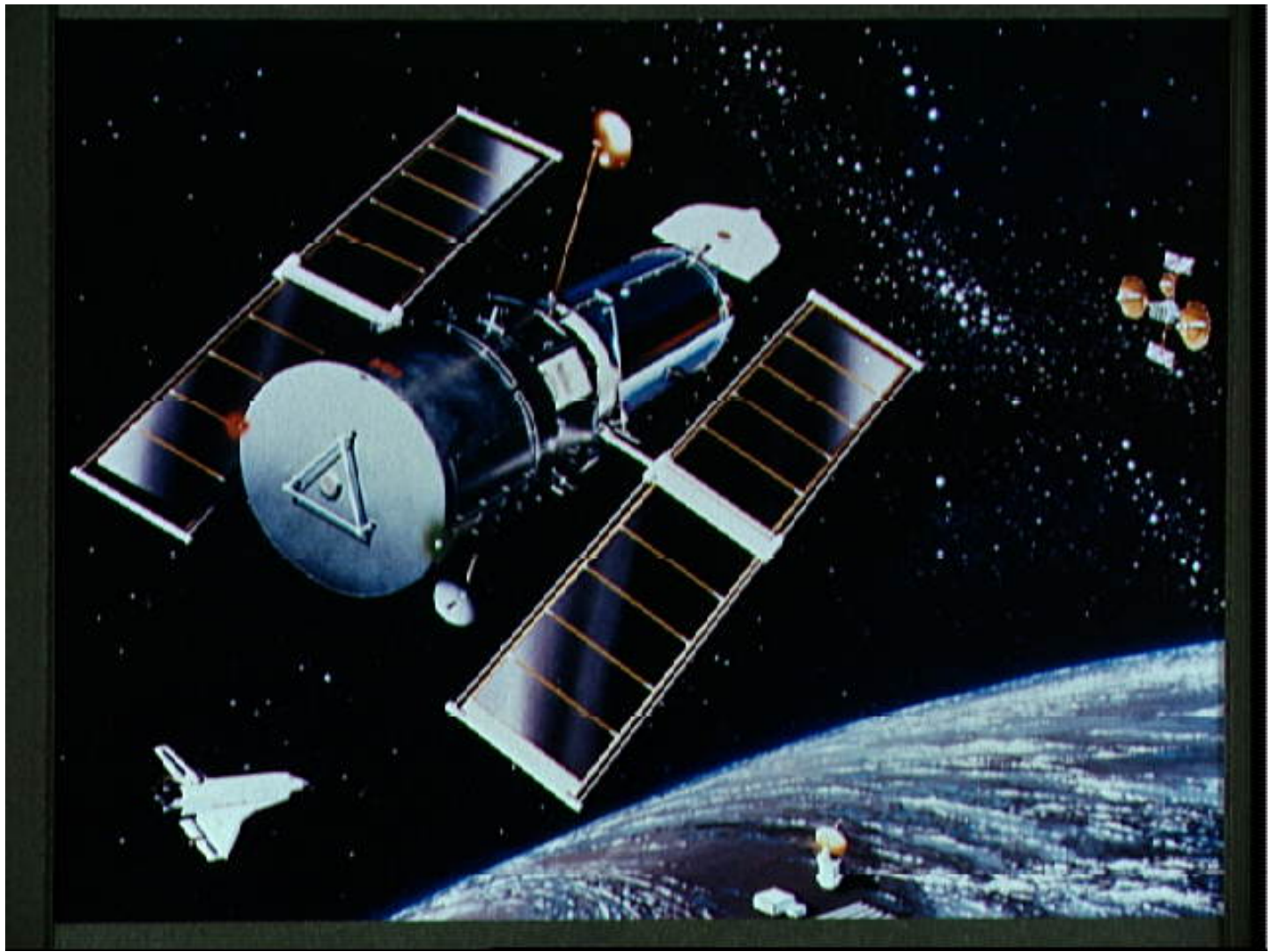
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NASA Photo ID: S88-47723

File Name: 10063486.jpg

Film Type: 35mm

Date Taken: 09/21/88

Title: Artist concept of the Hubble Space Telescope (HST) after STS-31 deployment
Description:

Artist concept shows the Hubble Space Telescope (HST) placed in orbit above the Earth's distorting layer of atmosphere by Discovery, Orbiter Vehicle (OV) 103, during mission STS-31. Tracking and data relay satellite (TDRS) is visible in the background and ground station is visible below on the Earth's surface. HST is the first of the great observatories to go into service and one of NASA's highest priority scientific spacecraft. Capable of observing in both visible and ultraviolet wavelengths, HST has been termed the most important scientific instrument ever designed for use on orbit. It will literally be able to look back in time, observing the universe as it existed early in its lifetime and providing information on how matter has evolved over the eons. The largest scientific payload ever built, the 12 1/2-ton, 43-foot HST was developed by Lockheed Missiles & Space Company, spacecraft prime contractor, and Perkin-Elmer Corporation, prime contractor for the optical assembly. The European Space Agency (ESA) furnished the power generating solar array and one of the system's five major instruments. Marshall Space Flight Center (MSFC) manages the HST project; Goddard Space Flight Center (GSFC) will be responsible, when the spacecraft is in orbit, for controlling the telescope and processing the images and instrument data returns.

Subject terms:

DISCOVERY (ORBITER)

EARTH SURFACE

HUBBLE SPACE TELESCOPE

STS-31

TDR SATELLITES

VISUAL AIDS

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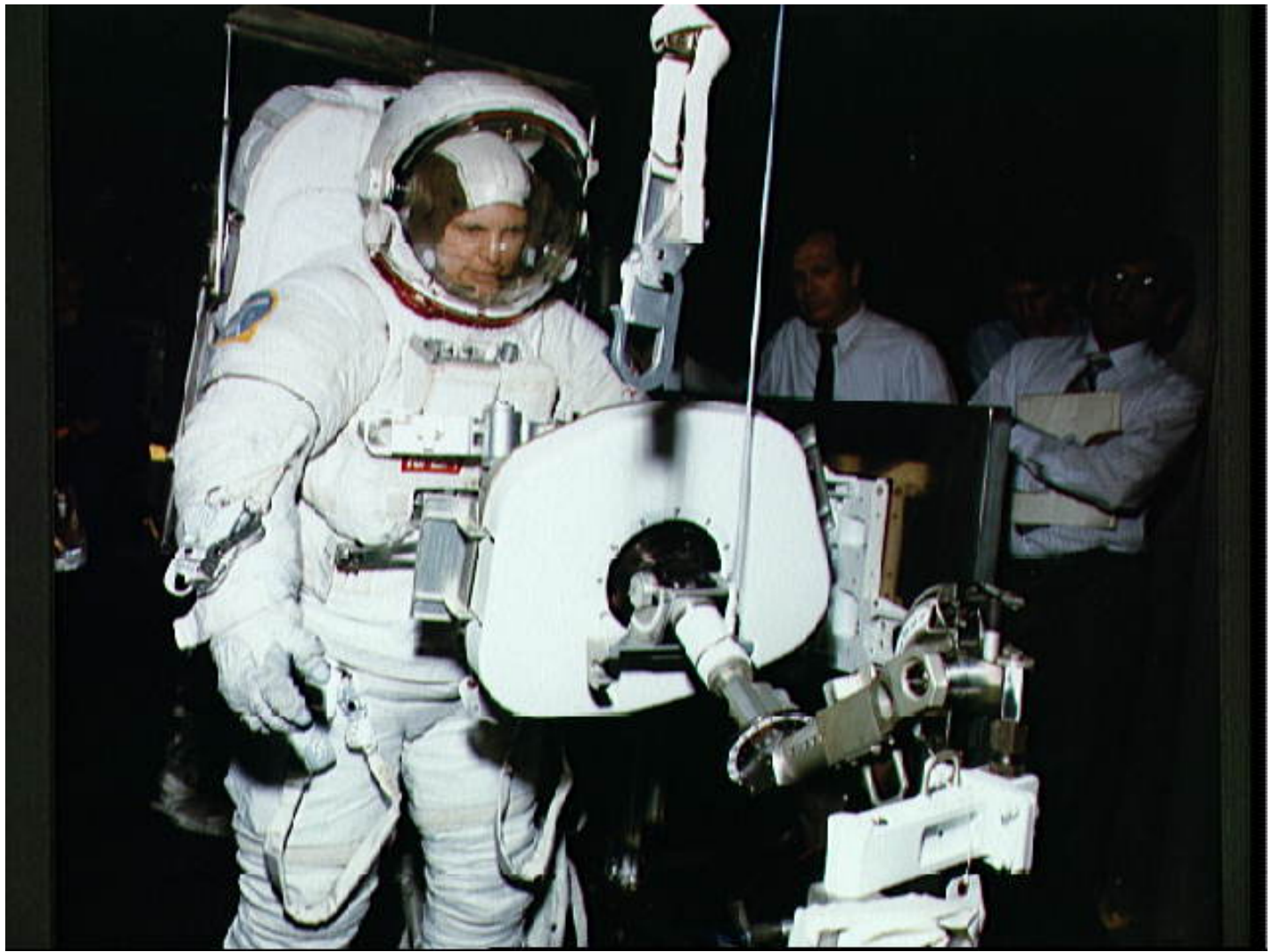
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NASA Photo ID: S89-32483

File Name: 10063520.jpg

Film Type: 120mm

Date Taken: 04/21/89

Title: STS-31 MS Sullivan, in EMU, evaluates tools in JSC's SESL Chamber B

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Mission Specialist (MS) Kathryn D. Sullivan, fully suited in an extravehicular mobility unit (EMU), manipulates a portable foot restraint (PFR) during a tool evaluation conducted in JSC's Space Environment Simulation Laboratory (SESL) Bldg 32 Chamber B. In the background, technicians monitor Sullivan's interaction with the PFR. Sullivan was preparing for a thermal vacuum test of the STS-31 tools. Photo taken by NASA JSC contract photographer Benny Benavides.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

EVALUATION

EXTRAVEHICULAR MOBILITY UNITS

FOOT RESTRAINTS

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NASA Photo ID: S89-35196

File Name: 10063521.jpg

Film Type: 35mm Widelux

Date Taken: 05/25/89

Title: STS-31 crewmembers participate in preflight ARRIFLEX camera briefing at JSC

Description:

Seated around a conference table are STS-31 crewmembers (left to right) Mission Specialist (MS) Steven A. Hawley, MS Bruce McCandless II, Commander Loren J. Shriver, MS Kathryn D. Sullivan. At the far right a training instructor looks on as McCandless handles the ARRIFLEX camera base. The briefing is part of the crew's preflight training at JSC.

Subject terms:

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NASA Photo ID: S89-35197

File Name: 10063522.jpg

Film Type: 35mm Widelux

Date Taken: 05/25/89

Title: STS-31 crewmembers participate in preflight ARRIFLEX camera briefing at JSC

Description:

A training instructor (foreground) explains the use of the ARRIFLEX camera during a briefing for the STS-31 crewmembers. Holding and examining the ARRIFLEX equipment is Mission Specialist (MS) Kathryn D. Sullivan. Seated next to her is Commander Loren J. Shriver (partially blocked by Sullivan). In the background on the opposite side of the table are MS Steven A. Hawley (left) and MS Bruce McCandless II.

Subject terms:

ASTRONAUT TRAINING

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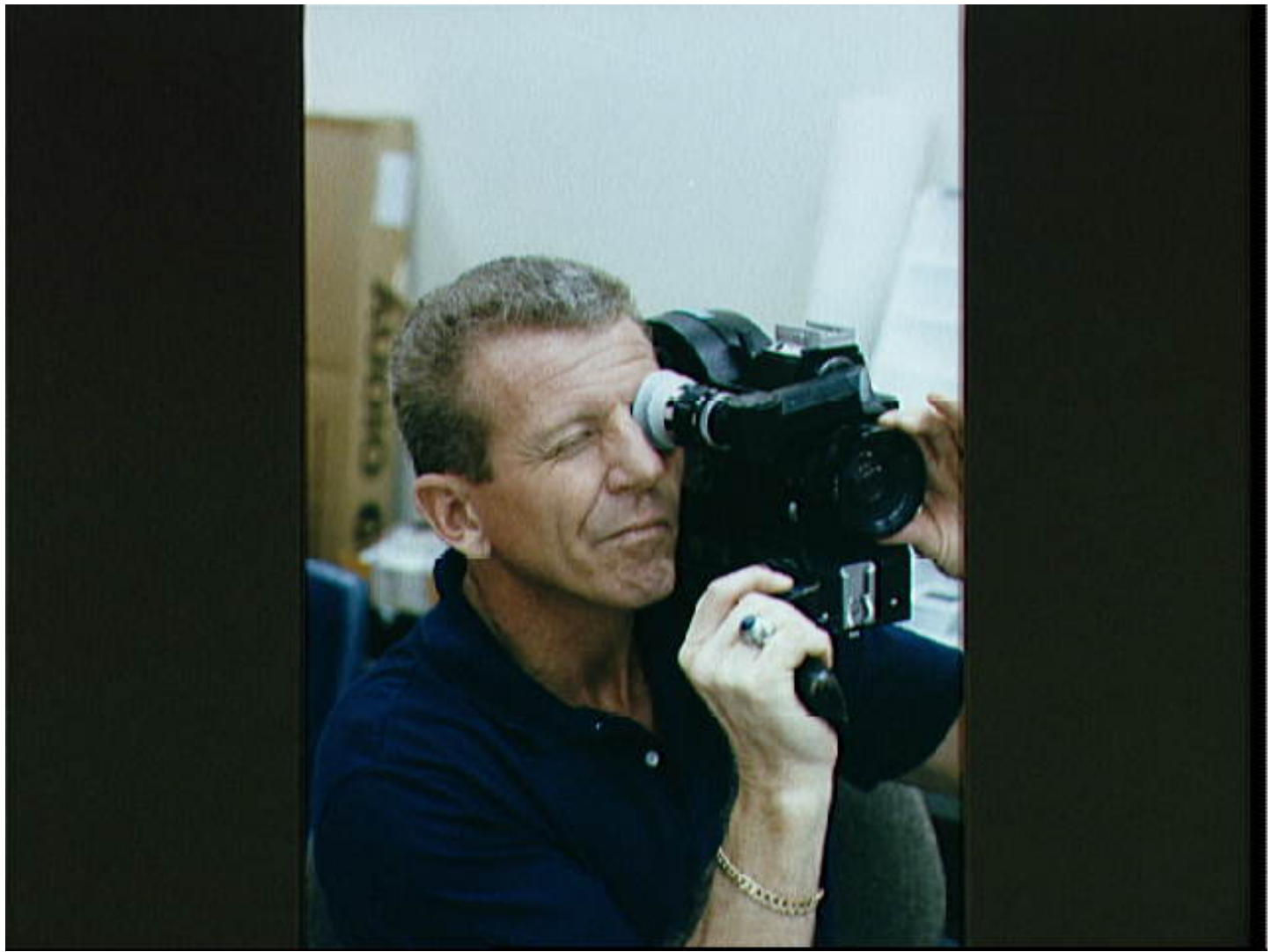
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NASA Photo ID: S89-35910

File Name: 10063523.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 Commander Loren J. Shriver uses ARRIFLEX camera during JSC briefing

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Commander Loren J. Shriver peers through the eye piece of the ARRIFLEX camera while adjusting the lens during JSC briefing. Shriver, along with other crewmembers, is familiarizing himself with the operation of the camera for use on his upcoming mission.

Subject terms:

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NASA Photo ID: S89-35911

File Name: 10063524.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 Mission Specialist Sullivan uses ARRIFFLEX camera during JSC briefing

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Mission Specialist (MS) Kathryn D. Sullivan, with the ARRIFFLEX camera propped on her shoulder, looks through the eye piece, focuses the camera lens, and familiarizes herself with the camera's features during a JSC briefing.

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NASA Photo ID: S89-35912

File Name: 10063525.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 Mission Specialist McCandless examines camera lens during JSC briefing

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II examines a camera lens during a JSC photography briefing. McCandless, along with other crewmembers, is familiarizing himself with the camera equipment he will use aboard Discovery, Orbiter Vehicle (OV) 103, during his upcoming mission.

Subject terms:

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NASA Photo ID: S89-35913

File Name: 10063527.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 Mission Specialist Hawley examines ARRIFLEX camera during JSC briefing

Description:

STS-31 Mission Specialist (MS) Steven A. Hawley, having removed the glass lens from the ARRIFLEX camera eye piece, examines it closely. Hawley, along with other crewmembers, is participating in a Photo/TV briefing and camera familiarization session at JSC. This type of camera equipment will be used during the STS-31 mission aboard Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

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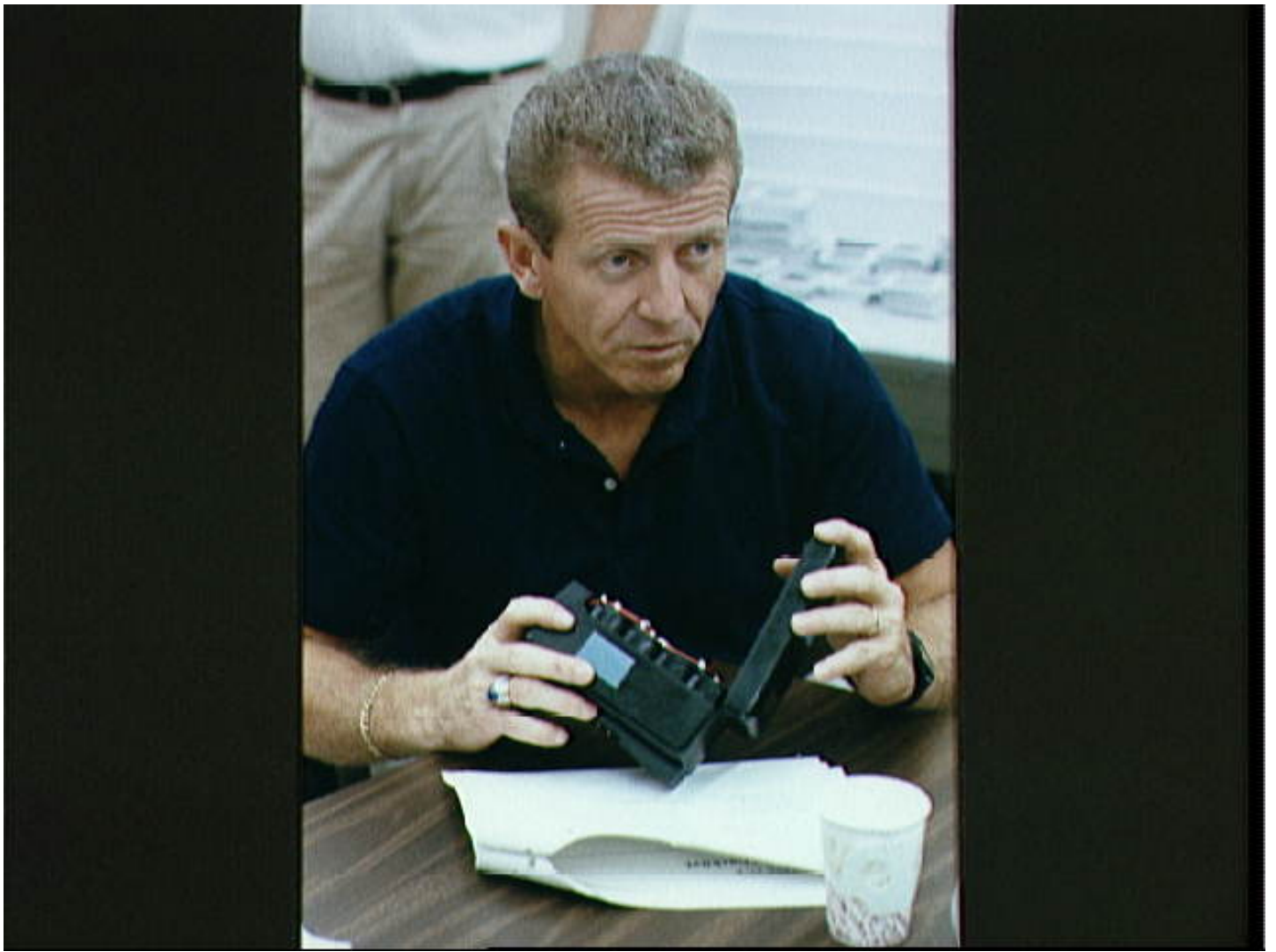
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NASA Photo ID: S89-35915

File Name: 10063526.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 Commander Shriver holds camera battery pack during JSC briefing

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Commander Loren J. Shriver, holding camera battery pack, inquires about its use during a JSC Photo/TV briefing. Shriver, along with other crewmembers, is familiarizing himself with the use of various pieces of photographic equipment that he will use on the upcoming STS-31 mission.

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NASA Photo ID: S89-35917

File Name: 10063529.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 MS Sullivan examines camera battery pack during JSC Photo/TV briefing

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan examines camera battery pack during JSC Photo/TV briefing. In the background, Commander Loren J. Shriver reviews a checklist. The crewmembers are familiarizing themselves with various pieces of camera equipment for their upcoming mission aboard Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

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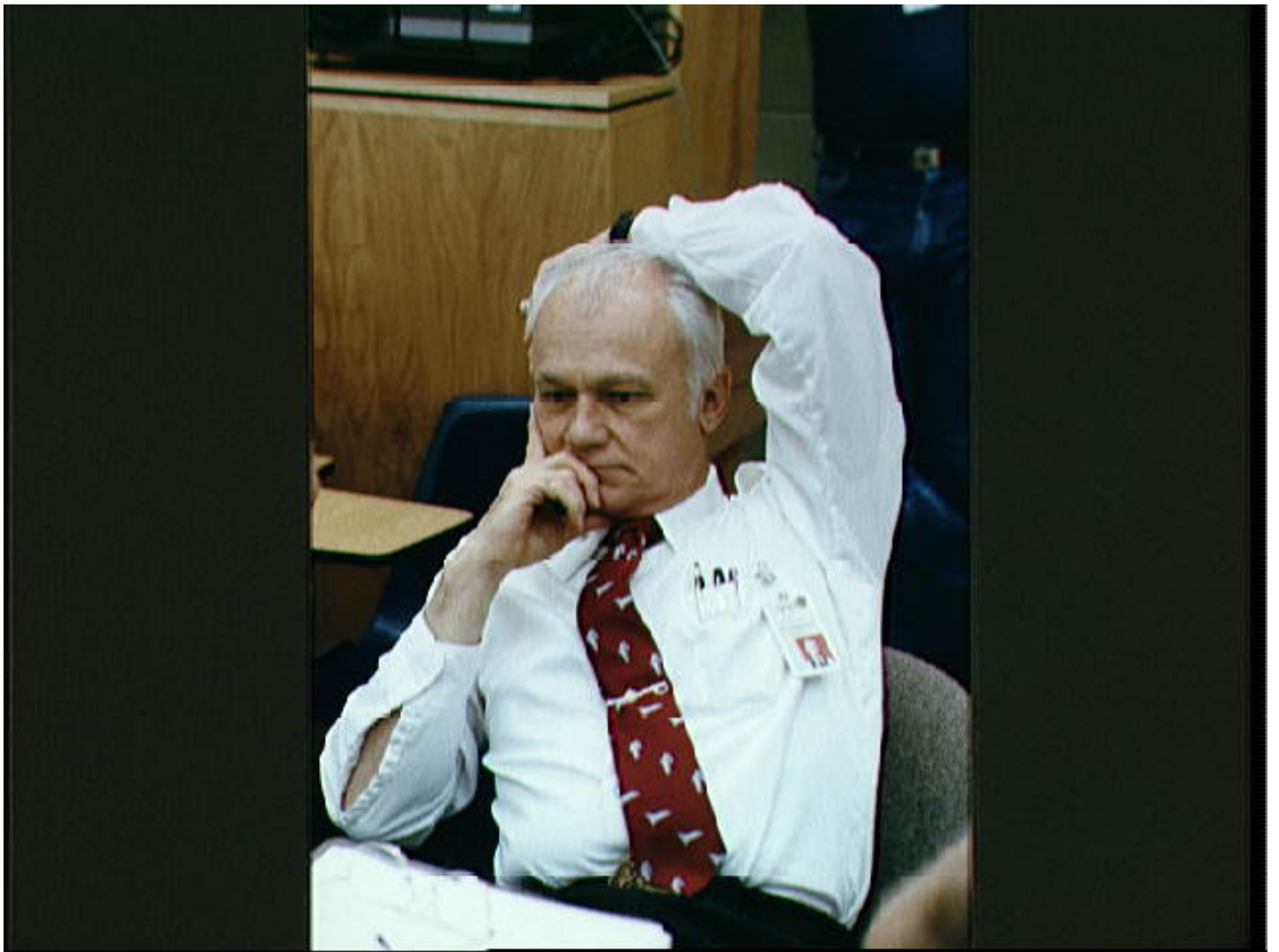
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NASA Photo ID: S89-35920

File Name: 10063528.jpg

Film Type: 35mm

Date Taken: 06/06/89

Title: STS-31 MS McCandless listens intently during JSC camera briefing

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II listens intently during a JSC Photo/TV briefing. McCandless, along with the other crewmembers, is participating in the camera training session to familiarize himself with the photographic equipment he will use aboard Discovery, Orbiter Vehicle (OV) 103 during his upcoming mission.

Subject terms:

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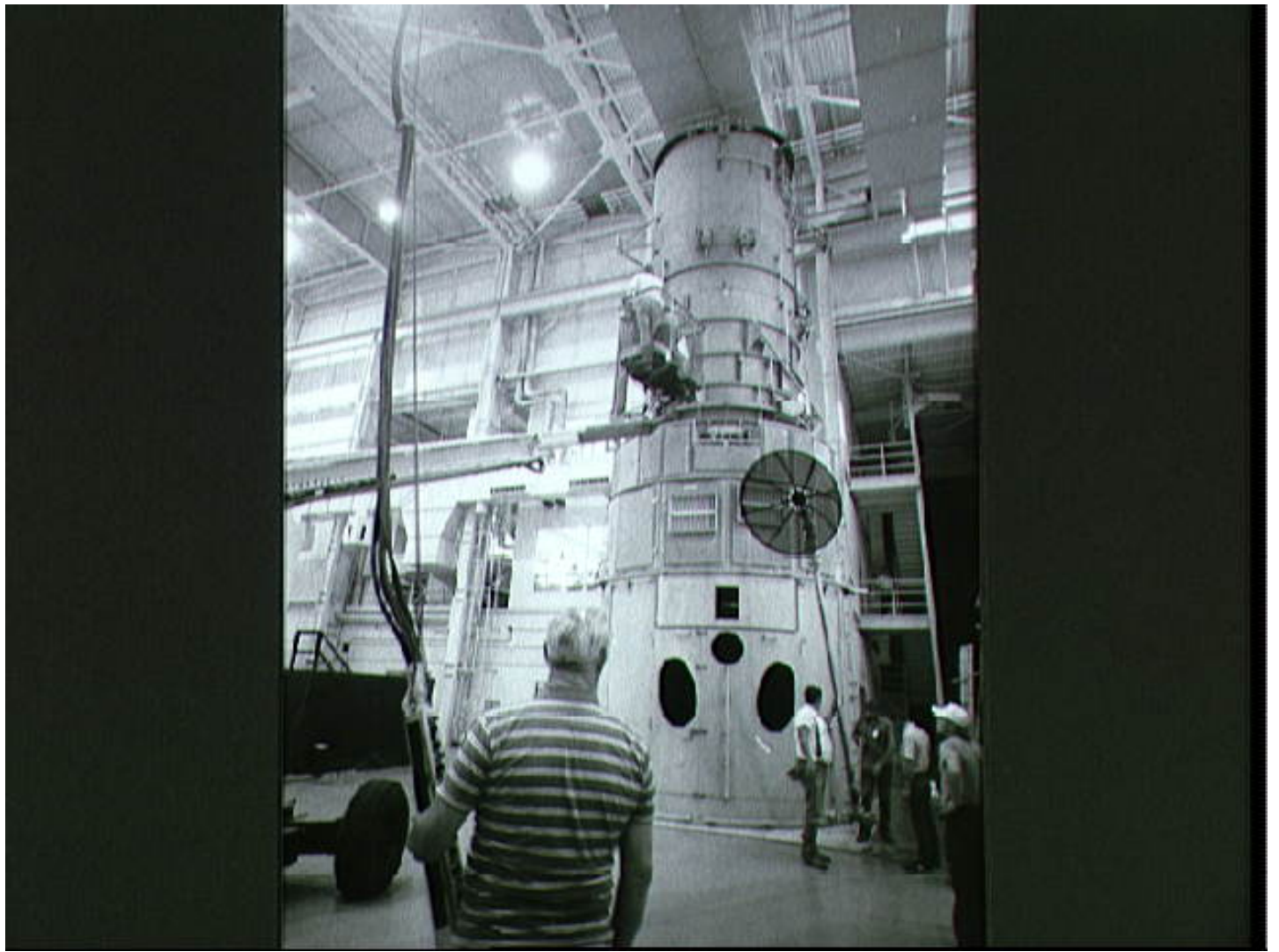
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NASA Photo ID: S89-37302

File Name: 10063516.jpg

Film Type: 35mm BW

Date Taken: 06/20/89

Title: Technicians complete assembly of Hubble Space Telescope (HST) mockup at JSC
Description:

Technicians complete assembly of the Hubble Space Telescope (HST) mockup at JSC's Mockup and Integration Laboratory (MAIL) Bldg 9A. In the foreground, a technician holds the controls for an overhead crane attached to one of the HST's high gain antennas (HGAs). Technicians on the ground prepare the HGA to be hoisted into position on the mockup's Support System Module (SSM) forward shell as others work on SSM from a cherry picker.

Subject terms:

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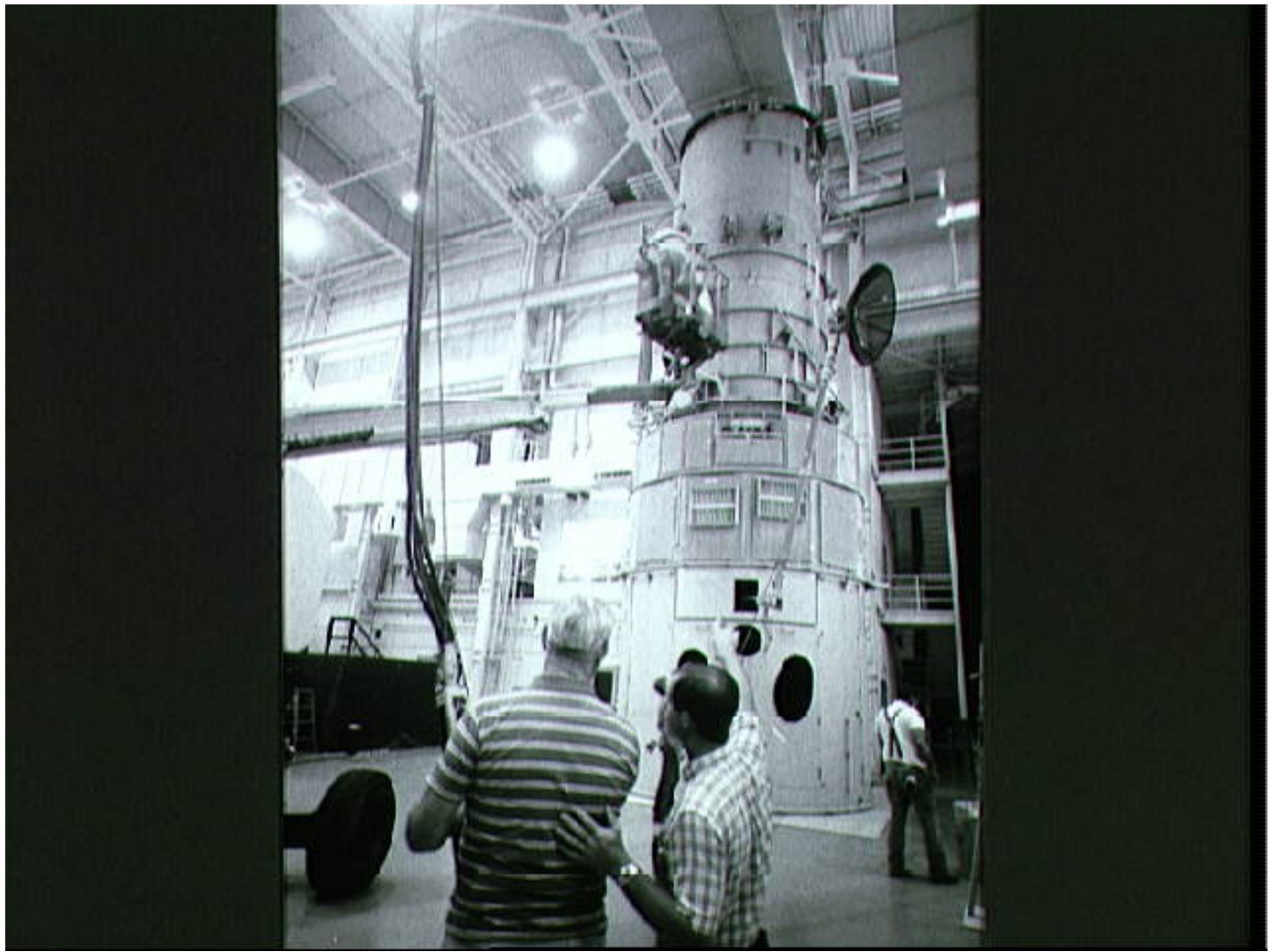
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NASA Photo ID: S89-37303

File Name: 10063514.jpg

Film Type: 35mm BW

Date Taken: 06/20/89

Title: Technicians complete assembly of Hubble Space Telescope (HST) mockup at JSC
Description:

A technician listens to instructions as he operates the controls for the overhead crane that is lifting one of the Hubble Space Telescope (HST) high gain antennas (HGAs) into place on the HST Support System Module (SSM) forward shell. Others in a cherry picker basket wait to install the HGA on the SSM mockup. The HST mockup will be used for astronaut training and is being assembled in JSC's Mockup and Integration Laboratory (MAIL) Bldg 9A.

Subject terms:

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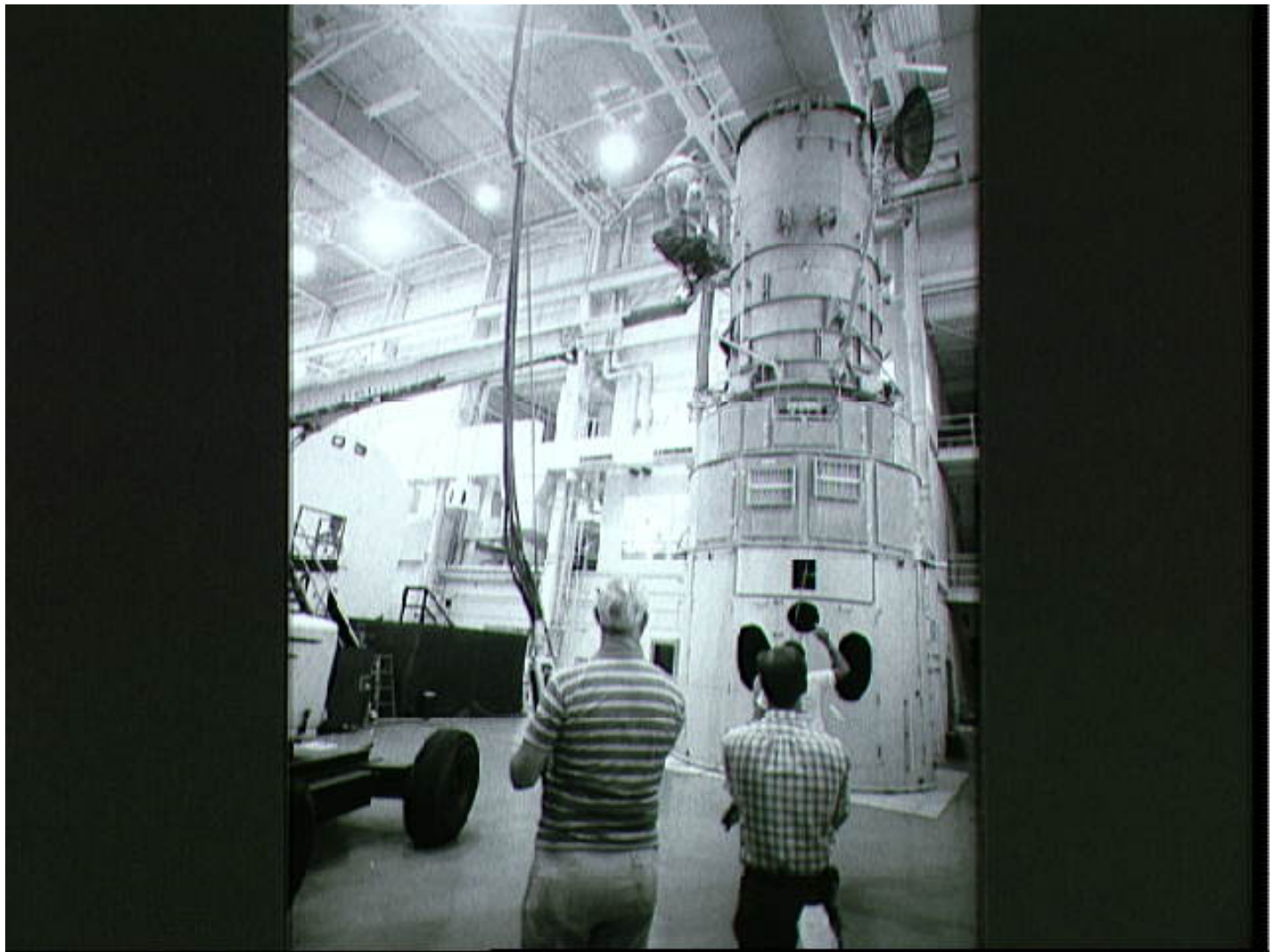
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NASA Photo ID: S89-37304

File Name: 10063515.jpg

Film Type: 35mm BW

Date Taken: 06/20/89

Title: Technicians assembly the Hubble Space Telescope (HST) mockup at JSC

Description:

At JSC's Mockup and Integration Laboratory (MAIL) Bldg 9A, technicians install a high gain antenna (HGA) on the Hubble Space Telescope (HST) mockup. On the ground a technician operates the controls for the overhead crane that is lifting the HGA into place on the Support System Module (SSM) forward shell. Others in a cherry picker basket wait for the HGA to near its final position so they can secure it on the mockup.

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NASA Photo ID: S89-47919

File Name: 10063513.jpg

Film Type: 120mm

Date Taken: 10/22/89

Title: Hubble Space Telescope (HST) during preflight processing at KSC

Description:

Hubble Space Telescope (HST) undergoes preflight processing at the Kennedy Space Center's (KSC's) Vertical Processing Facility (VPF). HST is in a horizontal position in a ground handling support cradle. An overhead crane with cables attached to the support structure prepares to lift the cradle with HST to a vertical position. Clean-suited technicians oversee handling operations. HST closed aperture door is at the right and the solar arrays (SAs) and high gain antennas (HGAs) are stowed against the support system module (SSM) forward shell.

Subject terms:

CRANES

FLORIDA

GROUND HANDLING

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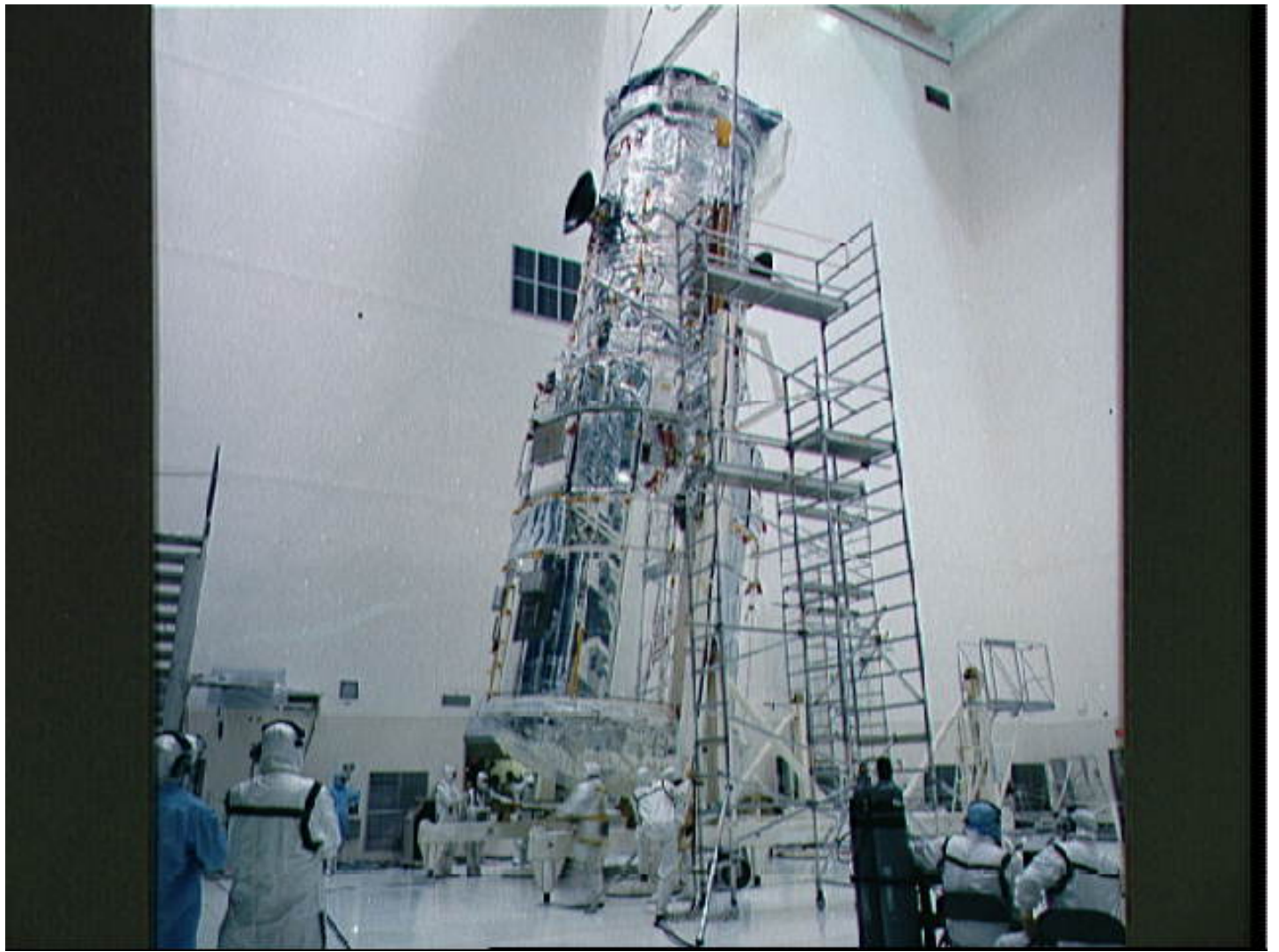
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NASA Photo ID: S89-47920

File Name: 10063511.jpg

Film Type: 120mm

Date Taken: 10/22/89

Title: Hubble Space Telescope (HST) preflight processing at Kennedy Space Center VPF

Description:

Hubble Space Telescope (HST) undergoes preflight processing at Kennedy Space Center's (KSC's) Vertical Processing Facility (VPF). Clean-suited technicians look on as the HST, positioned in a ground handling support cradle is raised from a horizontal to a vertical position via an overhead crane. The closed and plastic-covered aperture door is at the top of the HST with the solar arrays (SAs) and high gain antennas (HGAs) stowed along the Support System Module (SSM) forward shell.

Subject terms:

FLORIDA

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NASA Photo ID: S89-49168

File Name: 10063530.jpg

Film Type: 35mm

Date Taken: 11/15/89

Title: STS-31 MS McCandless dons EMU for JSC EVA underwater simulation in WETF pool
Description:

STS-31 Mission Specialist (MS) Bruce McCandless II, wearing an extravehicular mobility unit (EMU) lower torso, pulls his head and arms through the EMU upper torso with the assistance of two technicians. McCandless is positioned on a platform at the poolside of JSC's Weightless Environment Training Facility (WETF) Bldg 29. Once fully suited in the EMU, McCandless will be lowered into the nearby pool via the platform. Underwater and in a neutrally buoyant state, McCandless will rehearse contingency extravehicular activity (EVA) procedures associated with the Hubble Space Telescope (HST) payload. There are no EVAs planned for the flight aboard Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

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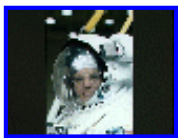
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NASA Photo ID: S89-49173

File Name: 10063532.jpg

Film Type: 35mm

Date Taken: 11/15/89

Title: STS-31 MS Sullivan in EMU prepares for JSC EVA simulation in the WETF pool
Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan, fully suited in an extravehicular mobility unit (EMU), undergoes final preparations before being lowered into the 25-ft deep pool of JSC's Weightless Environment Training Facility (WETF) Bldg 29. Once underwater, Sullivan will achieve a neutrally buoyant state and will rehearse contingency extravehicular activity (EVA) procedures associated with the Hubble Space Telescope (HST) payload. There are no EVAs planned for the flight aboard Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

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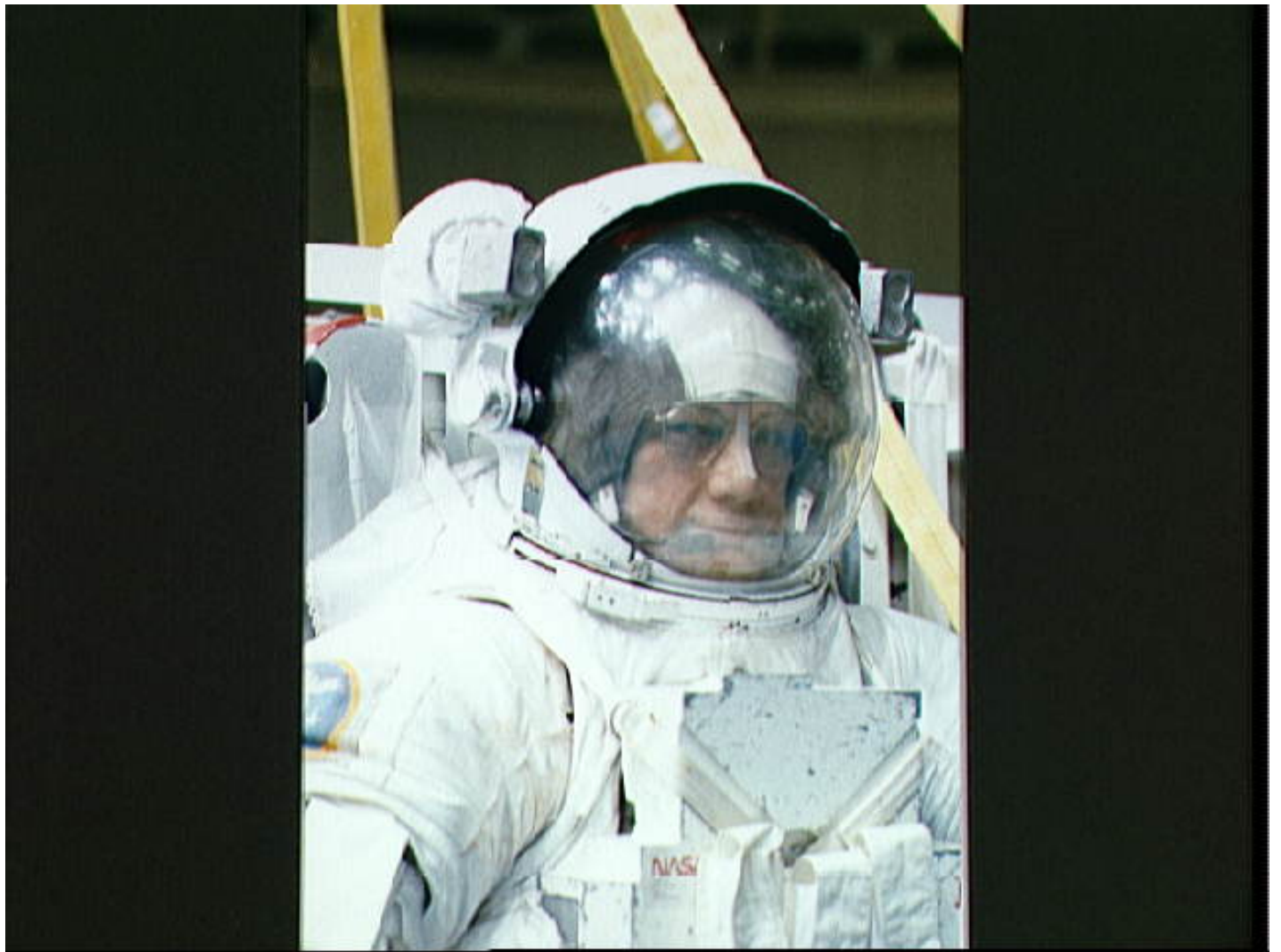
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NASA Photo ID: S89-49175

File Name: 10063531.jpg

Film Type: 35mm

Date Taken: 11/15/89

Title: STS-31 Mission Specialist (MS) McCandless in EMU prior to JSC WETF simulation

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II, fully suited in an extravehicular mobility unit (EMU), stands on platform before it is lifted and lowered into the 25-ft deep pool of JSC's Weightless Environment Training Facility (WETF) Bldg 29. Once underwater, McCandless will achieve a neutrally buoyant state and will rehearse extravehicular activity (EVA) procedures associated with the Hubble Space Telescope (HST) payload. There are no EVAs planned for the flight aboard Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

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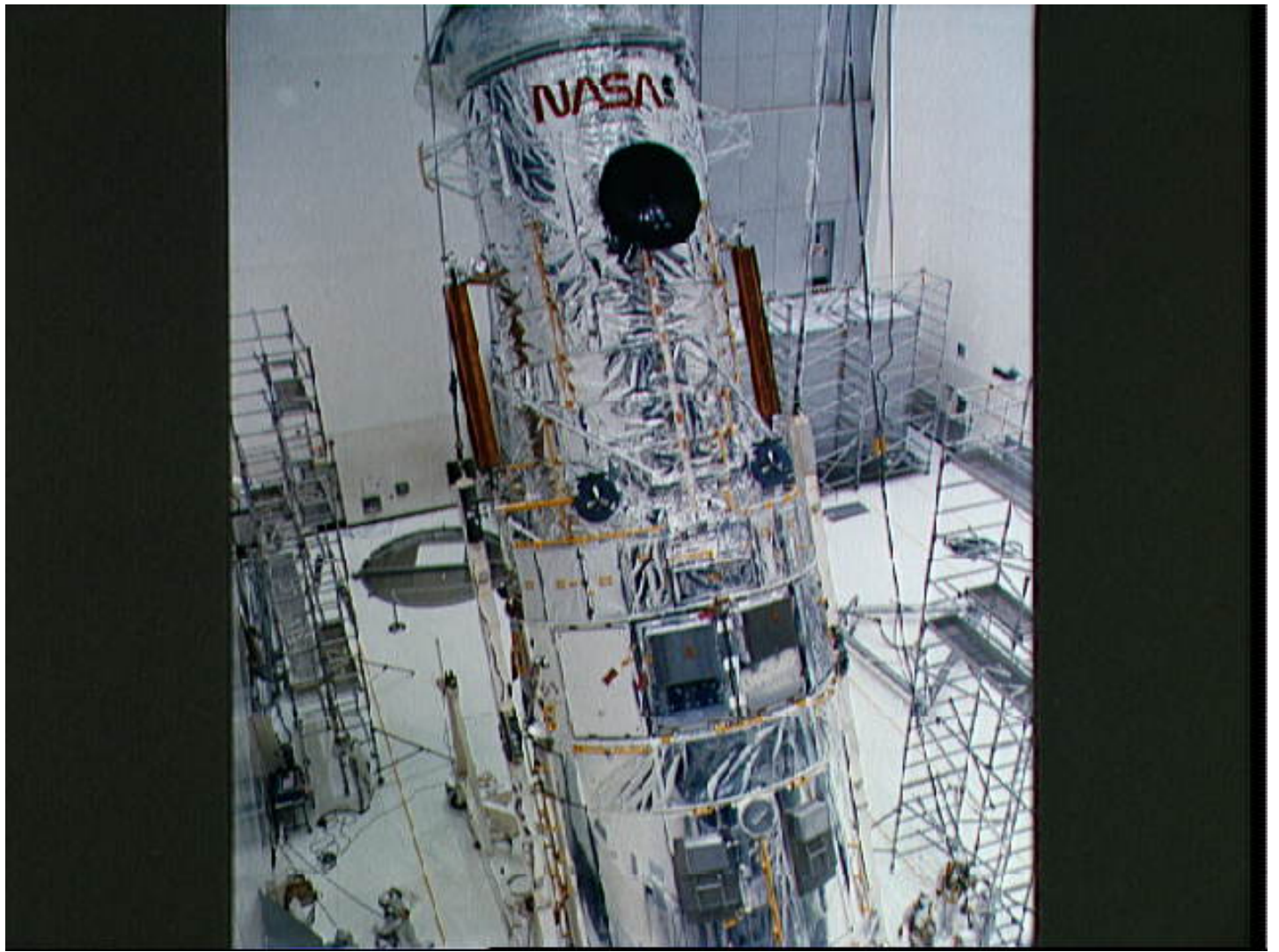
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NASA Photo ID: S89-49411

File Name: 10063512.jpg

Film Type: 4x5

Date Taken: 11/17/89

Title: Hubble Space Telescope (HST) preflight processing at the Kennedy Space Center

Description:

The Hubble Space Telescope (HST), mounted in a ground handling support cradle, is lifted into vertical position in the Vertical Processing Facility (VPF) as work begins at the Kennedy Space Center (KSC) to process the 94-inch primary mirror telescope for launch on Discovery, Orbiter Vehicle (OV) 103, on space shuttle mission STS-31 in March 1990. Clean-suited technicians operate the overhead crane and monitor the procedure from below. The closed and plastic-covered aperture door is partially visible at the top of the frame. Visible on HST Support System Module (SSM) are the grapple fixtures and the stowed solar arrays (SAs) and high-gain antennas (HGAs).

Subject terms:

FLORIDA

GROUND HANDLING

HUBBLE SPACE TELESCOPE

KENNEDY SPACE CENTER

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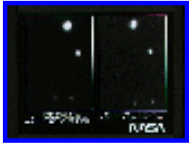


GROUND BASED IMAGE
LAS CAMPANAS OBSERVATORY
CARNEGIE INST. OF WASHINGTON



HUBBLE SPACE TELESCOPE
WIDE FIELD/PLANETARY CAMERA

NASA



NASA Photo ID: S90-20193

File Name: 10063626.jpg

Film Type: 35mm BW

Date Taken: 05/22/90

Title: First image from HST wide field planetary camera (WFPC)

Description:

First image from HST wide field planetary camera (WFPC) is compared with a ground-based picture from Las Campanas, Chile Observatory of the same region of the sky. The Las Campanas picture (left side) was taken with a 100-inch telescope and is typical of high quality pictures obtained from the ground. All objects seen are stars within the Milky Way Galaxy. The images of the stars in the ground based picture are fuzzy and in some cases are overlapping, because of the smearing by the Earth's atmosphere. The same stars in the HST image (right side) are sharper and well resolved, as shown by the double star at the top of the image. By avoiding the Earth's atmosphere, HST gives sharper images and better resolution. In this early engineering picture, the HST images are roughly 50 percent sharper than ground based images.

Subject terms:

ASTRONOMICAL OBSERVATORIES

HUBBLE SPACE TELESCOPE

MILKY WAY GALAXY

SPACEBORNE ASTRONOMY

SPACEBORNE TELESCOPES

STARS

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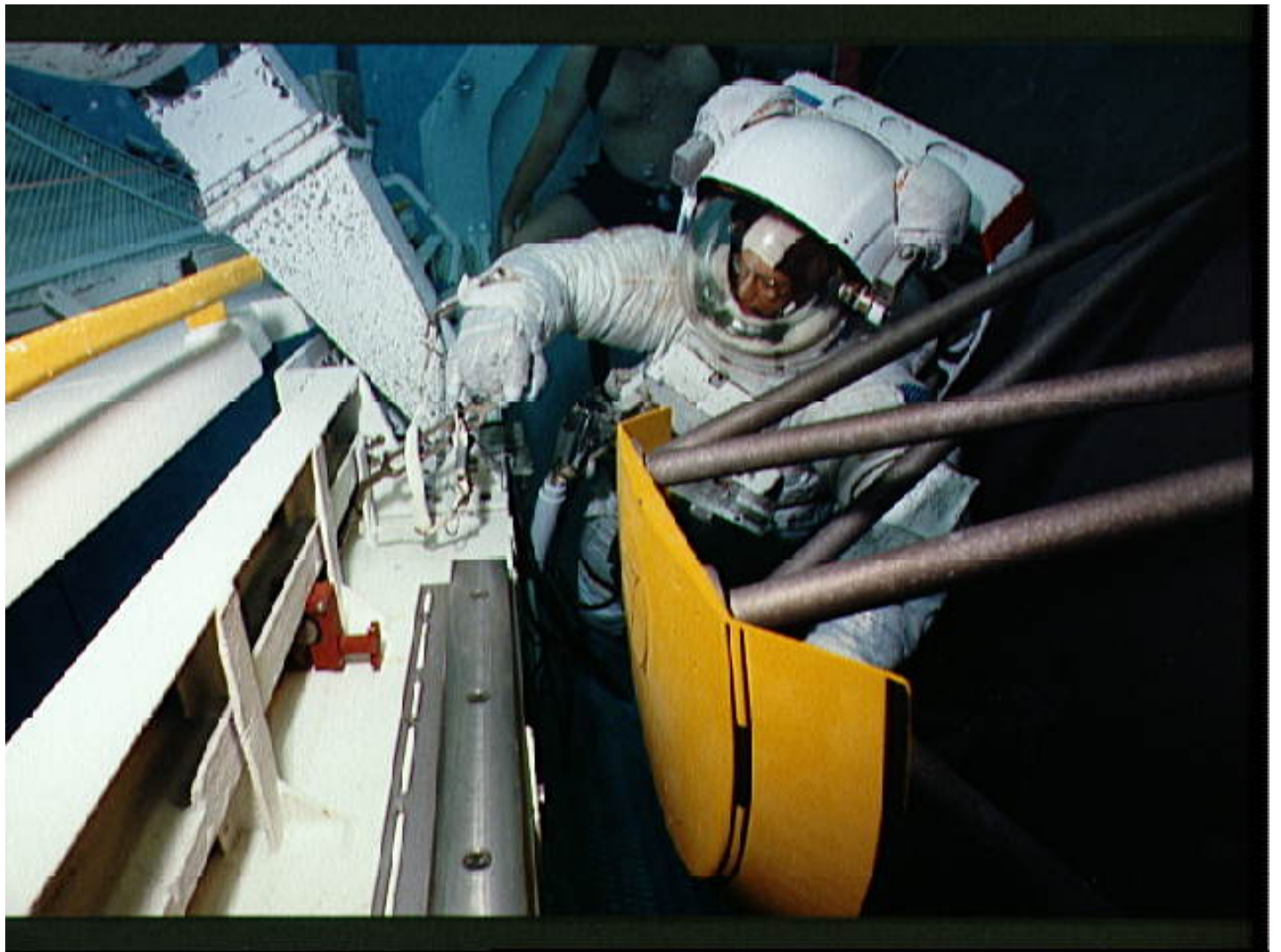
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NASA Photo ID: S90-30520

File Name: 10063533.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 MS McCandless, in EMU, during EVA underwater simulation in JSC's WETF
Description:

STS-31 Mission Specialist (MS) Bruce McCandless II, fully suited in an extravehicular mobility unit (EMU), uses a wrench to release a port side latch mechanism during an extravehicular activity (EVA) underwater simulation in JSC's Weightless Environment Training Facility (WETF) Bldg 29 pool. In the foreground on the Hubble Space Telescope (HST) mockup is a Support System Module (SSM) forward shell support structure. Behind McCandless is the HST mockup and a SCUBA-equipped diver. Though no EVA is planned for the STS-31 mission aboard Discovery, Orbiter Vehicle (OV) 103, two crewmembers train for contingencies that would necessitate leaving the shirt sleeve environment of the crew cabin and performing chores with the HST payload or related hardware in the payload bay (PLB).

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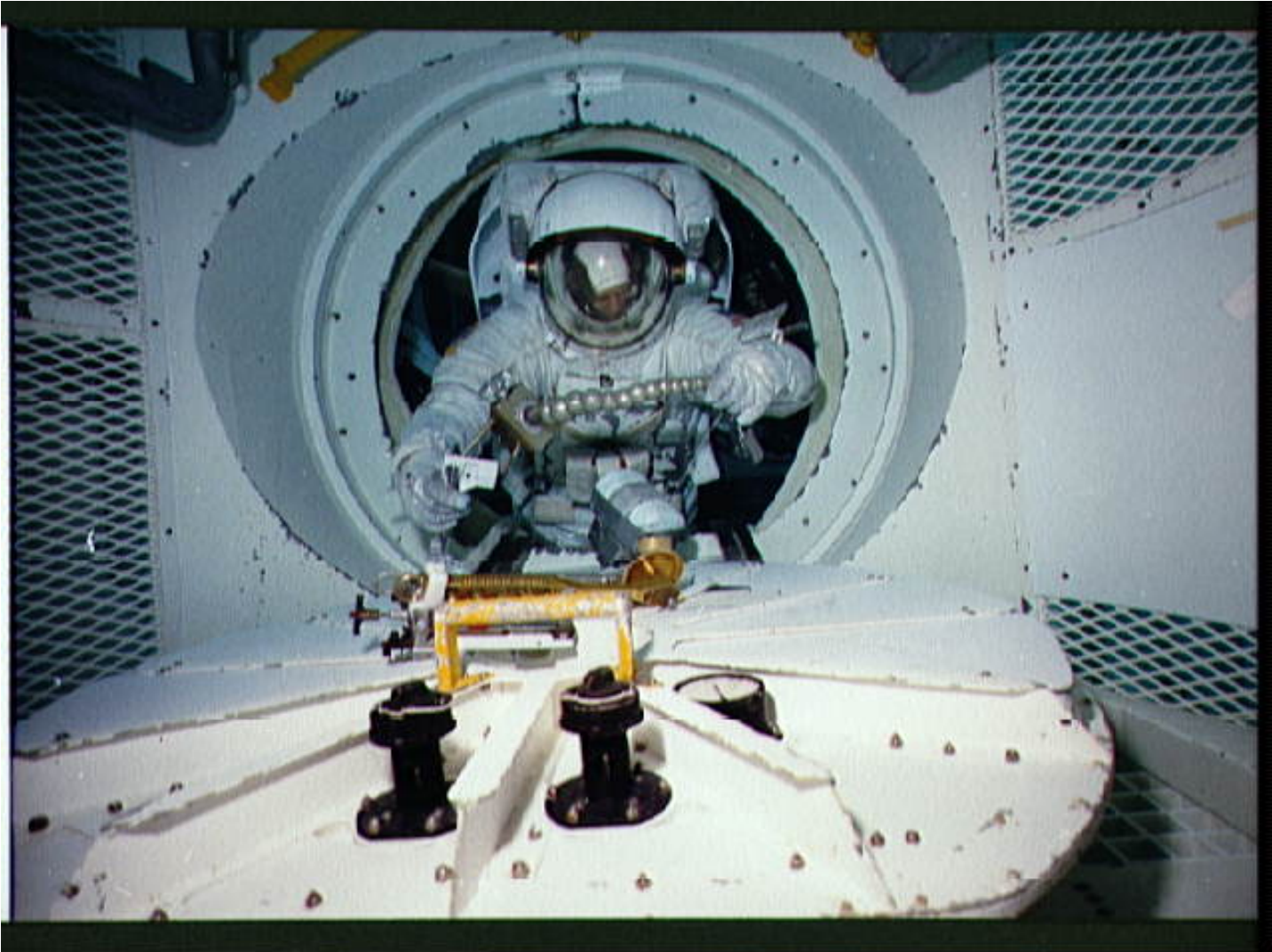
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NASA Photo ID: S90-30521

File Name: 10063534.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 MS Sullivan exits airlock mockup during JSC WETF underwater simulation

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan, fully suited in an extravehicular mobility unit (EMU) and holding a semirigid tether (SRT) and ratchet caddy assembly, egresses the airlock (AL) mockup during an underwater simulation in JSC's Weightless Environment Training Facility (WETF) Bldg 29 pool. The open AL extravehicular (EV) hatch appears in the foreground as Sullivan backs out into the payload bay (PLB). Though no extravehicular activity (EVA) is planned for STS-31, two crewmembers train for contingencies that would necessitate leaving the shirt sleeve environment of Discovery's, Orbiter Vehicle (OV) 103's, cabin and performing chores with their Hubble Space Telescope (HST) payload or related hardware in the PLB.

Subject terms:

AIR LOCKS

ASTRONAUT TRAINING

ASTRONAUTS

BRACKETS

CREWS

EXTRAVEHICULAR MOBILITY UNITS

HATCHES

HELMETS

MOCK-UP

NEUTRAL BUOYANCY SIMULATION

SPACE FLIGHT TRAINING

SPACE TOOLS

STS-31

TETHERING

TETHERLINES

WEIGHTLESS ENVIRONMENT TRAINING

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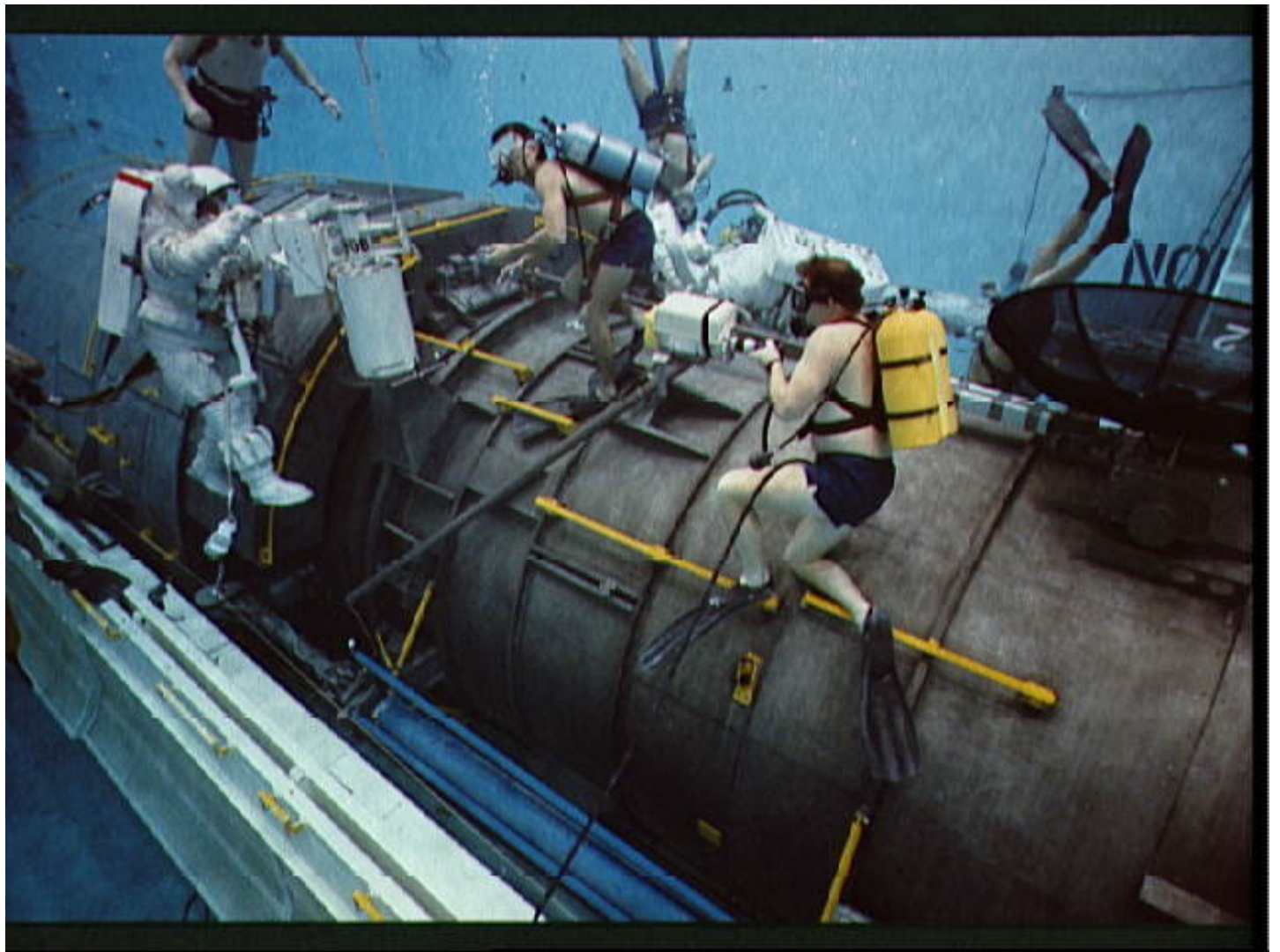
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NASA Photo ID: S90-30522

File Name: 10063535.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 MS McCandless, in EMU, during JSC WETF underwater simulation

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II (left), wearing an extravehicular mobility unit (EMU), maneuvers his way around a mockup of the remote manipulator system (RMS) end effector during an underwater simulation in JSC's Weightless Environment Training Facility (WETF) Bldg 29 pool. The end effector is attached to a grapple fixture on the Hubble Space Telescope (HST) mockup. As McCandless performs contingency extravehicular activity (EVA) procedures, fellow crewmember MS Kathryn D. Sullivan, in EMU, works on the opposite side of the HST mockup, and SCUBA-equipped divers monitor the activity. Though no EVA is planned for STS-31, the two crewmembers train for contingencies that would necessitate leaving the shirt sleeve environment of Discovery's, Orbiter Vehicle (OV) 103's, crew cabin and performing chores with the HST payload or related hardware in the payload bay (PLB).

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

DIVERS

END EFFECTORS

EXTRAVEHICULAR MOBILITY UNITS

HUBBLE SPACE TELESCOPE

MOCK-UP

NEUTRAL BUOYANCY SIMULATION

PAYLOAD BAY

SPACE FLIGHT TRAINING

SPACE SHUTTLE ORBITERS

STS-31

WEIGHTLESS ENVIRONMENT TRAINING

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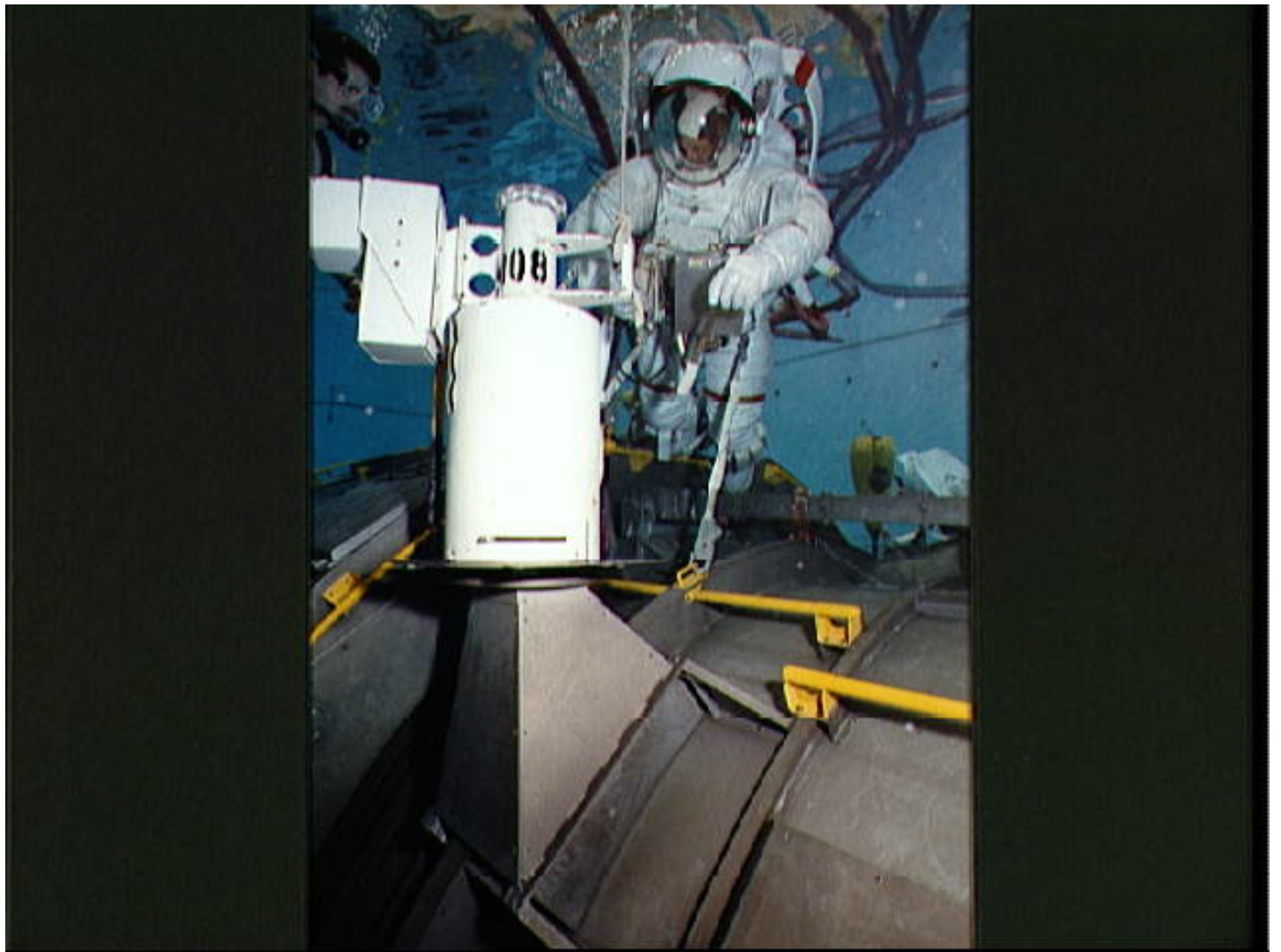
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NASA Photo ID: S90-30523

File Name: 10063537.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 MS McCandless, in EMU, during JSC WETF underwater simulation

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II, fully suited in an extravehicular mobility unit (EMU), maneuvers around the remote manipulator system (RMS) end effector during an underwater simulation in JSC's Weightless Environment Training Facility (WETF) Bldg 29 pool. The end effector is attached to a grapple fixture on the Hubble Space Telescope (HST) mockup. A SCUBA-equipped diver looks on as McCandless completes RMS-related activities. Though no extravehicular activity (EVA) is planned for STS-31, two crewmembers train for contingencies that would necessitate leaving the shirt sleeve environment of Discovery's, Orbiter Vehicle (OV) 103's, crew cabin and performing chores with the HST payload or related hardware in the payload bay (PLB).

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

DIVERS

END EFFECTORS

EXTRAVEHICULAR MOBILITY UNITS

HELMETS

HUBBLE SPACE TELESCOPE

MOCK-UP

NEUTRAL BUOYANCY SIMULATION

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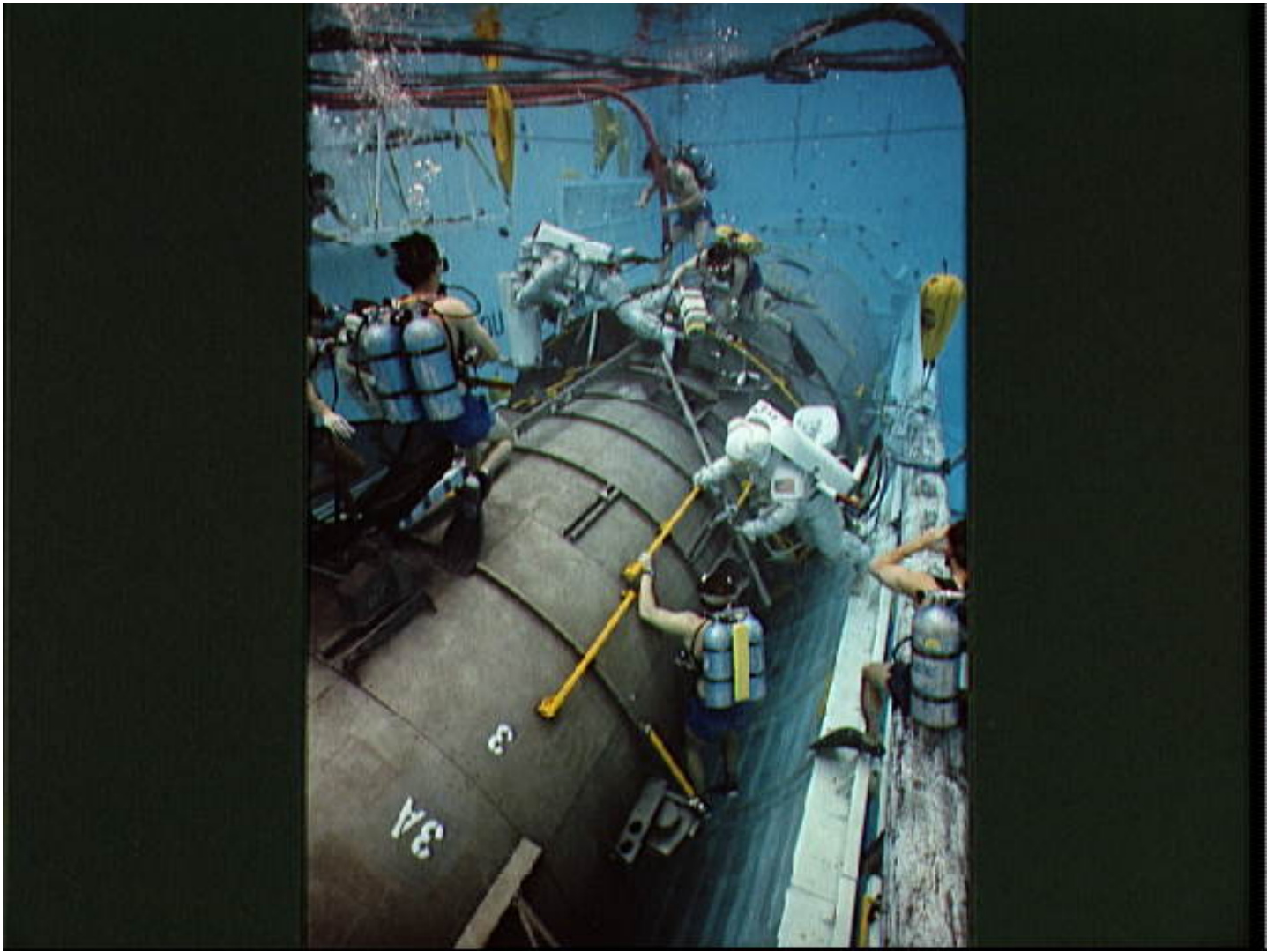
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NASA Photo ID: S90-30524

File Name: 10063536.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 MS McCandless and MS Sullivan during JSC WETF underwater simulation
Description:

This overall view shows STS-31 Mission Specialist (MS) Bruce McCandless II (left) and MS Kathryn D. Sullivan making a practice space walk in JSC's Weightless Environment Training Facility (WETF) Bldg 29 pool. McCandless works with a mockup of the remote manipulator system (RMS) end effector which is attached to a grapple fixture on the Hubble Space Telescope (HST) mockup. Sullivan manipulates HST hardware on the Support System Module (SSM) forward shell. SCUBA-equipped divers monitor the extravehicular mobility unit (EMU) suited crewmembers during this simulated extravehicular activity (EVA). No EVA is planned for the Hubble Space Telescope (HST) deployment, but the duo has trained for contingencies which might arise during the STS-31 mission aboard Discovery, Orbiter Vehicle (OV) 103. Photo taken by NASA JSC photographer Sheri Dunnette.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

DIVERS

END EFFECTORS

EXTRAVEHICULAR MOBILITY UNITS

HUBBLE SPACE TELESCOPE

MOCK-UP

NEUTRAL BUOYANCY SIMULATION

PAYLOAD BAY

SPACE FLIGHT TRAINING

SPACE SHUTTLE ORBITERS

STS-31

WEIGHTLESS ENVIRONMENT TRAINING

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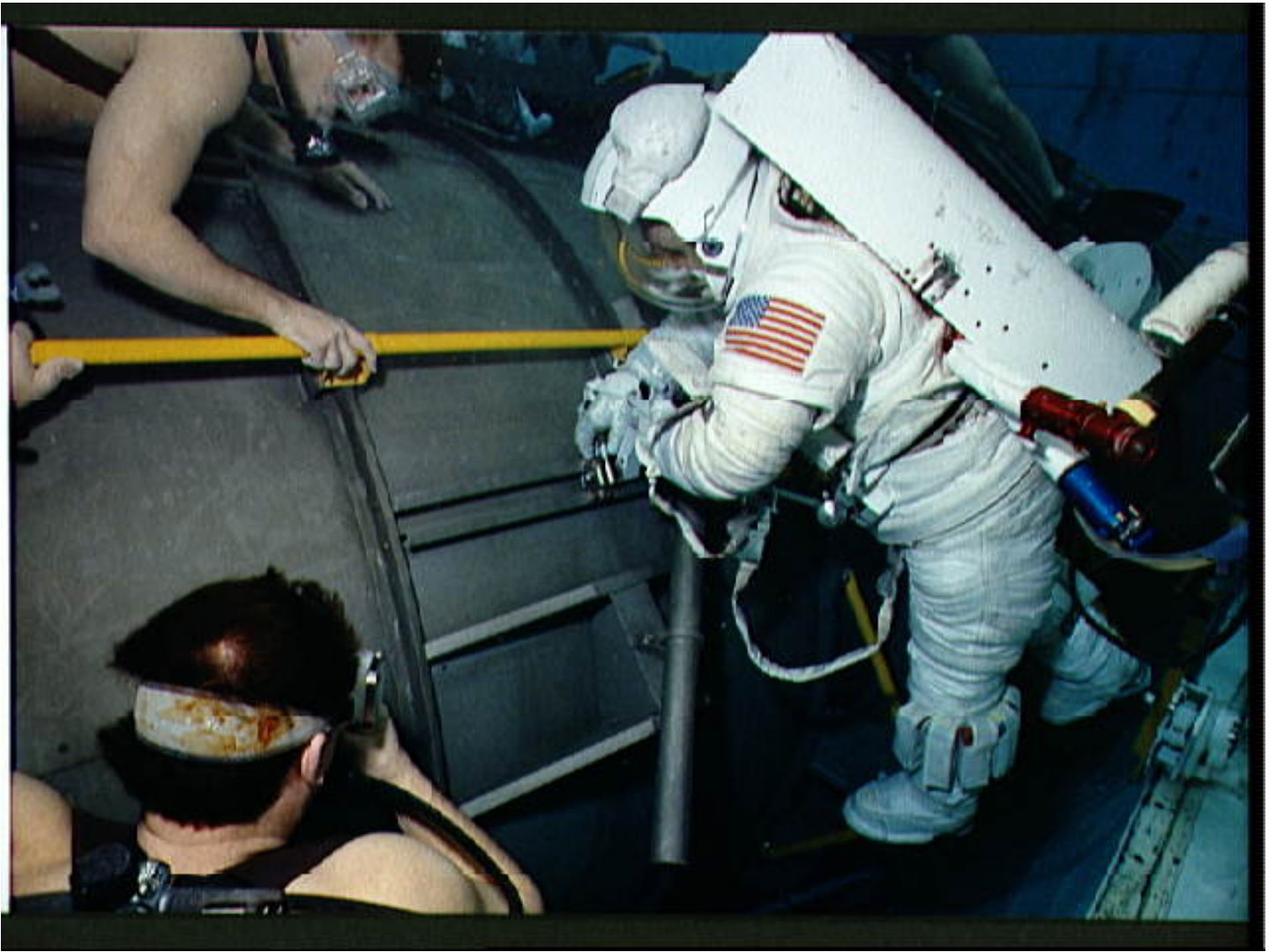
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NASA Photo ID: S90-30525

File Name: 10063538.jpg

Film Type: 35mm

Date Taken: 03/05/90

Title: STS-31 Mission Specialist (MS) Sullivan during JSC WETF underwater simulation

Description:

SCUBA-equipped divers look on as STS-31 Mission Specialist (MS) Kathryn D. Sullivan releases a pip pin on the Hubble Space Telescope (HST) Support System Module (SSM) forward shell mockup during an underwater simulation in JSC's Weightless Environment Training Facility Bldg 29 pool. Sullivan is suited in an extravehicular mobility unit (EMU) as she practices extravehicular activity (EVA) operations. Though no EVA is planned for STS-31, two crewmembers train for contingencies that would necessitate leaving the shirt sleeve environment of Discovery's, Orbiter Vehicle (OV) 103's, crew cabin and performing chores with the HST payload or related hardware in the payload bay (PLB).

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

DIVERS

EXTRAVEHICULAR MOBILITY UNITS

HELMETS

HUBBLE SPACE TELESCOPE

MOCK-UP

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NASA Photo ID: S90-32159

File Name: 10063540.jpg

Film Type: 120mm

Date Taken: 03/20/90

Title: STS-31 MS McCandless inspects HST tools during bench review at Boeing FEPF

Description:

Clean-suited STS-31 Mission Specialist (MS) Bruce McCandless II attaches an extension which is tethered to the ratchet caddy assembly to a torque limiter during the STS-31 bench review at Boeing's Flight Equipment Processing Facility (FEPF) near the JSC site. The tools McCandless is experimenting with will be used if extravehicular activity (EVA) operations are required during the STS-31 deployment of the Hubble Space Telescope (HST) aboard Discovery, Orbiter Vehicle (OV) 103. Technicians and training personnel stand by ready to explain the equipment and its operation.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREW PROCEDURES (PREFLIGHT)

CREWS

PERSONNEL

PROTECTIVE CLOTHING

SPACE FLIGHT TRAINING

SPACE TOOLS

STOWAGE (ONBOARD EQUIPMENT)

STS-31

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NASA Photo ID: S90-32180

File Name: 10063541.jpg

Film Type: 120mm

Date Taken: 03/20/90

Title: STS-31 MS Sullivan & Commander Shriver examine equipment during bench review

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan (left) and Commander Loran J. Shriver, holding equipment, examine the specialized tools as technicians and training instructors look on. The clean-suited crewmembers and personnel are reviewing equipment and stowage locations during the bench review conducted at Boeing's Flight Equipment Processing Facility (FEPF) near the JSC site.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREW PROCEDURES (PREFLIGHT)

CREWS

INSTRUCTORS

PERSONNEL

PROTECTIVE CLOTHING

SPACE FLIGHT TRAINING

SPACE TOOLS

STOWAGE (ONBOARD EQUIPMENT)

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TOOLS

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NASA Photo ID: S90-32749

File Name: 10063544.jpg

Film Type: 35mm

Date Taken: 03/27/90

Title: STS-31 crewmembers during T-30 (30 days before launch) briefing at JSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, crewmembers (left to right) Mission Specialist (MS) Kathryn D. Sullivan, MS Steven A. Hawley, and MS Bruce McCandless II participate in T-30 (thirty days before launch) briefing at JSC's Auditorium and Public Affairs Facility Bldg 2. Scale models of the Hubble Space Telescope (HST) are displayed in front of the crewmembers as they field questions from the audience of news media representatives.

Subject terms:

ASTRONAUTS

CONFERENCES

CREW PROCEDURES (PREFLIGHT)

CREWS

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

NEWS MEDIA

SCALE MODELS

STS-31

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NASA Photo ID: S90-32754

File Name: 10063543.jpg

Film Type: 35mm

Date Taken: 03/27/90

Title: STS-31 MS Sullivan explains HST operation during T-30 briefing at JSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, Mission Specialist (MS) Kathryn D. Sullivan, using a model, explains the Hubble Space Telescope (HST) aperture door operation during the T-30 (thirty days before launch) briefing at JSC's Auditorium and Public Affairs Facility Bldg 2.

Crewmembers described STS-31 mission activities to and answered questions from news media representatives during the conference.

Subject terms:

ASTRONAUTS

CONFERENCES

CREW PROCEDURES (PREFLIGHT)

CREWS

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

NEWS MEDIA

SCALE MODELS

STS-31

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NASA Photo ID: S90-32759

File Name: 10063546.jpg

Film Type: 35mm

Date Taken: 03/27/90

Title: STS-31 crewmembers pose for informal portrait after T-30 briefing at JSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, crewmembers pose for an informal portrait after the T-30 (thirty days before launch) briefing at JSC's Auditorium and Public Affairs Facility Bldg 2. Standing behind the conference table are (left to right) Mission Specialist (MS) Steven A. Hawley, MS Kathryn D. Sullivan, MS Bruce McCandless II, Pilot Charles F. Bolden, and Commander Loren J. Shriver.

Subject terms:

ASTRONAUTS

CONFERENCES

CREW PROCEDURES (PREFLIGHT)

CREWS

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

NEWS MEDIA

PORTRAIT

SCALE MODELS

STS-31

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NASA Photo ID: S90-32760

File Name: 10063547.jpg

Film Type: 35mm

Date Taken: 03/27/90

Title: STS-31 crewmembers pose for informal portrait after T-30 briefing at JSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, crewmembers pose for an informal portrait after the T-30 (thirty days before launch) briefing at JSC's Auditorium and Public Affairs Facility Bldg 2. Standing behind the conference table are (left to right) Mission Specialist (MS) Steven A. Hawley, MS Kathryn D. Sullivan, MS Bruce McCandless II, Pilot Charles F. Bolden, and Commander Loren J. Shriver.

Subject terms:

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NASA Photo ID: S90-32805

File Name: 10063542.jpg

Film Type: 35mm

Date Taken: 03/28/90

Title: STS-31 T-30 preflight press conference with FD William D. Reeves in Bldg 2
Description:

During STS-31 thirty days before launch (T-30) press conference, Flight Director (FD) William D. Reeves fields questions from news media representatives in Auditorium and Public Affairs Facility Bldg 2. A scale model of the Hubble Space Telescope is on the conference table beside him.

Subject terms:

CONFERENCES

HUBBLE SPACE TELESCOPE

NEWS MEDIA

PUBLIC RELATIONS

SCALE MODELS

STS-31

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NASA Photo ID: S90-32806

File Name: 10063545.jpg

Film Type: 35mm

Date Taken: 03/28/90

Title: STS-31 preflight press conference with SSIP participant Gregory S. Peterson

Description:

During STS-31 thirty days before launch (T-30) press conference, Shuttle Student Involvement Project (SSIP) participant Gregory S. Peter (right), a senior at Utah State University in Logan, fields questions about his student experiment (SE) to be flown on STS-31. Others pictured are Ed Mason (left) of Morton-Thiokol and Jeff Blakely of Utah State Space Dynamics Laboratory. A model of the experiment titled "Ion Arc Behavior in Microgravity" SE 82-16 was used during the briefing (pictured). SE 82-16 will be located on Discovery, Orbiter Vehicle (OV) 103, middeck to observe the effects of microgravity on an electric arc. The absence of convection currents in a weightless environment will keep the arc from rising. SE 82-16 will also study the effect of a magnetic field on an arc without correction. An Arriflex 16mm camera will be used to photograph the experiment.

Subject terms:

CONFERENCES

ION MOTION

NEWS MEDIA

PUBLIC RELATIONS

SPACEBORNE EXPERIMENTS

STS-31

STUDENTS

UNIVERSITIES

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NASA Photo ID: S90-34002

File Name: 10063490.jpg

Film Type: 4x5

Date Taken: 04/05/90

Title: Artist concept of Hubble Space Telescope (HST) orbiting Earth after deploy
Description:

This artist concept shows the Hubble Space Telescope (HST) in operational configuration orbiting the Earth after its deploy from Discovery, Orbiter Vehicle (OV) 103 during STS-31. The high gain antennas (HGAs) and solar arrays (SAs) have been extended. HST's aperture door is open as it views the universe from a vantage point above the Earth's atmosphere. View provided by the Marshall Space Flight Center (MSFC).

Subject terms:

DRAWINGS

EARTH SURFACE

HUBBLE SPACE TELESCOPE

STS-31

VISUAL AIDS

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NASA Photo ID: S90-34051

File Name: 10063548.jpg

Film Type: 4x5

Date Taken: 04/05/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, during transfer operations at KSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, riding atop a special flat bed transport vehicle, is on its way to Kennedy Space Center's (KSC's) Vehicle Assembly Building (VAB). Personnel walk along side OV-103 and the transport vehicle as it journeys from the Orbiter Processing Facility (OPF) to the VAB. View provided by KSC with alternate number KSC-90PC-305.

Subject terms:

DISCOVERY (ORBITER)

FLORIDA

KENNEDY SPACE CENTER

PERSONNEL

PREFLIGHT OPERATIONS

STS-31

TRANSPORT VEHICLES

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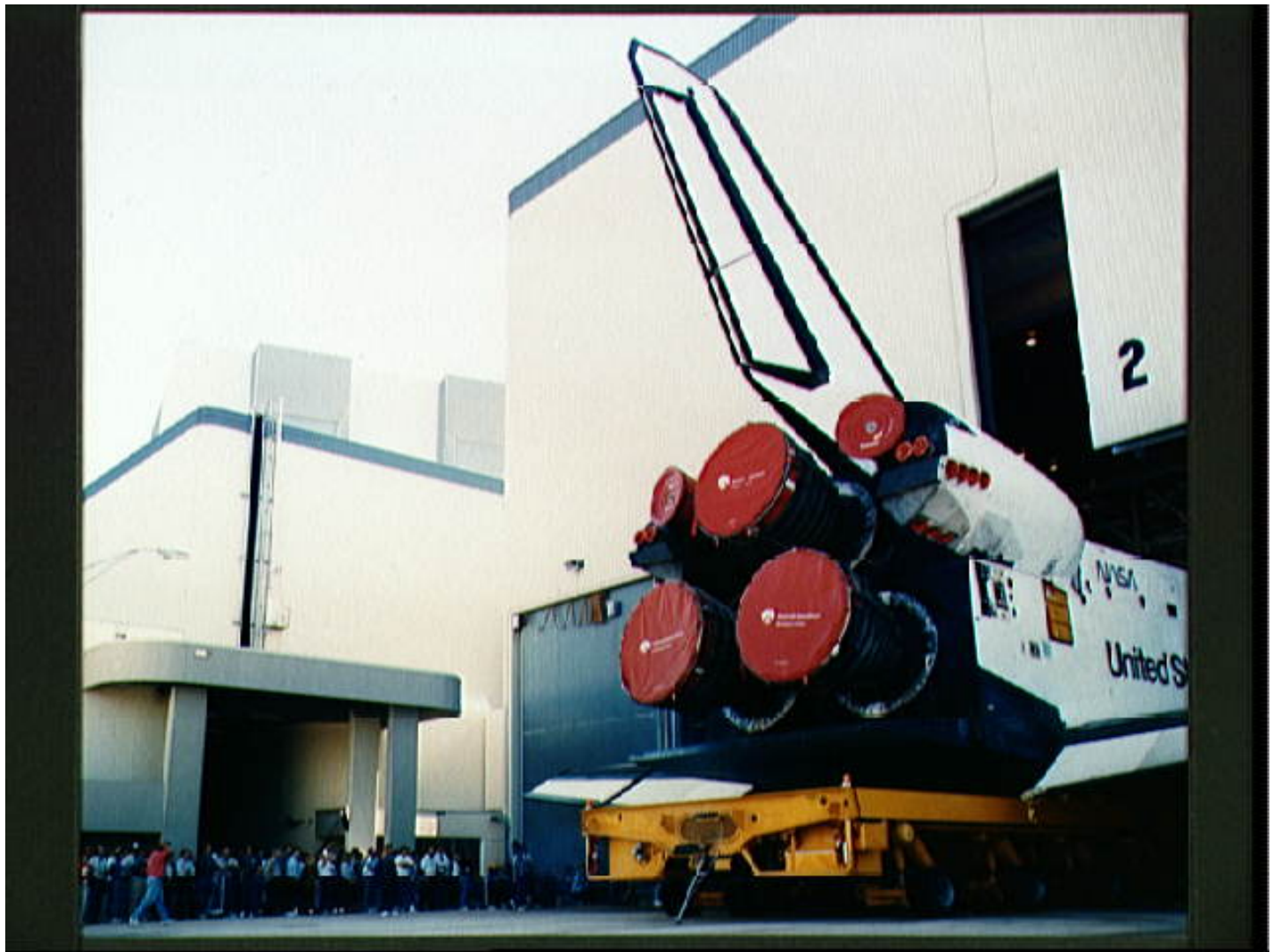
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NASA Photo ID: S90-34052

File Name: 10063549.jpg

Film Type: 4x5

Date Taken: 04/05/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, is transferred from KSC's OPF
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, riding atop a special flat bed transport vehicle, backs out of the Kennedy Space Center's (KSC's) Orbiter Processing Facility (OPF) during transfer operations. OV-103 is being transferred to the Vehicle Assembly Building (VAB) where preflight processing will continue. The space shuttle main engine (SSME) nozzles, the orbital maneuvering system (OMS) nozzles, and the reaction control system (RCS) jets/thrusters are protected from contamination with red covers. A crowd of employees watches the transfer activity. View provided by KSC with alternate KSC number KSC-90PC-306.

Subject terms:

COVERINGS

DISCOVERY (ORBITER)

FLORIDA

KENNEDY SPACE CENTER

NOZZLES

PERSONNEL

PREFLIGHT OPERATIONS

SPACE SHUTTLE MAIN ENGINE

STS-31

TRANSPORT VEHICLES

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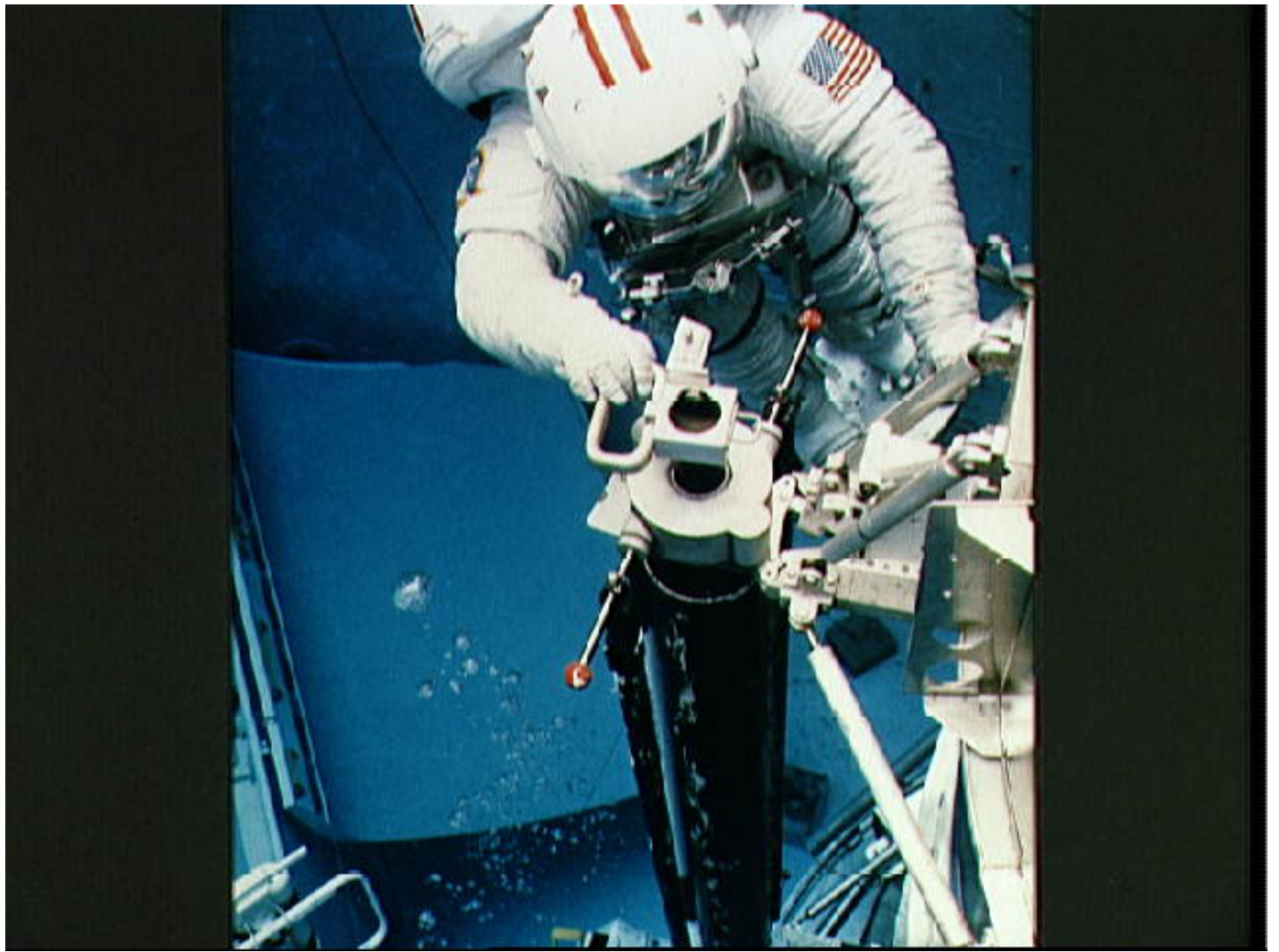
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NASA Photo ID: S90-34384

File Name: 10063539.jpg

Film Type: 4x5

Date Taken: 04/10/90

Title: STS-31 Hubble Space Telescope (HST) solar array (SA) mockup at MSFC, Alabama
Description:

A close-up shot shows an extravehicular mobility unit (EMU)-suited astronaut inspecting a solar array (SA) on the Hubble Space Telescope (HST) mockup in the Neutral Buoyancy Simulator (NBS) at the Marshall Space Flight Center (MSFC) in Huntsville, Alabama. MSFC managed the design and development of the telescope. The weightlessness simulator was used to practice SA contingency procedures that might be used in space. Astronauts also practiced SA servicing missions in the simulator which they will perform on the telescope in space. The solar arrays which supply electrical power to the space telescope were developed and contributed by the European Space Agency (ESA). ESA's two prime contractors were British Aerospace in England and AEG in West Germany. The two wing-like solar arrays contain 48,000 solar cells. They convert the sun's energy to electricity during that portion of an orbit when they are exposed to sunlight. The power is stored in six batteries to support the telescope during eclipse. HST was developed by NASA and its partners in space and is scheduled for launch in April 1990. View released by MSFC on Release No. 90P-37 with alternate MSFC number 559802C.

Subject terms:

ALABAMA

EXTRAVEHICULAR MOBILITY UNITS

HUBBLE SPACE TELESCOPE

MARSHALL SPACE FLIGHT CENTER

MOCK-UP

NEUTRAL BUOYANCY SIMULATION

SOLAR ARRAYS

STS-31

WEIGHTLESS ENVIRONMENT TRAINING

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NASA Photo ID: S90-34385

File Name: 10063550.jpg

Film Type: 4x5

Date Taken: 04/10/90

Title: MSFC Technical Support Team in the Huntsville Support Operations Center

Description:

NASA and Hubble Space Telescope (HST) contractor employees monitor their data screens in the Huntsville Support Operations Center during a recent HST mission simulation at the Marshall Space Flight Center (MSFC) in Huntsville, Alabama. The Center will have a major role in the launch, deployment, and checkout of the HST in April 1990. The technicians will monitor telescope telemetry, tracking several thousand engineering measurements to determine the ongoing status of the HST and to confirm whether the telescope has responded properly to ground commands sent from the control center at the Goddard Space Flight Center (GSFC). With the information they receive, they can identify problems if they arise. Also, they will use their in-depth knowledge of the telescope and its systems to analyze problems and recommend ways to resolve them. Thirdly, they will evaluate HST performance to determine its true capabilities and project its future performance. Huntsville Support Operations Center will provide engineering support for the telescope through the orbital verification period 24 hours a day, seven days a week. That period could last for several months. View released by MSFC on Release No 90P-36 with alternate number 9005807C.

Subject terms:

ALABAMA

COMMUNICATION NETWORKS

COMPUTERS

CONSOLES

GROUND BASED CONTROL

HUBBLE SPACE TELESCOPE

MARSHALL SPACE FLIGHT CENTER

PERSONNEL

SIMULATION

STS-31

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NASA Photo ID: S90-34386

File Name: 10063492.jpg

Film Type: 4x5

Date Taken: 04/10/90

Title: Artist concept of Hubble Space Telescope (HST) onorbit payload bay servicing
Description:

A Hubble Space Telescope (HST) servicing mission onboard a space shuttle orbiter is depicted in this artist concept. Extravehicular mobility unit (EMU) suited crewmembers (one on the remote manipulator system (RMS) and one in the payload bay (PLB)) perform maintenance tasks on HST which is positioned in the PLB atop the flight support structure (FSS). During its 15 years in space, the observatory will be visited several times by astronauts who will perform scheduled maintenance and replace telescope instruments with new updated ones. The Goddard Space Flight Center (GSFC) is responsible for servicing the telescope. Discovery, Orbiter Vehicle (OV) 103, with HST is scheduled for launch in April 1990. HST was developed by NASA and its partners in space. The Marshall Space Flight Center (MSFC) managed the design and development of the telescope, which will be the largest, most sensitive astronomical observatory ever to be placed in orbit. It will examine the size and origin of the universe, help determine how stars and galaxies are formed, and could provide clues to the existence of planets that orbit other stars in the same way the Earth revolves around the sun. Art work created by Gordon Raney. View provided by Marshall Space Flight Center (MSFC) with alternate number 89-0591C.

Subject terms:

ASTRONAUTS

CREW PROCEDURES (INFLIGHT)

DRAWINGS

EXTRAVEHICULAR ACTIVITY

EXTRAVEHICULAR MOBILITY UNITS

HUBBLE SPACE TELESCOPE

PAYLOAD BAY

REMOTE MANIPULATOR SYSTEM

REPAIRING

SPACE MAINTENANCE

SPACE SHUTTLE ORBITERS

SPACECRAFT MAINTENANCE

STS-31

STS-61

VISUAL AIDS

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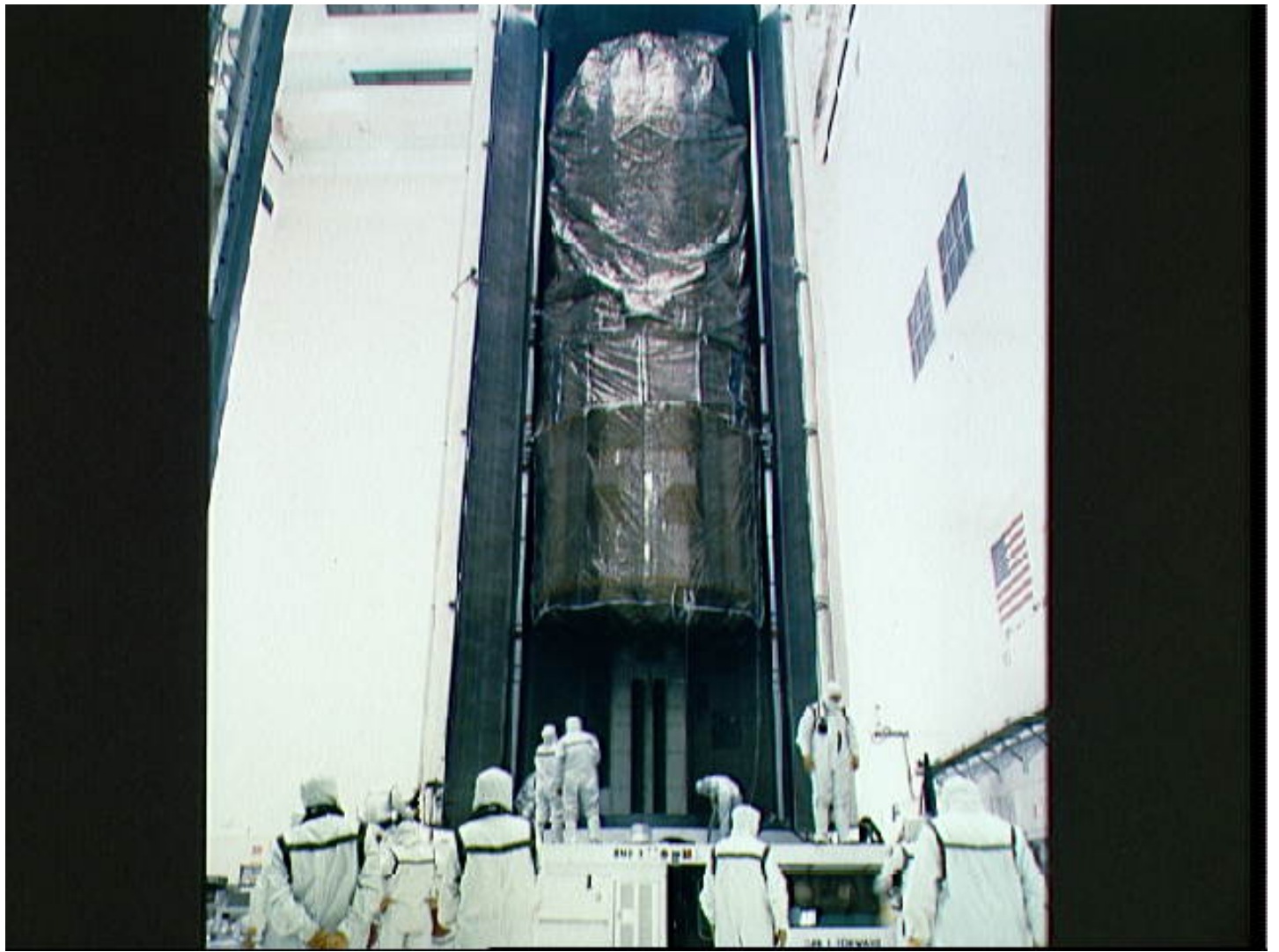
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NASA Photo ID: S90-34973

File Name: 10063552.jpg

Film Type: 4x5

Date Taken: 04/17/90

Title: STS-31 Hubble Space Telescope (HST) in payload canister during KSC processing

Description:

In the Kennedy Space Center (KSC) Vertical Processing Facility (VPF), the Hubble Space Telescope (HST) has been installed in the payload canister which is atop the payload transporter. Clean-suited technicians oversee the HST processing. The canister doors will be closed and the HST will be transported to KSC Launch Complex (LC) Pad 39B via the payload transporter. The telescope is contained within a protective cocoon which is a double bag sanitary liner. This provides added cleanliness and protection and has been on HST since its arrival at KSC in October, 1989. It was removed immediately prior to installation of the telescope into the payload bay (PLB) of Discovery, Orbiter Vehicle (OV) 103. View provided by KSC with alternate KSC number KSC-90PC-456.

Subject terms:

CANISTERS

COVERINGS

FLORIDA

GROUND HANDLING

HUBBLE SPACE TELESCOPE

KENNEDY SPACE CENTER

PERSONNEL

PREFLIGHT OPERATIONS

PROTECTIVE CLOTHING

STS-31

TRANSPORT VEHICLES

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NASA Photo ID: S90-34974

File Name: 10063551.jpg

Film Type: 4x5

Date Taken: 04/17/90

Title: STS-31 Hubble Space Telescope (HST) in VPF test cell at KSC

Description:

STS-31 Hubble Space Telescope (HST) undergoes handling operations in the test cell of the Kennedy Space Center's (KSC's) Vertical Processing Facility (VPF). KSC technicians are removing the protective "cocoon" from the upper portion of the HST. This is a sanitary liner which further assures cleanliness. After the lower portion of the cocoon is cut away, there will be a final cleaning of the telescope and a contamination inspection. A fresh cocoon will then be lowered over HST. View provided by KSC with alternate KSC number KSC-90PC-407.

Subject terms:

COVERINGS

FLORIDA

HUBBLE SPACE TELESCOPE

KENNEDY SPACE CENTER

PERSONNEL

PREFLIGHT OPERATIONS

PREFLIGHT PROCESSING

STS-31

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NASA Photo ID: S90-34975

File Name: 10063553.jpg

Film Type: 4x5

Date Taken: 04/17/90

Title: STS-31 crewmembers, wearing LEES, in M113 tracked vehicle during TCDT at KSC
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, crewmembers, wearing launch and entry suits (LEEs), take a break from emergency escape procedures in front of the M113 tracked vehicle during the Terminal Countdown Demonstration Test (TCDT) at the Kennedy Space Center (KSC). From left are Mission Specialist (MS) Bruce McCandless II, MS Kathryn D. Sullivan, and MS Steven A. Hawley. View provided by KSC with alternate number KSC-90PC-448.

Subject terms:

ASTRONAUT TRAINING

ASTRONAUTS

CREWS

DISCOVERY (ORBITER)

EMERGENCIES

ESCAPE SYSTEMS

FLORIDA

KENNEDY SPACE CENTER

LAUNCH AND ENTRY SUIT

SPACE FLIGHT TRAINING

STS-31

TRANSPORT VEHICLES

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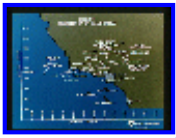
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STS-31 DESCENT OVER CALIFORNIA





NASA Photo ID: S90-35093

File Name: 10063620.jpg

Film Type: 4x5

Date Taken: 04/18/90

Title: Artist concept titled "STS-31 Descent Over California" produced by Rockwell
Description:

Rockwell International (RI) supplied artist concept titled "STS-31 Descent over California" shows Discovery, Orbiter Vehicle (OV) 103, approach to Edwards Air Force Base (EAFB), California. Annotated ground track map identifies major events in landing sequence starting at touch down minus (-) 10 minutes to weight on main landing gear (MLG) runway 17.

Subject terms:

APPROACH

CHARTS

DISCOVERY (ORBITER)

MAPS

STS-31

VISUAL AIDS

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STS-31 DEORBIT & REENTRY TRACK



 **Rockwell International**
Space Transportation
Systems Division
Office of Media Relations



NASA Photo ID: S90-35094

File Name: 10063619.jpg

Film Type: 4x5

Date Taken: 04/18/90

Title: Artist concept titled "STS-31 Deorbit & Reentry Track" produced by Rockwell
Description:

Rockwell International (RI) supplied artist concept titled "STS-31 Deorbit & Reentry Track". Map tracks Discovery, Orbiter Vehicle (OV) 103, from deorbit over Madagascar through atmospheric reentry maneuvers to touchdown minus (-) 20 minutes at Edwards Air Force Base (EAFB), California.

Subject terms:

CHARTS

DISCOVERY (ORBITER)

MAPS

STS-31

VISUAL AIDS

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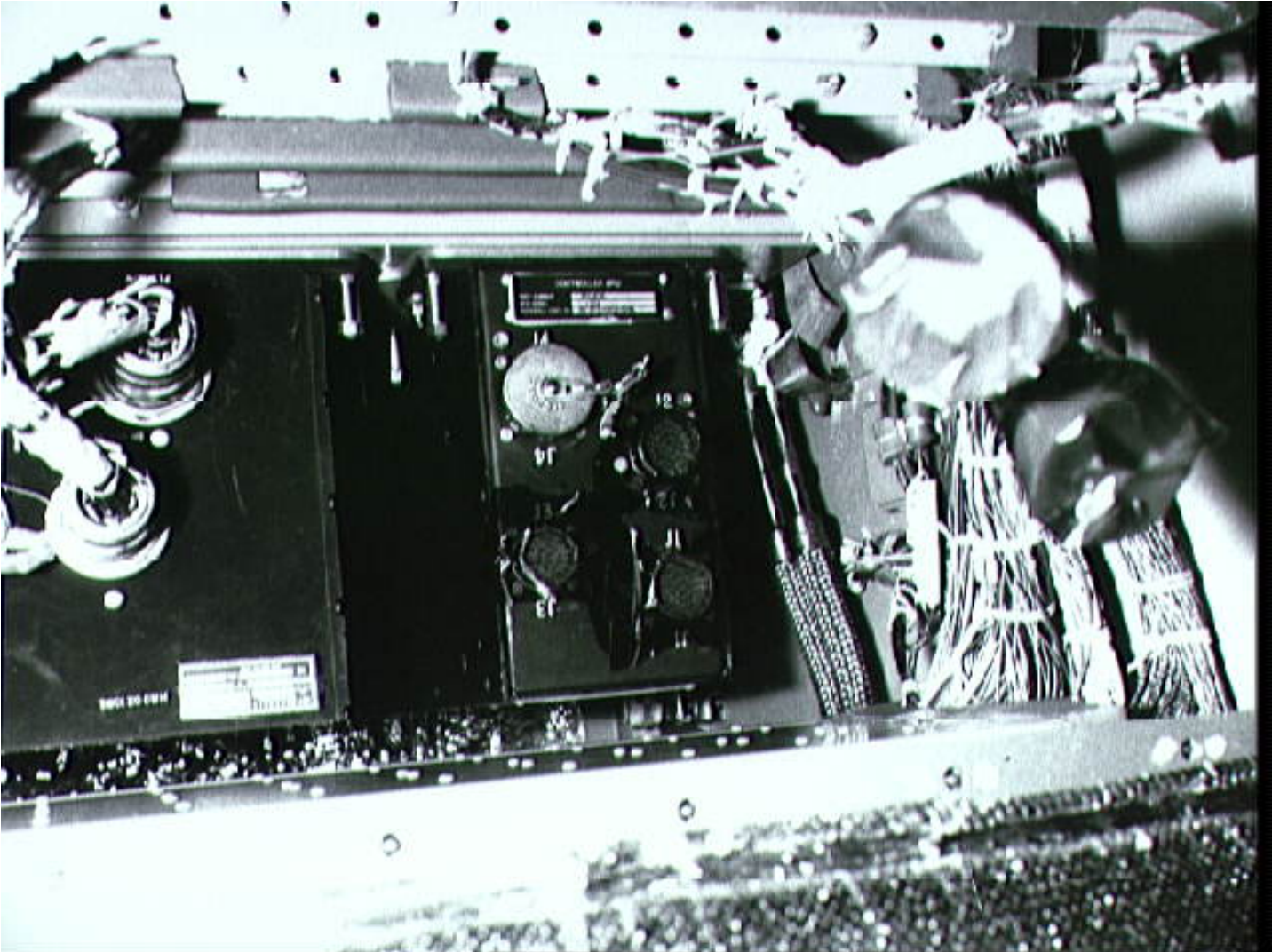
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NASA Photo ID: S90-38627

File Name: 10063554.jpg

Film Type: 4x5 BW

Date Taken: 05/23/90

Title: STS-31 Discovery, OV-103, auxiliary power unit 1 (APU-1) controller

Description:

The controller for Discovery's, Orbiter Vehicle (OV) 103's, auxiliary power unit 1 (APU-1) is documented before removal following the launch scrub on 04-10-90. The controller weighs about 15 pounds and controls the speed of the APU. It was flown to the vendor, Sundstrand Corp., Rockford, Illinois, for analysis and testing. Launch of OV-103 on mission STS-31 has been rescheduled for 04-24-90 following the successful replacement of the APU-1 and the recharging of the Hubble Space Telescope's (HST's) nickel-hydrogen batteries. View provided by the Kennedy Space Center (KSC) with alternate KSC number KSC-90PC-663.

Subject terms:

AUXILIARY POWER SOURCES

CONTROLLERS

DISCOVERY (ORBITER)

FAILURE ANALYSIS

FLORIDA

KENNEDY SPACE CENTER

ONBOARD EQUIPMENT

REPLACING

SPACECRAFT MAINTENANCE

STS-31

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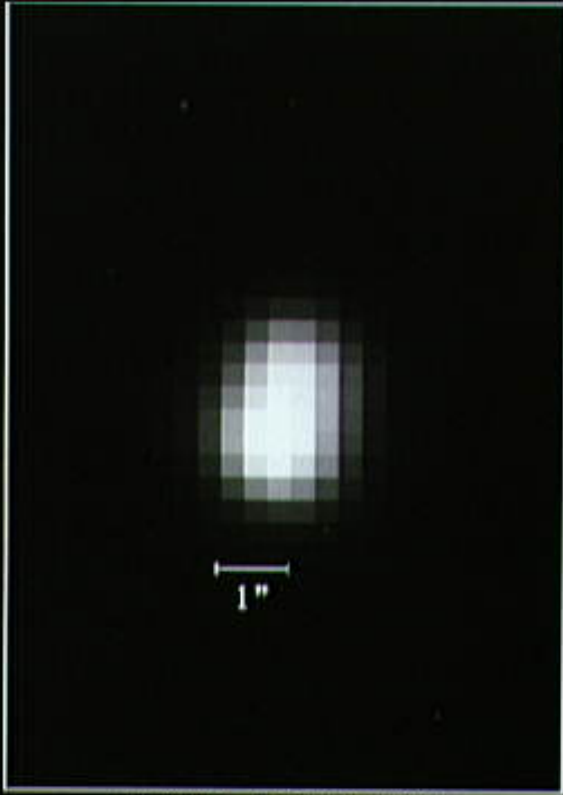
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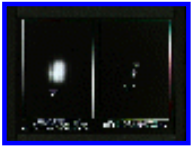
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GROUND BASED IMAGE
LAS CAMPANAS OBSERVATORY
CARNEGIE INST. OF WASHINGTON



HUBBLE SPACE TELESCOPE
WIDE FIELD/PLANETARY CAMERA



NASA Photo ID: S90-38829

File Name: 10063627.jpg

Film Type: 35mm BW

Date Taken: 05/29/90

Title: Double star images taken by HST WFPC and Las Campanas Observatory

Description:

Comparison of the same area of sky (a double star) taken by the Hubble Space Telescope (HST) wide field planetary camera (WFPC) and ground-based image taken from the Las Campanas Observatory, Carnegie Institute of Washington.

Subject terms:

HUBBLE SPACE TELESCOPE

OBSERVATORIES

SPACEBORNE ASTRONOMY

STARS

TELESCOPES

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NASA Photo ID: S90-44867

File Name: 10063557.jpg

Film Type: 4x5

Date Taken: 08/01/90

Title: STS-31 Discovery, OV-103, liftoff from KSC

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from Kennedy Space Center (KSC) Launch Complex (LC) 39 Pad B. In the foreground STS-35 Columbia, OV-102, is visible on launch pad 39A. This event marked the first time since January 1986 that there was an orbiter on each pad. LC 39 pads are separated by 1.6 miles. View provided by KSC with alternate number KSC-90PC-610.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX

COLUMBIA (ORBITER)

DISCOVERY (ORBITER)

FLORIDA

KENNEDY SPACE CENTER

LAUNCHING

LAUNCHING PADS

LIFTOFF (LAUNCHING)

SPACE SHUTTLE ORBITERS

STS-31

STS-35

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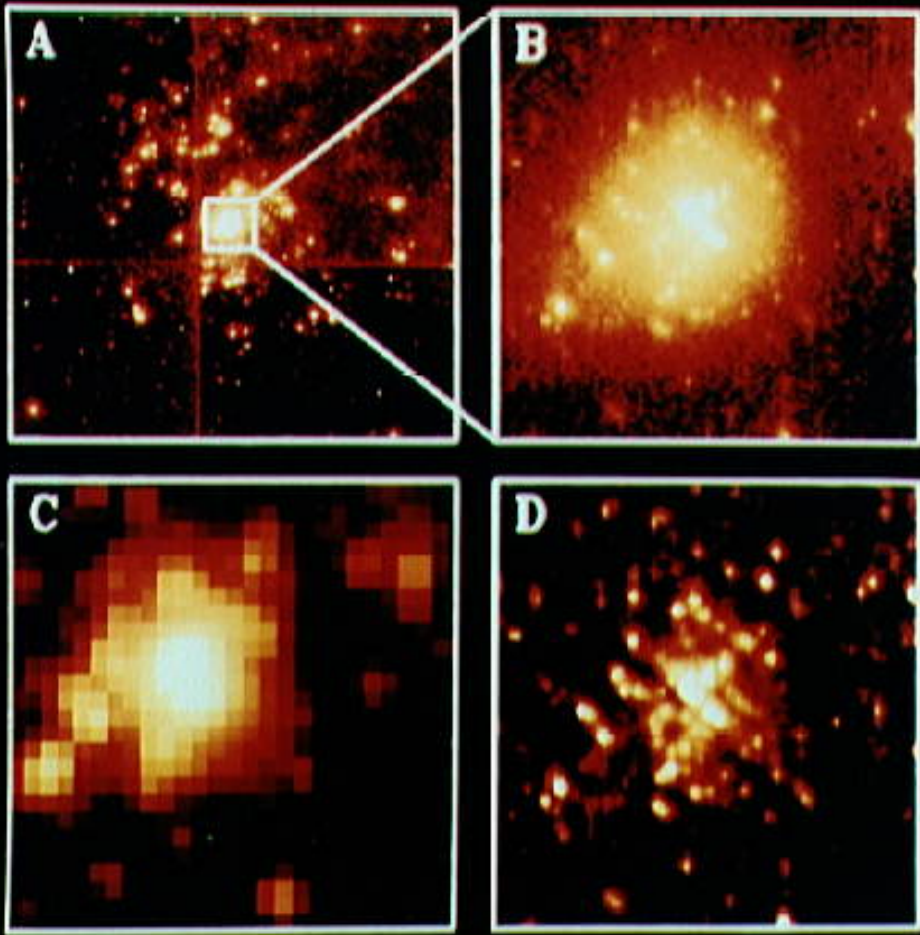
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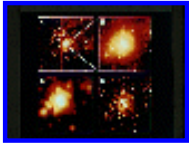
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NASA Photo ID: S90-46425

File Name: 10063628.jpg

Film Type: 4x5

Date Taken: 08/20/90

Title: HUBBLE SPACE TELESCOPE (HST) IMAGERY OF THE 30 DORADUS NEBULA

Description:

Hubble Space Telescope (HST) images of the 30 Doradus Nebula show its remarkable cluster of tightly-packed young stars 160,000 light years from Earth in the large Magellanic cloud galaxy. Panel A is a portion of a image made with the HST Wide Field Planetary Camera (WFPC). WFPC photographed four adjoining sky regions simultaneously which are assembled in this mosaic. Panel B is an enlargement of the central portion of the HST image which was made in violet light. It shows the compact star cluster R136, which consists of very hot and massive young stars. The star images have bright cores that are only 0.1 arc seconds wide, allowing many more stars to be distinguished than in previous ground-based telescopic photos. Panel C is a photograph of the same region as Panel B, obtained with the Max Planck 2.2 meter telescope at the European Southern Observatory in Chile. The star images are 0.6 arc seconds wide. Panel D shows how computer processing of the HST image in Panel B has sharpened its appearance. The undesirable fuzzy halos around the stars as seen in Panel B are substantially reduced. Image was released from the Goddard Space Flight Center (GSFC).

Subject terms:

ASTRONOMICAL OBSERVATORIES

GALAXIES

HUBBLE SPACE TELESCOPE

NEBULAE

STARS

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NASA Photo ID: S90-47925

File Name: 10063629.jpg

Film Type: 4x5

Date Taken: 09/12/90

Title: Hubble Space Telescope (HST) imagery of galaxy NGC 7457 and Supernova 1987A
Description:

Hubble Space Telescope (HST) imagery of galaxy NGC 7457 (47925 BW) and Supernova 1987A (47926 CN) released 08/29/90. HST view of galaxy NGC 7457 (47925) was taken on 08/17/90 with the Wide Field and Planetary Camera (WFPC). The picture on the left with high contrast shows the central portion of the galaxy. The picture on the right is of the same galaxy, but the contrast has been adjusted to reveal a surprisingly high concentration of stars pinpointed exactly at the galaxy's core. The nucleus is so compact it is beyond HST's .1 arc resolution. Forty million light-years away NGC 7457 is one of the first "normal" galaxies that HST has observed. The gaseous ring seen around Supernova 1987A (47926) was taken with the European Space Agency's (ESA) Faint Object Camera (FOC), 08/23/90. The ring appears as a yellow ellipse and tightly knotted debris from the stellar explosion appears as a red blob near the center of the ring. The blue stars to the left and right of the ring are not associated with the supernova. This raw image, not computer reconstructed, was made in the yellow light of doubly ionized oxygen (5007 angstroms) the blue and red color was added to reflect the object's true color. The ring is located 160,000 light-years from Earth. Caption information provided by the Goddard Space Flight Center (GSFC) Office of Public Affairs.

Subject terms:

GALAXIES

HUBBLE SPACE TELESCOPE

SPACEBORNE ASTRONOMY

SUPERNOVA 1987A

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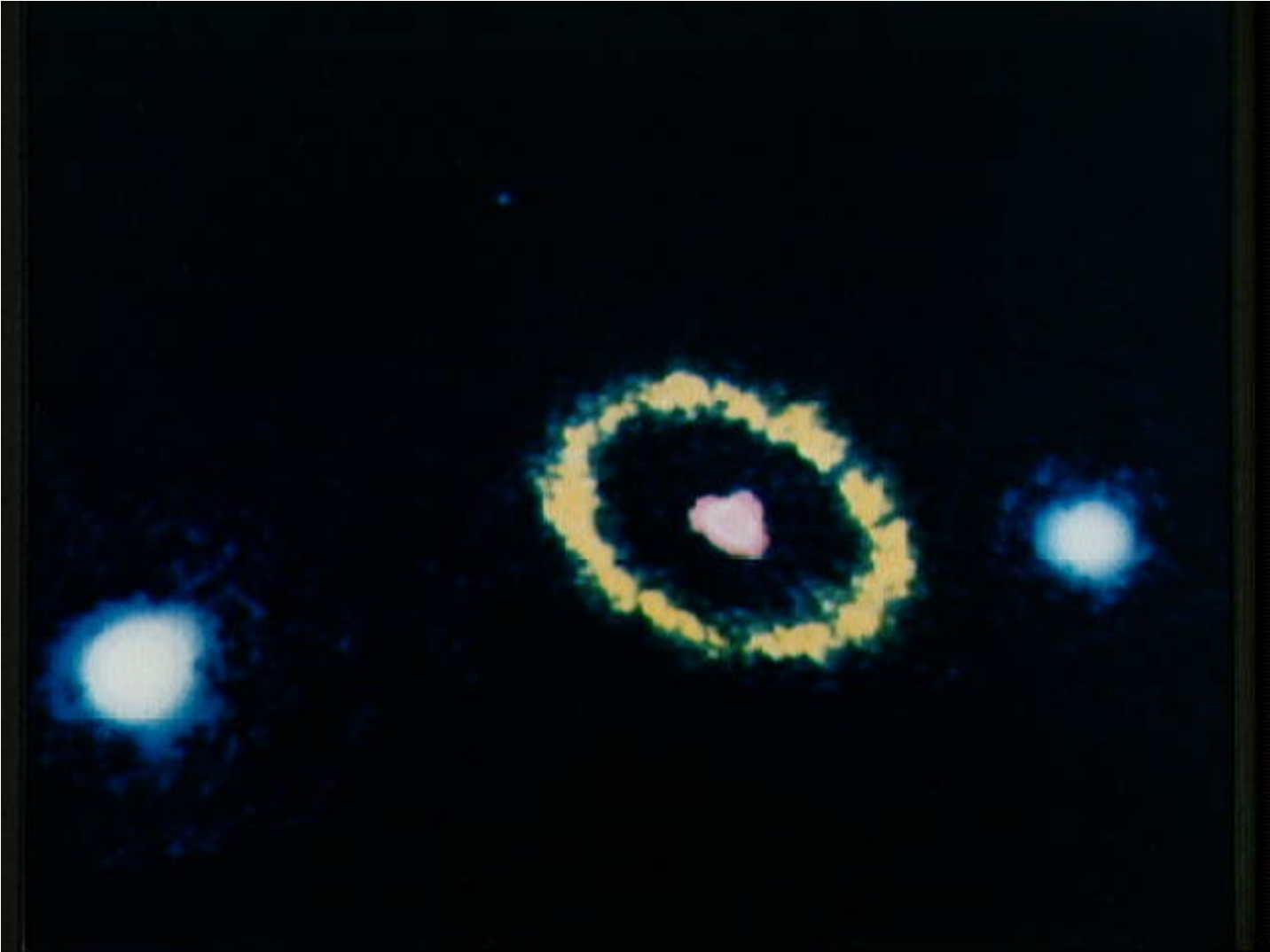
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NASA Photo ID: S90-47926

File Name: 10063630.jpg

Film Type: 4x5

Date Taken: 09/12/90

Title: Hubble Space Telescope (HST) imagery of galaxy NGC 7457 and Supernova 1987A

Description:

Hubble Space Telescope (HST) imagery of galaxy NGC 7457 (47925 BW) and Supernova 1987A (47926 CN) released 08/29/90. HST view of galaxy NGC 7457 (47925) was taken on 08/17/90 with the Wide Field and Planetary Camera (WFPC). The picture on the left with high contrast shows the central portion of the galaxy. The picture on the right is of the same galaxy, but the contrast has been adjusted to reveal a surprisingly high concentration of stars pinpointed exactly at the galaxy's core. The nucleus is so compact it is beyond HST's 1 arc resolution. Forty million light-years away NGC 7457 is one of the first "normal" galaxies that HST has observed. The gaseous ring seen around Supernova 1987A (47926) was taken with the European Space Agency's (ESA) Faint Object Camera (FOC), 08/23/90. The ring appears as a yellow ellipse and tightly knotted debris from the stellar explosion appears as a red blob near the center of the ring. The blue stars to the left and right of the ring are not associated with the supernova. This raw image, not computer reconstructed, was made in the yellow light of doubly ionized oxygen (5007 angstroms) the blue and red color was added to reflect the object's true color. The ring is located 160,000 light-years from Earth. Caption information provided by the Goddard Space Flight Center (GSFC) Office of Public Affairs.

Subject terms:

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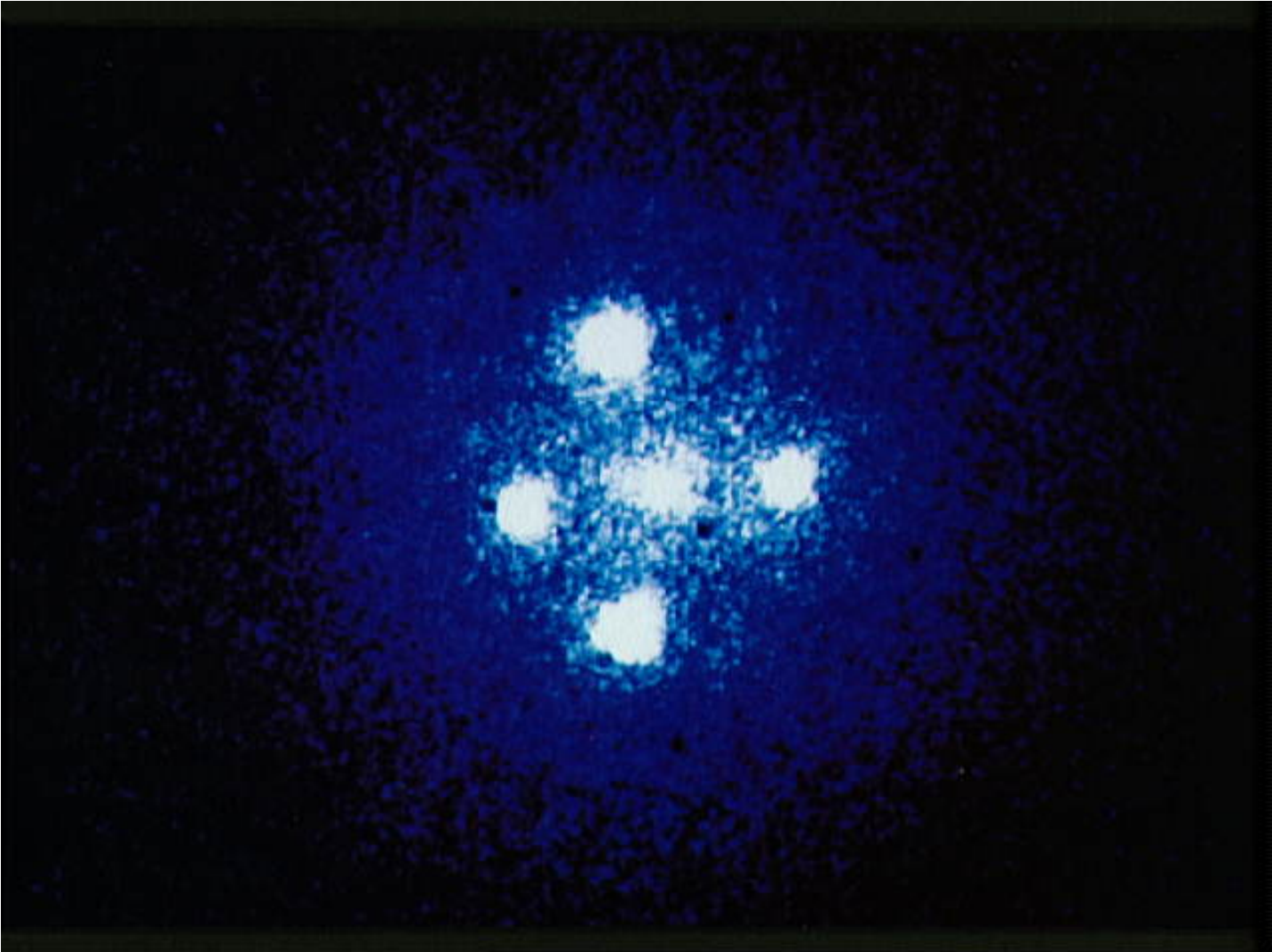
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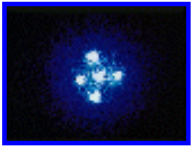
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NASA Photo ID: S90-48729

File Name: 10063633.jpg

Film Type: 4x5

Date Taken: 09/21/90

Title: HST image of Gravitational Lens G2237 + 305 or "Einstein Cross"

Description:

European Space Agency (ESA) Faint Object Camera (FOC) science image was taken from the Hubble Space Telescope (HST) of Gravitational Lens G2237 + 305 or "Einstein Cross". The gravitational lens G2237 + 305 or "Einstein Cross" shows four images of a very distant quasar which has been multiple-imaged by a relatively nearby galaxy acting as a gravitational lens. The angular separation between the upper and lower images is 1.6 arc seconds. Photo was released from Goddard Space Flight Center (GSFC) 09-12-90.

Subject terms:

FAINT OBJECTS

GRAVITATIONAL LENSES

HUBBLE SPACE TELESCOPE

QUASARS

SPACEBORNE ASTRONOMY

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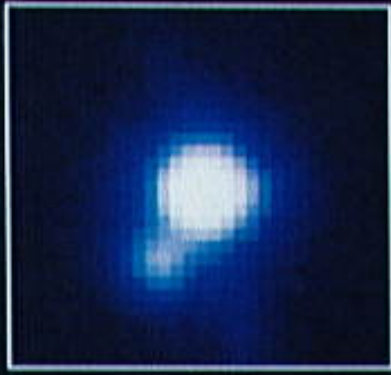
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Ground Based

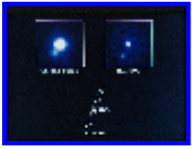


HST/FOC



Pluto

Charon



NASA Photo ID: S90-50868

File Name: 10063632.jpg

Film Type: 4x5

Date Taken: 10/23/90

Title: HST image of Pluto - the "Double Planet"

Description:

European Space Agency (ESA) Faint Object Camera (FOC) image was taken by the Hubble Space Telescope (HST) of Pluto - the "Double Planet". This FOC image, the first long duration HST exposure of a moving target, appears in the upper right hand frame and shows Pluto (bright object at the center of the frame) and Charon (fainter object in the lower left). Charon's orbit around Pluto is indicated in the diagram at the bottom and the best ground-based image of Pluto and Charon taken from the Canada-France-Hawaii telescope in Hawaii appears in the upper left hand frame. Image was released 10-04-90.

Subject terms:

CHARON

FAINT OBJECTS

HUBBLE SPACE TELESCOPE

PLUTO (PLANET)

SPACEBORNE ASTRONOMY

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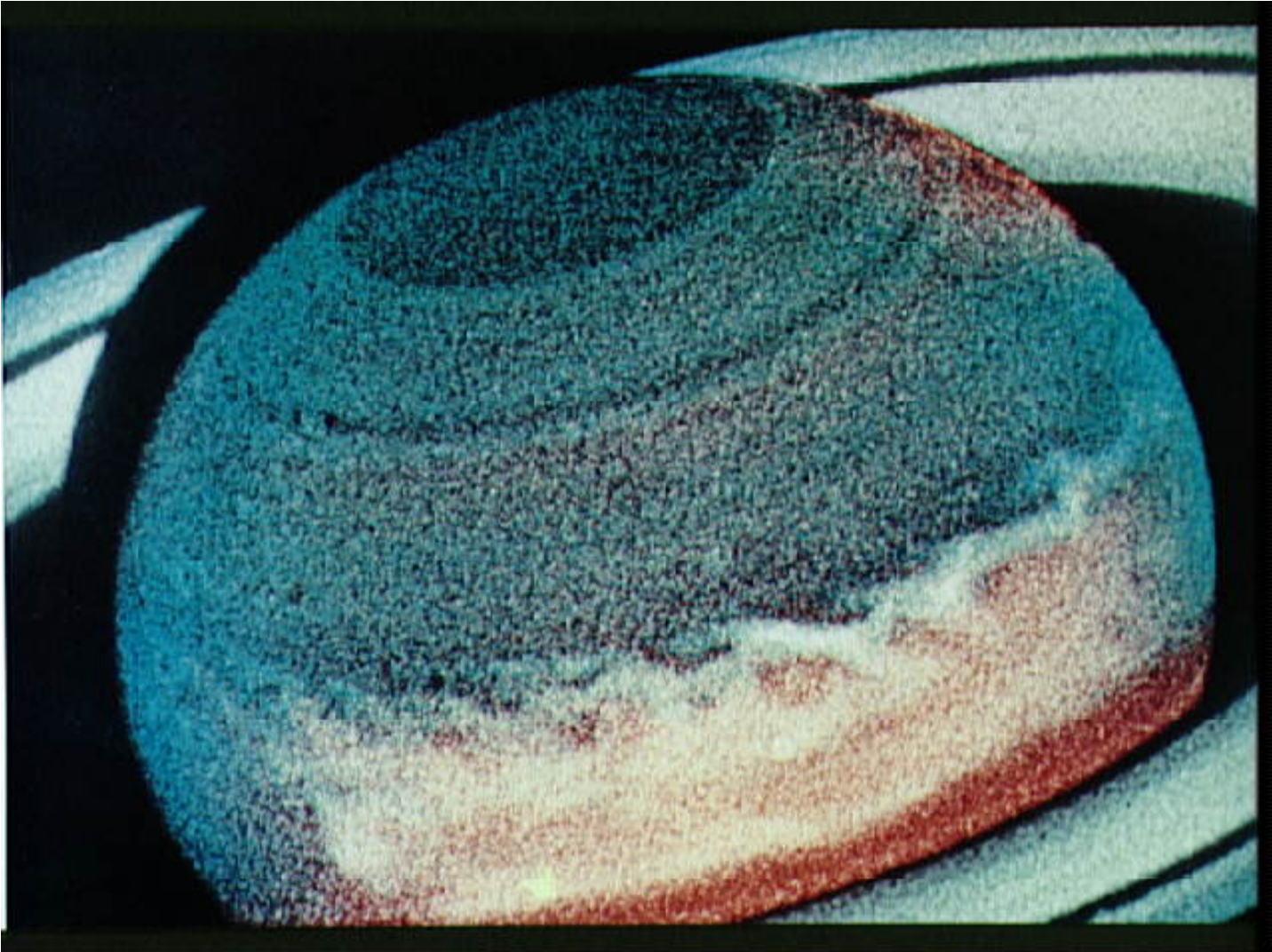
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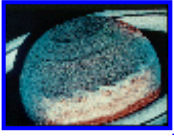
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NASA Photo ID: S90-53462

File Name: 10063631.jpg

Film Type: 4x5

Date Taken: 11/27/90

Title: HST image of Saturn's "white spot"

Description:

Saturn's "white spot" or cloud believed to be ammonia ice crystals recorded by the Hubble Space Telescope (HST) planetary camera in blue and infrared light. HST data was computer-processed improving the image sharpness.

Subject terms:

HUBBLE SPACE TELESCOPE (HST)

SATURN (PLANET)

SATURN RINGS

SPACEBORNE ASTRONOMY

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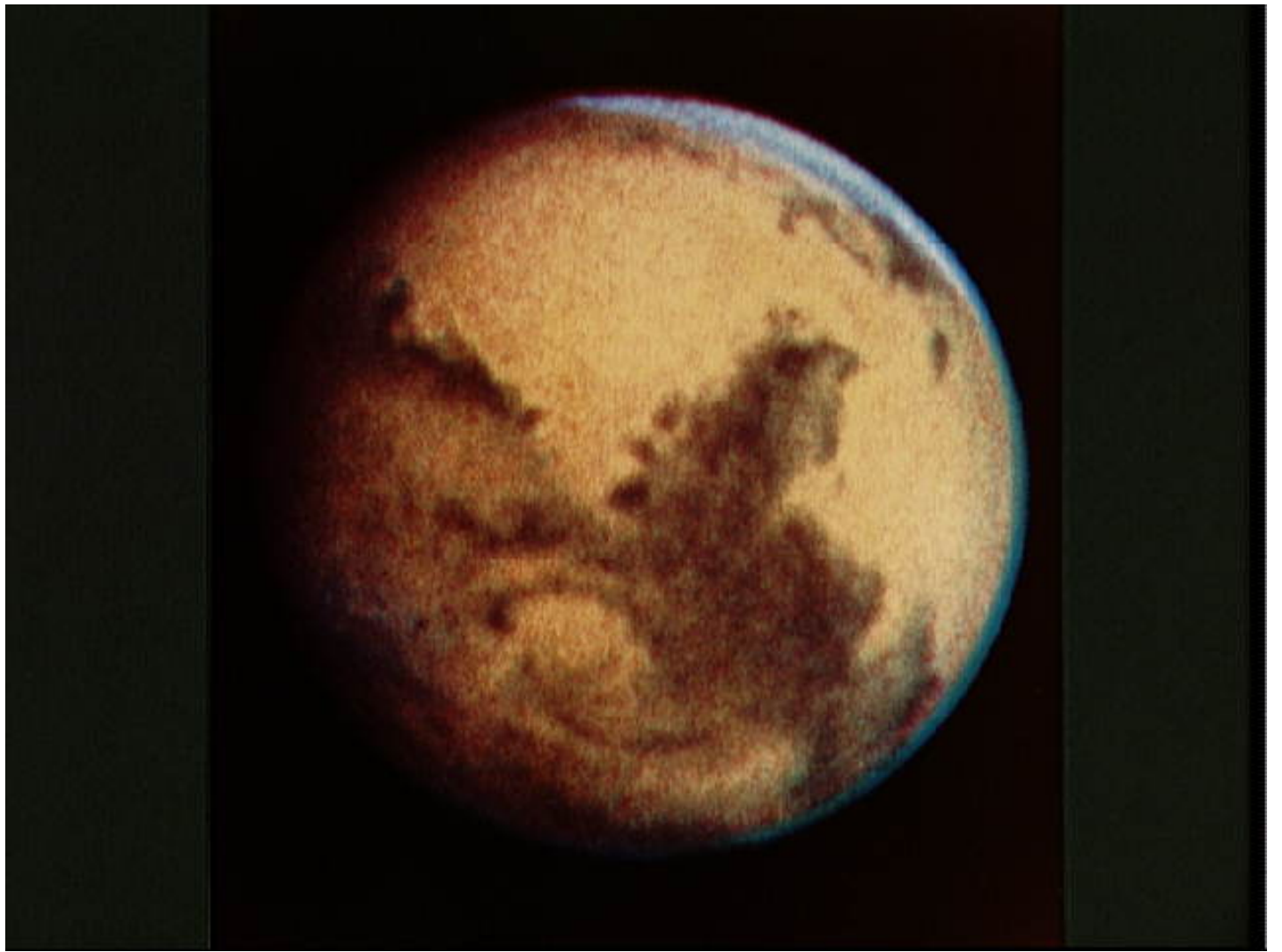
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NASA Photo ID: S91-32389

File Name: 10063635.jpg

Film Type: 4x5

Date Taken: 03/29/91

Title: Composite image of the planet Mars taken by Hubble Space Telescope (HST)

Description:

Composite image of the planet Mars taken by Hubble Space Telescope (HST)

Wide Field and Planetary Camera (WFPC).

Subject terms:

HUBBLE SPACE TELESCOPE (HST)

MARS (PLANET)

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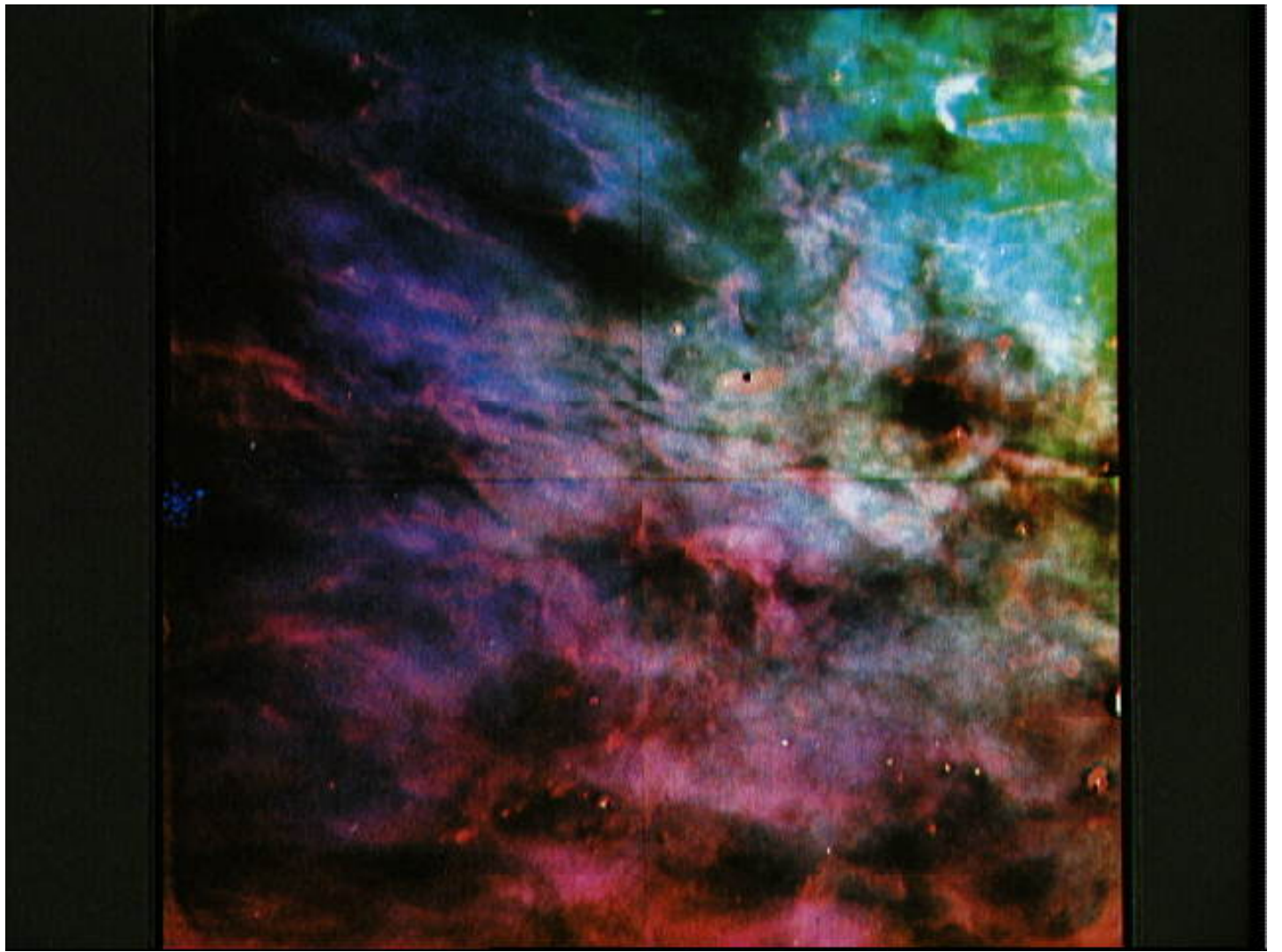
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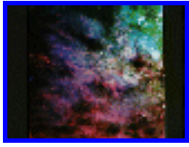
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NASA Photo ID: S92-52109

File Name: 10063634.jpg

Film Type: 4x5

Date Taken: 12/30/92

Title: HST image of the Orion's Great Nebula "window-curtain" structure

Description:

Hubble Space Telescope (HST) image shows the thin sheets of gas at the edge of the Great Nebula in the constellation of Orion. These thin sheets of gas discovered by HST's wide field/planetary camera (WFPC) have been compared to rippled "window-curtains" and mark the boundaries between the hot and diffuse inner regions of the Great Nebula and cooler and denser neighboring cloud. The sheets of gas are seen in light that has been emitted by atoms of gaseous sulfur (shown as red). Also visible in the image is the emitted light from oxygen and hydrogen which appears in blue and green. The light emissions of the gases are stimulated by the intense ultraviolet radiation given off from a nearby cluster of particularly hot and luminous young stars. The sulfur emissions are coming from a region where the light from the young stars is "boiling off" material from the face of the dense cloud.

Subject terms:

HUBBLE SPACE TELESCOPE

INTERSTELLAR GAS

ORION CONSTELLATION

ORION NEBULA

SATELLITE OBSERVATION

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NASA Photo ID: STS031(S)002

File Name: 10063476.jpg

Film Type: 120mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, official crew portrait

Description:

The five astronaut crewmembers for the STS-31 mission have chosen a busy night sky scene as a background for their portrait. Wearing mission t-shirts are (left to right) Pilot Charles F. Bolden, Mission Specialist (MS) Steven A. Hawley, Commander Loren J. Shriver, MS Bruce McCandless II, and MS Kathryn D. Sullivan. The Hubble Space Telescope (HST) depicted in the upper left of the background scene is scheduled to be deployed from the payload bay (PLB) of Discovery, Orbiter Vehicle (OV) 103, by the crew. Portrait made by NASA JSC contract photographer Jack Jacob.

Subject terms:

ASTRONAUTS

CREWS

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

INSIGNIAS

MODELS

PORTRAIT

STS-31

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NASA Photo ID: STS031(S)064

File Name: 10063555.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from KSC LC Pad 39B
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B at 8:33:51.0492 am (Eastern Daylight Time (EDT)). Exhaust plumes billow from OV-103's two solid rocket boosters (SRBs) and cover the launch pad area. OV-103 atop the external tank (ET) is not yet clear of the fixed service structure (FSS) tower. The retracted rotating service structure (RSS) appears at the left. In the foreground, the SRB and space shuttle main engine (SSME) firings are reflected in a nearby waterway. The diamond shock effect is visible at the SSME nozzles.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX

DISCOVERY (ORBITER)

EXHAUST CLOUDS

EXTERNAL TANKS

FLORIDA

KENNEDY SPACE CENTER

LAUNCHING PADS

LIFTOFF (LAUNCHING)

SPACE SHUTTLE BOOSTERS

STS-31

TOWERS

WATERWAYS

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NASA Photo ID: STS031(S)073

File Name: 10063556.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, lifts off from KSC LC Pad 39B
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, nearly clear of the fixed service structure (FSS) tower rises above Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B after liftoff at 8:33:51.0492 am (Eastern Daylight Time (EDT)). An exhaust cloud produced by the solid rocket boosters (SRBs) covers the launch pad below. The top of the retracted rotating service structure (RSS) appears at the left. OV-103 atop the external tank (ET) and flanked by the SRBs heads into Earth orbit with the Hubble Space Telescope (HST) aboard.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX

DISCOVERY (ORBITER)

EXHAUST CLOUDS

EXTERNAL TANKS

KENNEDY SPACE CENTER

LIFTOFF (LAUNCHING)

SPACE SHUTTLE BOOSTERS

STS-31

TOWERS

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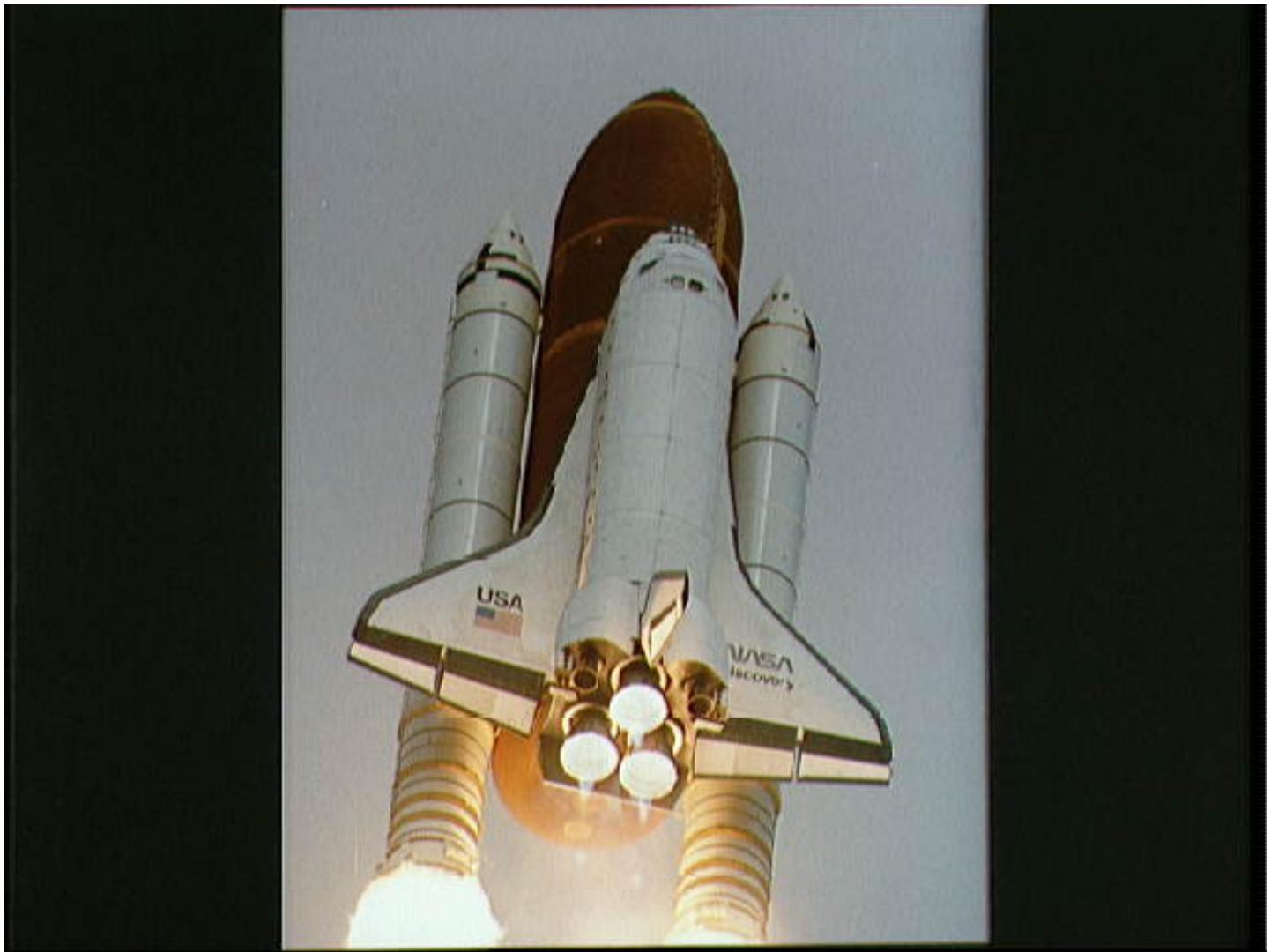
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NASA Photo ID: STS031(S)074

File Name: 10063561.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Discovery, OV-103, begins its roll maneuver after liftoff from KSC
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, begins its roll maneuver after liftoff from Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B at 8:33:51.0492 am (Eastern Daylight Time (EDT)). This low-angle view of the launch shows OV-103 atop the external tank (ET) and flanked by two solid rocket boosters (SRBs) as it rises into the sky headed to Earth orbit. The space shuttle main engines (SSMEs), orbital maneuvering system (OMS) pods, and overhead windows W7 and W8 are clearly visible.

Subject terms:

DISCOVERY (ORBITER)

EXTERNAL TANKS

FLORIDA

KENNEDY SPACE CENTER

LIFTOFF (LAUNCHING)

SPACE SHUTTLE BOOSTERS

SPACE SHUTTLE MAIN ENGINE

STS-31

WINDOWS

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NASA Photo ID: STS031(S)075 File Name: 10063560.jpg
Film Type: 70mm Date Taken: 04/29/90
Title: STS-31 Discovery, OV-103, rockets through low-lying clouds after KSC liftoff
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, rides above the firey glow of the solid rocket boosters (SRBs) and space shuttle main engines (SSMEs) and a long trail of exhaust as it heads toward Earth orbit. Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B is covered in an exhaust cloud moments after the liftoff of OV-103 at 8:33:51.0492 am (Eastern Daylight Time (EDT)). The exhaust plume pierces the low-lying clouds as OV-103 soars into the clear skies above. A nearby waterway appears in the foreground.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX
CLOUDS
DISCOVERY (ORBITER)
EXHAUST CLOUDS
KENNEDY SPACE CENTER
LAUNCHING PADS
LIFTOFF (LAUNCHING)
STS-31
WATERWAYS

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NASA Photo ID: STS031(S)076

File Name: 10063559.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Discovery, OV-103, is hidden in low-lying clouds after KSC liftoff
Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, is hidden in low-lying cloud cover as it rises above Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B just after its liftoff at 8:33:51.0492 am (Eastern Daylight Time (EDT)). The glow of the solid rocket booster (SRB) and the space shuttle main engine (SSME) firings appears just below the cloud cover and is reflected in the nearby waterway (foreground). An exhaust plume trails from OV-103 and its SRBs and covers the launch pad area.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX

CLOUDS

DISCOVERY (ORBITER)

EXHAUST CLOUDS

KENNEDY SPACE CENTER

LAUNCHING PADS

LIFTOFF (LAUNCHING)

STS-31

WATERWAYS

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NASA Photo ID: STS031(S)077

File Name: 10063558.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, heads skyward after KSC liftoff
Description:

In this distant view, STS-31 Discovery, Orbiter Vehicle (OV) 103, is seen as it heads skyward after liftoff from Kennedy Space Center (KSC) Launch Complex (LC) Pad 39B at 8:33:51.0492 am (Eastern Daylight Time (EDT)). OV-103's silhouette atop the external tank (ET) appears above the glow of the solid rocket booster (SRB) and space shuttle main engine (SSME) firings. An exhaust plume trails behind and covers the launch pad area below the orbiter. A nearby waterway reflects the SRB/SSME glow in the foreground. At the far right and barely discernible is KSC LC Pad 39A and the Sound Suppression Water System tower. Columbia, OV-102, is on LC Pad 39A which is separated by a distance of 1.6 miles. This was the first time since January 1986 that there was a shuttle on each pad.

Subject terms:

CAPE KENNEDY LAUNCH COMPLEX

CLOUDS

DISCOVERY (ORBITER)

EXHAUST CLOUDS

FLORIDA

KENNEDY SPACE CENTER

LAUNCHING PADS

LIFTOFF (LAUNCHING)

STS-31

WATERWAYS

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NASA Photo ID: STS031(S)129

File Name: 10063624.jpg

Film Type: 120mm

Date Taken: 04/29/90

Title: STS-31 crew egresses Discovery, OV-103, via stairway after EAFB landing

Description:

NASA's Acting Associate Administrator for Space Flight William B. Lenoir greets the STS-31 crew as they egress Discovery, Orbiter Vehicle (OV) 103, via a mobile stairway. Stepping off the bottom stair onto Edwards Air Force Base (EAFB) concrete runway 22 is Commander Loren J. Shriver. He is followed by Mission Specialist (MS) Steven A. Hawley, MS Bruce McCandless II, MS Kathryn D. Sullivan, and Pilot Charles F. Bolden. Ground personnel look on as the crewmembers, wearing their launch and entry suits (LESs), exit OV-103. Wheel stop occurred at 6:51:00 am (Pacific Daylight Time (PDT)).

Subject terms:

ASTRONAUTS
CALIFORNIA
CREWS
DISCOVERY (ORBITER)
EDWARDS AIR FORCE BASE
LAUNCH AND ENTRY SUIT
MANAGEMENT
PERSONNEL
RUNWAYS
SPACECRAFT LANDING
STAIRWAYS
STS-31

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NASA Photo ID: STS031(S)130

File Name: 10063625.jpg

Film Type: 120mm

Date Taken: 04/29/90

Title: STS-31 crew poses on EAFB concrete runway after egressing OV-103

Description:

STS-31 crewmembers, wearing their launch and entry suits (LEs), pose for an informal portrait on Edwards Air Force Base (EAFB) concrete runway 22 after egressing Discovery, Orbiter Vehicle (OV) 103. Left to right are Mission Specialist (MS) Steven A. Hawley, Pilot Charles F. Bolden, MS Kathryn D. Sullivan, Commander Loren J. Shriver, and MS Bruce McCandless II. A service vehicle and OV-103's main landing gear (MLG) are visible in the background. The highly successful five-day mission concluded at EAFB with wheel stop at 6:51:00 am (Pacific Daylight Time (PDT)).

Subject terms:

ASTRONAUTS

CALIFORNIA

CREWS

DISCOVERY (ORBITER)

EDWARDS AIR FORCE BASE

LANDING GEAR

LAUNCH AND ENTRY SUIT

PORTRAIT

RUNWAYS

STS-31

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NASA Photo ID: STS031(S)131

File Name: 10063621.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, glides toward EAFB landing

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, approaches Edwards Air Force Base (EAFB), California landing facility. This view was captured moments before the landing gear was deployed and shows OV-103's port side and its underside of carefully placed heat shield tiles. OV-103 came to a complete wheel stop at 6:51:00 am (Pacific Daylight Time (PDT)) on concrete runway 22.

Subject terms:

AERIAL PHOTOGRAPHY

APPROACH

DISCOVERY (ORBITER)

SPACECRAFT LANDING

STS-31

THERMAL PROTECTION

TILES

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NASA Photo ID: STS031(S)135

File Name: 10063622.jpg

Film Type: 120mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, lands on EAFB concrete runway 22

Description:

The main landing gear (MLG) of Discovery, Orbiter Vehicle (OV) 103, rides along concrete runway 22 at Edwards Air Force Base (EAFB), California, bringing mission STS-31 to an end. The nose landing gear (NLG) is suspended above the runway prior to touchdown and wheel stop which occurred at 6:51:00 am (Pacific Daylight Time (PDT)). View shows OV-103's starboard side and deployed rudder/speedbrake. EAFB facilities are seen in the distance.

Subject terms:

CALIFORNIA

DISCOVERY (ORBITER)

EDWARDS AIR FORCE BASE

LANDING GEAR

RUNWAYS

SPACECRAFT LANDING

STS-31

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NASA Photo ID: STS031(S)136

File Name: 10063623.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Discovery, Orbiter Vehicle (OV) 103, lands on EAFB concrete runway 22

Description:

STS-31 Discovery, Orbiter Vehicle (OV) 103, rolls along concrete runway 22 at Edwards Air Force Base (EAFB), California, after nose landing gear (NLG) and main landing gear (MLG) touchdown. This view looks down OV-103's port side from the space shuttle main engines (SSMEs) to the nose section. The SSMEs are gimbaled to their descent position and the rudder/speedbrake is deployed on the vertical stabilizer. Wheel stop occurred at 6:51 am (Pacific Daylight Time (PDT)). In the distance EAFB facilities are visible.

Subject terms:

CALIFORNIA

DISCOVERY (ORBITER)

EDWARDS AIR FORCE BASE

LANDING GEAR

RUNWAYS

SPACE SHUTTLE MAIN ENGINE

SPACECRAFT LANDING

STS-31

TAIL ASSEMBLIES

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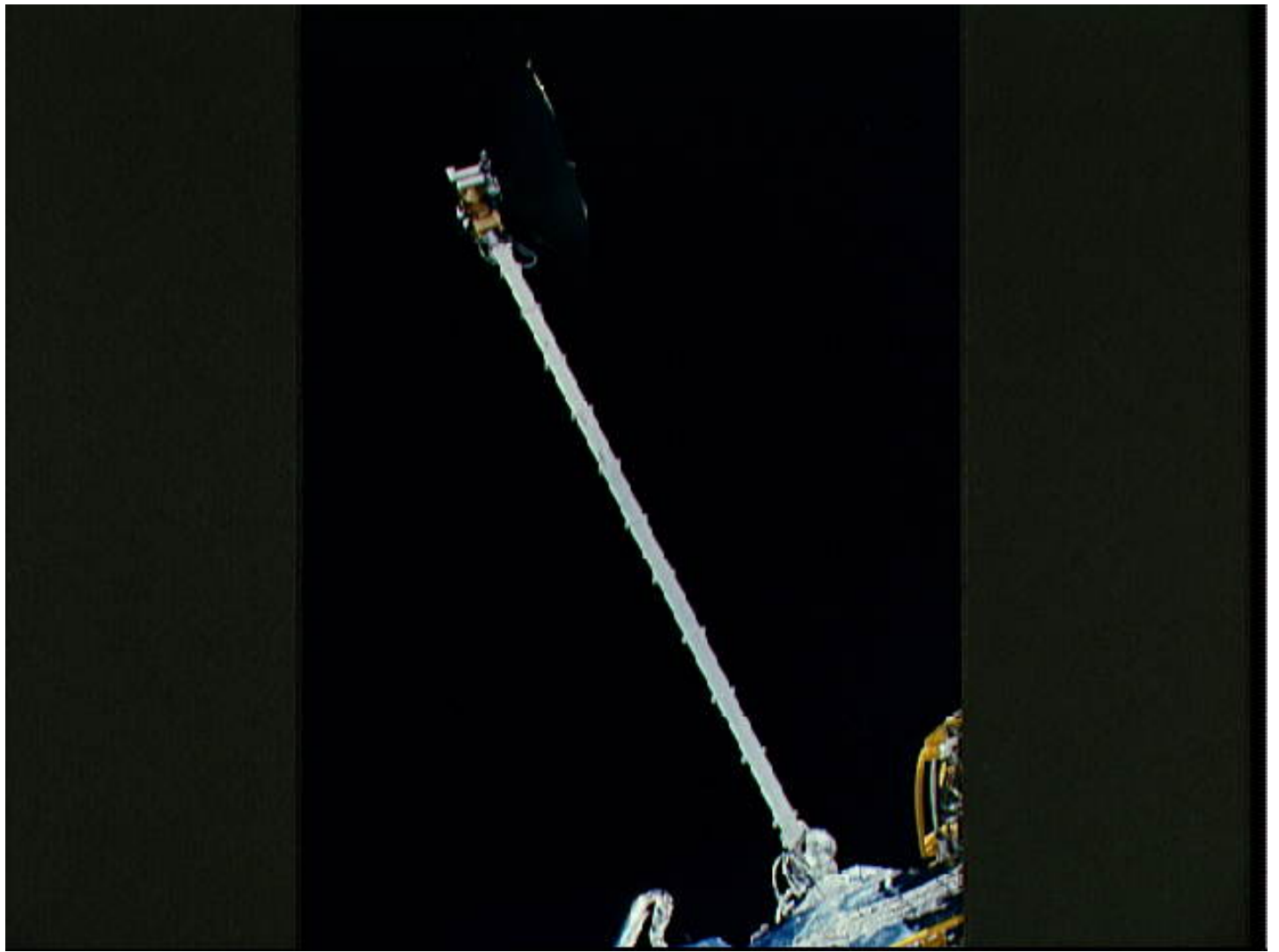
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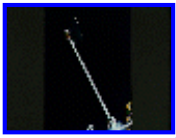
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NASA Photo ID: STS031-03-002

File Name: 10063592.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: Hubble Space Telescope (HST) high gain antenna (HGA) deployment during STS-31

Description:

Held in appendage deploy position, the Hubble Space Telescope's (HST's) high gain antenna (HGA) has been released from its stowed position along the Support System Module (SSM) forward shell. The STS-31 crew aboard Discovery, Orbiter Vehicle (OV) oversees the automatic HGA deployment prior to releasing HST. HST HGA is backdropped against the blackness of space.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

HIGH GAIN

HUBBLE SPACE TELESCOPE

SPACECRAFT ANTENNAS

STS-31

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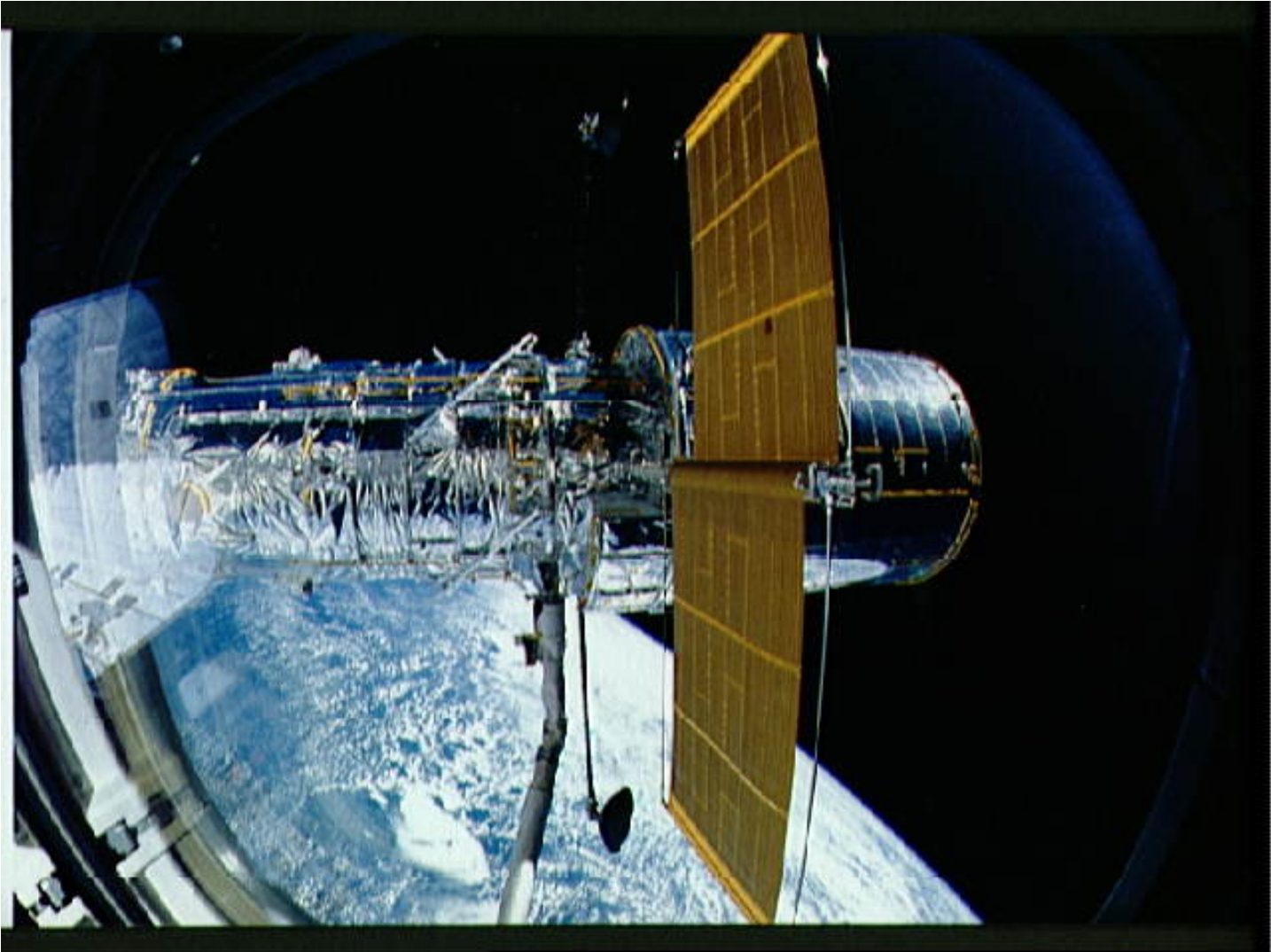
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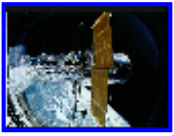
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NASA Photo ID: STS031-03-009

File Name: 10063593.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) (SAs & HGAs deployed) is grappled by RMS
Description:

During STS-31, the Hubble Space Telescope (HST), still in the grasp of Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS), is backdropped over the Earth some 332 nautical miles below. In this scene, HST's starboard solar array (SA) wing and two high gain antennae (HGA) are fully extended. An aft flight deck window frames the scene.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH OBSERVATIONS (FROM SPACE)

END EFFECTORS

HIGH GAIN

HUBBLE SPACE TELESCOPE

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

SPACECRAFT ANTENNAS

STS-31

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NASA Photo ID: STS031-03-014

File Name: 10063594.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) appendage deploy aboard OV-103

Description:

Grappled by the remote manipulator system (RMS) end effector of Discovery, Orbiter Vehicle (OV) 103, the Hubble Space Telescope (HST) is held in appendage deploy position. The starboard solar array (SA) wing and the two high gain antennae (HGA) are fully extended. An STS-31 crewmember took this view through aft flight deck window W7. The HST is backdropped against the Earth's limb.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH SURFACE

HIGH GAIN

HUBBLE SPACE TELESCOPE

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

SPACECRAFT ANTENNAS

STS-31

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NASA Photo ID: STS031-03-024 File Name: 10063579.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: STS-31 MS McCandless in LCVG removes EMU lower torso on OV-103's middeck
Description:
STS-31 Mission Specialist (MS) Bruce McCandless II, wearing liquid cooling and ventilation garment (LCVG), works his way out of the extravehicular mobility unit (EMU) lower torso on the middeck of Discovery, Orbiter Vehicle (OV) 103. McCandless was in a standby mode to perform extravehicular activity (EVA) if needed to support Hubble Space Telescope (HST) deployment and post-deployment tasks. None was needed. His helmet and gloves freefloat in the background.
Subject terms:
ASTRONAUTS
CREW PROCEDURES (INFLIGHT)
CREWS
DISCOVERY (ORBITER)
EXTRAVEHICULAR MOBILITY UNITS
GLOVES
HELMETS
LIQUID COOLING AND VENTILATION GARMENT
MIDDECK
ONBOARD ACTIVITIES
STS-31

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NASA Photo ID: STS031-03-025 File Name: 10063578.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: STS-31 MS McCandless in LCVG removes EMU lower torso on OV-103's middeck
Description:

STS-31 Mission Specialist (MS) Bruce McCandless II, wearing liquid cooling and ventilation garment (LCVG), is assisted by the microgravity of space as he removes the extravehicular mobility unit (EMU) lower torso. McCandless was in a standby mode to perform extravehicular activity (EVA) if needed to support Hubble Space Telescope (HST) deployment and post-deployment tasks. None was needed. His EMU helmet and gloves freefloat in the background.

Subject terms:

ASTRONAUTS
CREW PROCEDURES (INFLIGHT)
CREWS
DISCOVERY (ORBITER)
EXTRAVEHICULAR MOBILITY UNITS
HELMETS
LIQUID COOLING AND VENTILATION GARMENT
MIDDECK
ONBOARD ACTIVITIES
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NASA Photo ID: STS031-03-027

File Name: 10063577.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Mission Specialist (MS) Sullivan dons EMU in OV-103's airlock

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan, wearing extravehicular mobility unit (EMU) & communications carrier assembly (CCA), attaches service and cooling umbilical (SCU) to the EMU connection on the display & control module (DCM) during contingency extravehicular activity (EVA) preparations in the airlock of Discovery, Orbiter Vehicle (OV) 103. The procedure was completed in case an EVA was required to support Hubble Space Telescope (HST) deployment.

Subject terms:

AIR LOCKS

ASTRONAUTS

COMMUNICATION EQUIPMENT

CREW PROCEDURES (INFLIGHT)

CREWS

DISCOVERY (ORBITER)

EXTRAVEHICULAR MOBILITY UNITS

ONBOARD ACTIVITIES

STS-31

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NASA Photo ID: STS031-03-030

File Name: 10063576.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS Sullivan wearing EMU prepares for contingency EVA in OV-103 airlock

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan, wearing extravehicular mobility unit (EMU) and communications carrier assembly (CCA), prepares for contingency extravehicular activity (EVA) in the event of problems with the Hubble Space Telescope (HST) deployment.

Subject terms:

AIR LOCKS

ASTRONAUTS

COMMUNICATION EQUIPMENT

CREW PROCEDURES (INFLIGHT)

CREWS

DISCOVERY (ORBITER)

EXTRAVEHICULAR MOBILITY UNITS

ONBOARD ACTIVITIES

STS-31

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NASA Photo ID: STS031-04-002 File Name: 10063564.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: STS-31 MS Sullivan, MS McCandless, DSO 462 medical device on OV-103 middeck
Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan applies a gel to a transducer while MS Bruce McCandless II uses a central venous pressure mouthpiece on the middeck of Discovery, Orbiter Vehicle (OV) 103. The crewmembers are conducting Detailed Supplementary Objective (DSO) 462, Non-Invasive Estimation of Central Venous Pressure. After preparing the transducer, Sullivan will apply it to McCandless' juggler. DSO 462 will measure the physiological adaptation to the headward shift that occurs in microgravity. This non-invasive technique of determining central venous pressure uses the mouthpiece with varying resistance and a probe that utilizes Doppler flowmetry.

Subject terms:

ASTRONAUTS
CREW EXPERIMENT STATIONS
CREW PROCEDURES (INFLIGHT)
CREWS
DISCOVERY (ORBITER)
MEDICAL EQUIPMENT
MIDDECK
ONBOARD ACTIVITIES
PHYSIOLOGICAL TESTS
SPACEBORNE EXPERIMENTS
STS-31

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NASA Photo ID: STS031-04-027 File Name: 10063580.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: Hubble Space Telescope (HST) above OV-103's PLB during STS-31 deployment
Description:

The Hubble Space Telescope (HST) is raised above the payload bay (PLB) in low hover position during STS-31 checkout and pre-deployment procedures aboard Discovery, Orbiter Vehicle (OV) 103. Stowed along the HST Support System Module (SSM) are the high gain antenna (HGA) (center) and the two solar arrays (one either side). In the background are the orbital maneuvering system (OMS) pods and the Earth's surface.

Subject terms:

ANTENNAS
DISCOVERY (ORBITER)
EARTH LIMB
HUBBLE SPACE TELESCOPE
PAYLOAD BAY
PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM
SOLAR ARRAYS
STS-31

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NASA Photo ID: STS031-05-002

File Name: 10063566.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 crew activity on the middeck of the Earth-orbiting Discovery, OV-103

Description:

This high angle overall view taken with a "fish eye" lens captures the STS-31 crew activity on the middeck of the Earth-orbiting Discovery, Orbiter Vehicle (OV) 103. Mission Specialist (MS) Kathryn D. Sullivan works with the IMAX camera in the foreground, while MS Steven A. Hawley consults a checklist in the corner at the aft lockers next to the open airlock. An ARRIFLEX motion picture camera records Student Experiment (SE) 82-16, Ion arc - studies of the effects of microgravity and a magnetic field on an electric arc, attached to lockers MF28G and MF28H on Sullivan's left. The stowed treadmill on middeck floor and the starboard wall-mounted sleep restraints are also seen in the view.

Subject terms:

ASTRONAUTS

CAMERAS

CREWS

DISCOVERY (ORBITER)

MIDDECK

PHOTOGRAPHIC EQUIPMENT

SPACEBORNE EXPERIMENTS

STS-31

STUDENTS

TREADMILLS

VIDEO EQUIPMENT

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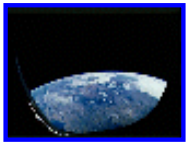
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NASA Photo ID: STS031-05-008

File Name: 10063563.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Earth observation of western United States, Salton Sea, Imperial Valley

Description:

STS-31 Earth observation taken aboard Discovery, Orbiter Vehicle (OV) 103, is of the western United States with the Salton Sea and Imperial Valley area recognizable at the lower left. The view is framed in a flight deck window and was photographed using a fish-eye lens.

Subject terms:

DISCOVERY (ORBITER)

EARTH LIMB

EARTH OBSERVATIONS (FROM SPACE)

SALTON SEA (CA)

STS-31

UNITED STATES

VALLEYS

WINDOWS

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NASA Photo ID: STS031-06-008 File Name: 10063573.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: STS-31 Commander Shriver with HASSELBLAD camera on OV-103's aft flight deck
Description:

STS-31 Commander Loren J. Shriver, holding HASSELBLAD camera, looks away from his Earth observation work on the aft flight deck of Discovery, Orbiter Vehicle (OV) 103, to smile for a fellow crewmember's snap shot. Shriver is positioned below overhead window W8 and in front of the onorbit station and aft flight deck viewing window W10.

Subject terms:

ASTRONAUTS
CAMERAS
CREW OBSERVATION STATIONS
CREW PROCEDURES (INFLIGHT)
CREWS
DISCOVERY (ORBITER)
FLIGHT DECK
ONBOARD ACTIVITIES
PHOTOGRAPHIC EQUIPMENT
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NASA Photo ID: STS031-06-010 File Name: 10063567.jpg
Film Type: 35mm Date Taken: 04/29/90
Title: STS-31 MS McCandless with LINHOF camera on OV-103's forward flight deck
Description:

STS-31 Mission Specialist (MS) Bruce McCandless II looks away from the bracket-mounted LINHOF Aero Technika camera on the forward flight deck of Discovery, Orbiter Vehicle (OV) 103, to pose for this picture. McCandless is positioned in the commanders station and is recording Earth observations outside forward flight deck window W2. His hair freefloats away from his head in the microgravity environment and he sports a five o'clock shadow.

Subject terms:

ASTRONAUTS
BRACKETS
CAMERAS
CREW OBSERVATION STATIONS
CREW PROCEDURES (INFLIGHT)
CREWS
DISCOVERY (ORBITER)
FLIGHT DECK
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NASA Photo ID: STS031-06-035

File Name: 10063570.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 camera & photographic equipment displayed on OV-103's aft flight deck

Description:

This array of photographic equipment, displayed on the aft flight deck payload station, represents just a part of the imaging and recording hardware which was carried aboard Discovery, Orbiter Vehicle (OV) 103, for STS-31's five day mission. Lenses, film magazines, cassettes, recorders, camera chassis, a pair of binoculars, spot meter, tape recorder, and a bracket-mounted light fixture are included among the array.

Subject terms:

BRACKETS

CAMERAS

CREW WORKSTATIONS

DISCOVERY (ORBITER)

FLIGHT DECK

LIGHTING EQUIPMENT

PHOTOGRAPHIC EQUIPMENT

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NASA Photo ID: STS031-07-021

File Name: 10063565.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS Sullivan conducts DSO 473 test on Pilot Bolden on OV-103's middeck
Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan conducts a Merieux skin test on Pilot Charles F. Bolden as part of Detailed Supplementary Objective (DSO) 473, Delayed-Type Hypersensitivity. In Sullivan's left hand is a bar filled with doses of a bacterial antigen to be administered to the subject's skin. The two crewmembers are in front of forward lockers on the middeck of the Earth-orbiting Discovery, Orbiter Vehicle (OV) 103.

Subject terms:

ASTRONAUTS

CREW EXPERIMENT STATIONS

CREW PROCEDURES (INFLIGHT)

CREWS

DISCOVERY (ORBITER)

MEDICAL EQUIPMENT

MIDDECK

ONBOARD ACTIVITIES

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NASA Photo ID: STS031-08-010

File Name: 10063568.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS McCandless and MS Sullivan set up PCG-III on OV-103's middeck

Description:

STS-31 Mission Specialist (MS) Bruce McCandless II positions 35mm camera on the Protein Crystal Growth III (PCG-III) as MS Kathryn D. Sullivan lights the PCG-III module from below with a portable light fixture. During the photographic documentation of the developing crystals, PCG-III is extended from its middeck locker MF14H.

Subject terms:

ASTRONAUTS

CAMERAS

CREW EXPERIMENT STATIONS

CREWS

CRYSTAL GROWTH

DISCOVERY (ORBITER)

MIDDECK

ONBOARD ACTIVITIES

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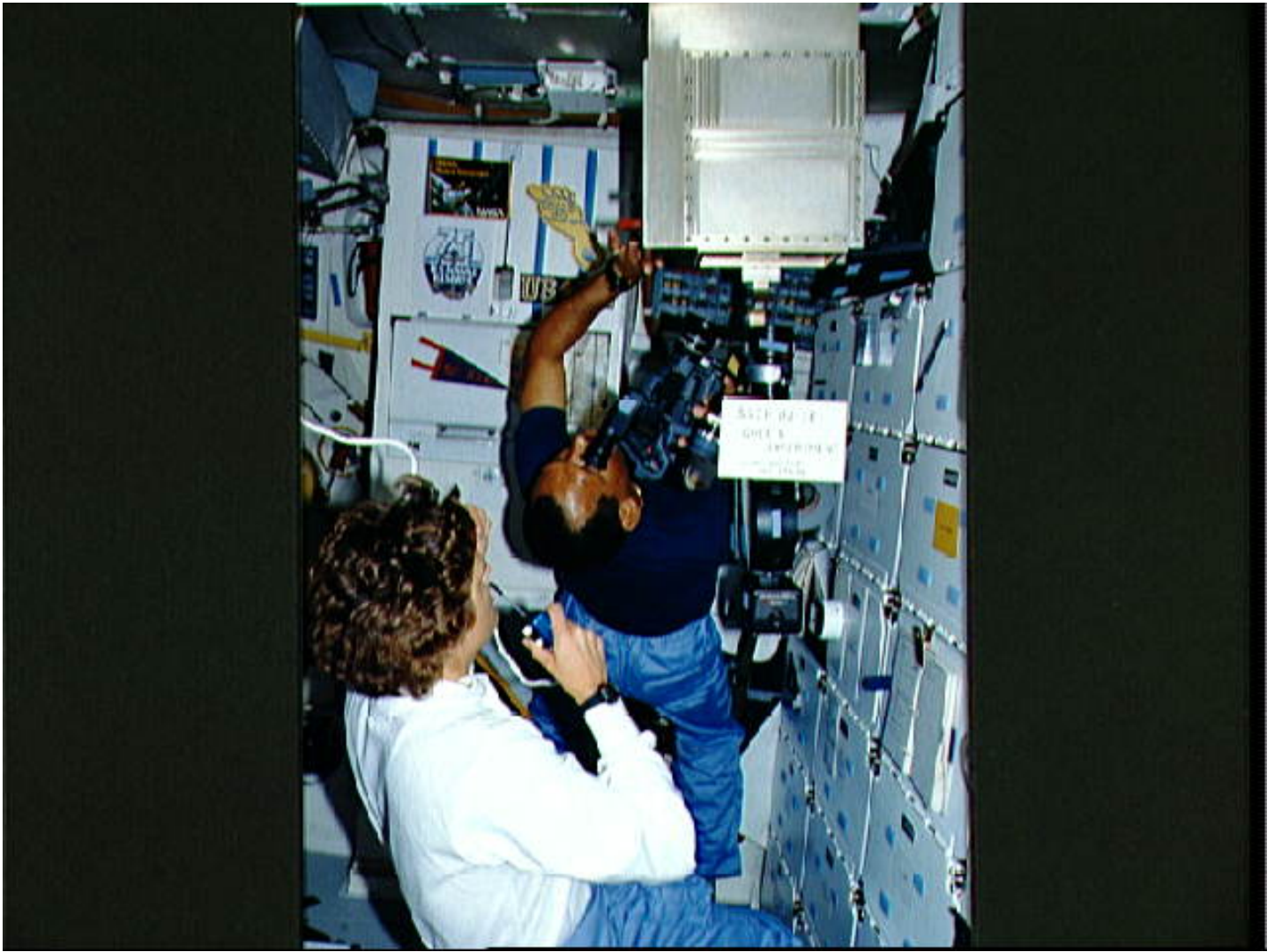
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NASA Photo ID: STS031-08-035

File Name: 10063571.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS Sullivan & Pilot Bolden monitor SE 82-16 Ion Arc on OV-103 middeck
Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan monitors and advises ground controllers of the activity inside the Student Experiment (SE) 82-16, Ion arc - studies of the effects of microgravity and a magnetic field on an electric arc, mounted in front of the middeck lockers aboard Discovery, Orbiter Vehicle (OV) 103. Pilot Charles F. Bolden uses a video camera and an ARRIFLEX motion picture camera to record the activity inside the special chamber. A sign in front of the experiment reads "SSIP 82-16 Greg's Experiment Happy Graduation from STS-31." SSIP stands for Shuttle Student Involvement Program. Gregory S. Peterson who developed the experiment (Greg's Experiment) is a student at Utah State University and monitored the experiment's operation from JSC's Mission Control Center (MCC) during the flight. Decals displayed in the background on the orbiter galley represent the Hubble Space Telescope (HST), the United States (U.S.) Naval Reserve, Navy Oceanographers, U.S. Navy, and University of Kansas.

Subject terms:

ASTRONAUTS

CAMERAS

CREW EXPERIMENT STATIONS

CREW PROCEDURES (INFLIGHT)

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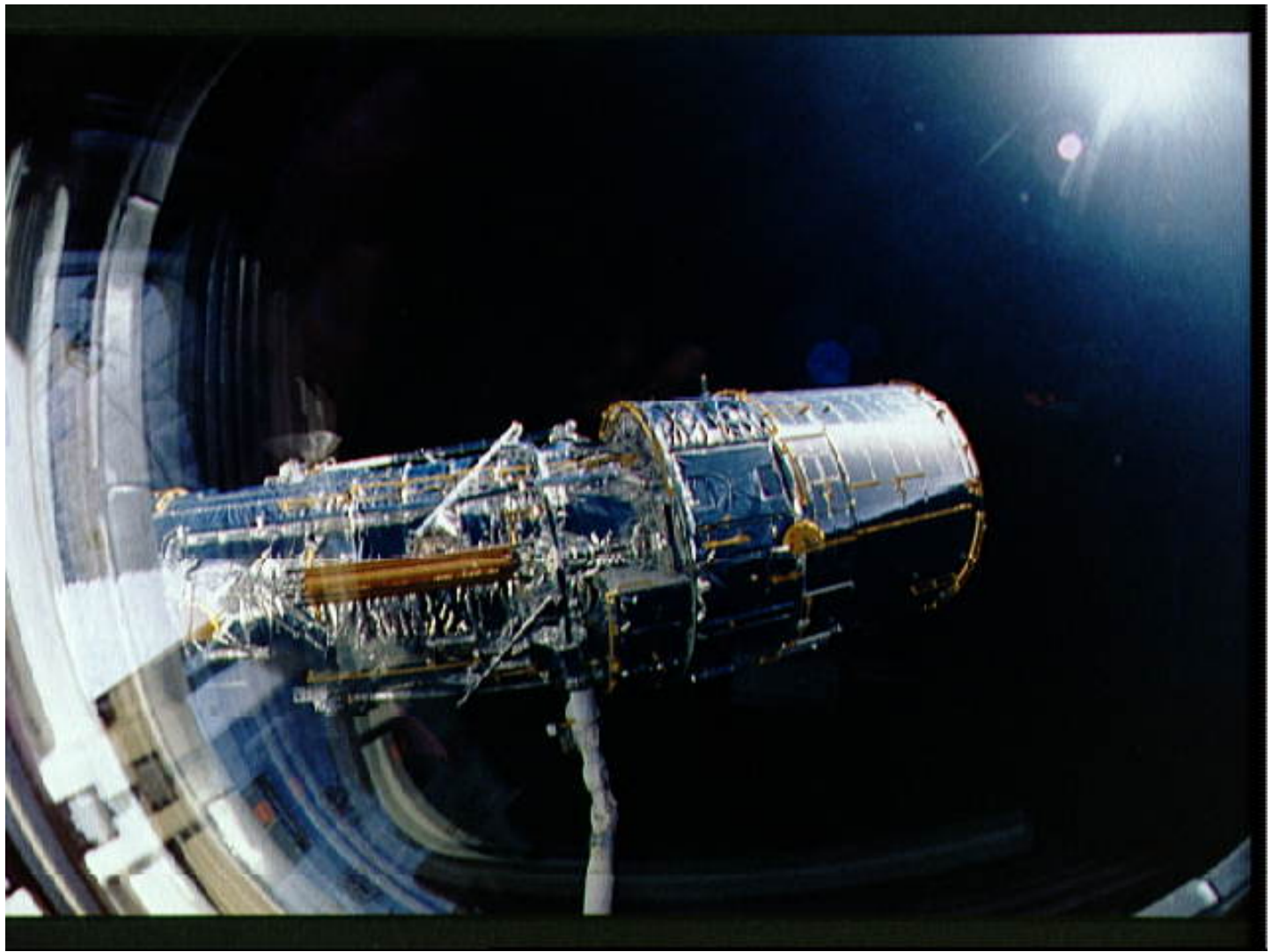
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NASA Photo ID: STS031-10-016

File Name: 10063582.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 pre-deployment checkout of the Hubble Space Telescope (HST) on OV-103

Description:

View taken through overhead window W7 aboard Discovery, Orbiter Vehicle (OV) 103, shows the Hubble Space Telescope (HST) grappled by the remote manipulator system (RMS) and held in a 90 degree pitch position against the blackness of space. The solar array (SA) panel (center) and the high gain antennae (HGA) (on either side) are visible along the Support System Module (SSM) forward shell prior to deployment during STS-31.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

END EFFECTORS

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

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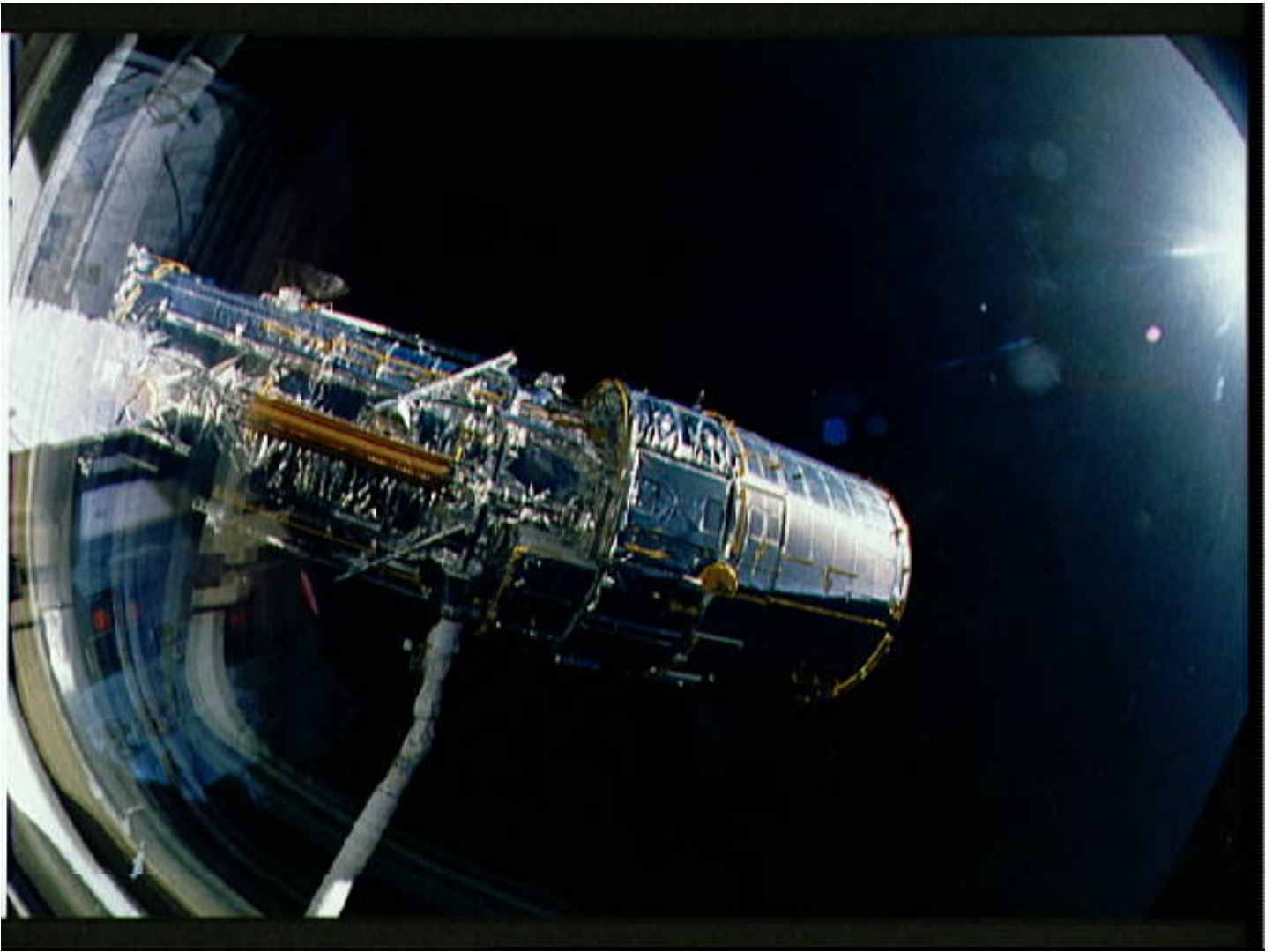
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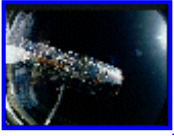
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NASA Photo ID: STS031-10-017

File Name: 10063583.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 pre-deployment checkout of the Hubble Space Telescope (HST) on OV-103

Description:

The Hubble Space Telescope (HST), grappled by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS), is oriented in a 90 degree pitch position during STS-31 pre-deployment checkout procedures. The solar array (SA) panel (center) and high gain antennae (HGA) (on either side) are stowed along the Support System Module (SSM) forward shell prior to deployment. The sun highlights HST against the blackness of space.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

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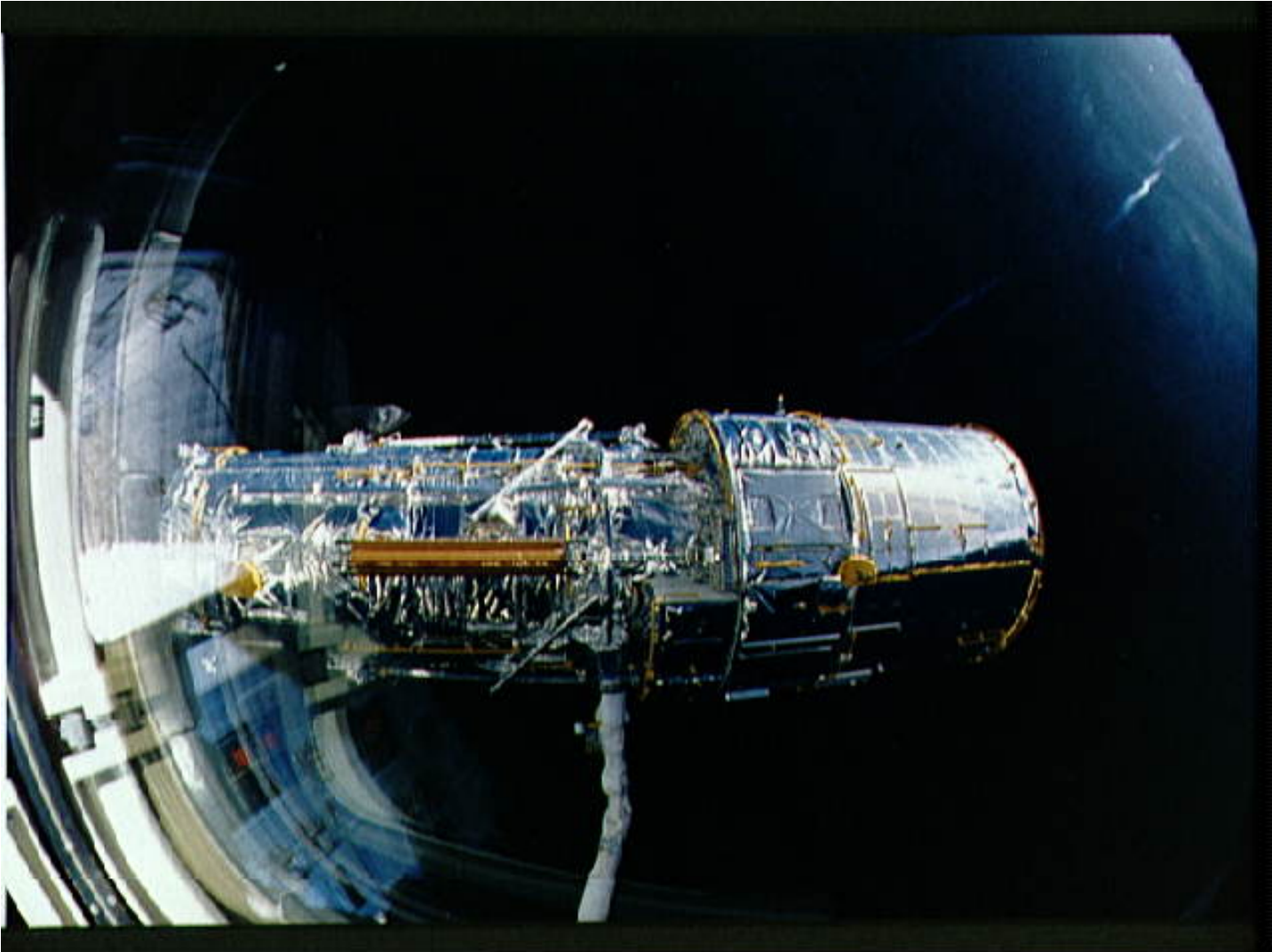
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NASA Photo ID: STS031-10-018

File Name: 10063584.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 pre-deployment checkout of the Hubble Space Telescope (HST) on OV-103

Description:

During STS-31 checkout, the Hubble Space Telescope (HST) is held in a pre-deployment position by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS). The view, taken from the crew cabin overhead window W7, shows the starboard solar array (SA) panel (center) and two high gain antennae (HGA) (on either side) stowed along side the Support System Module (SSM) forward shell. The sun highlights HST against the blackness of space.

Subject terms:

DISCOVERY (ORBITER)

HUBBLE SPACE TELESCOPE

REMOTE MANIPULATOR SYSTEM

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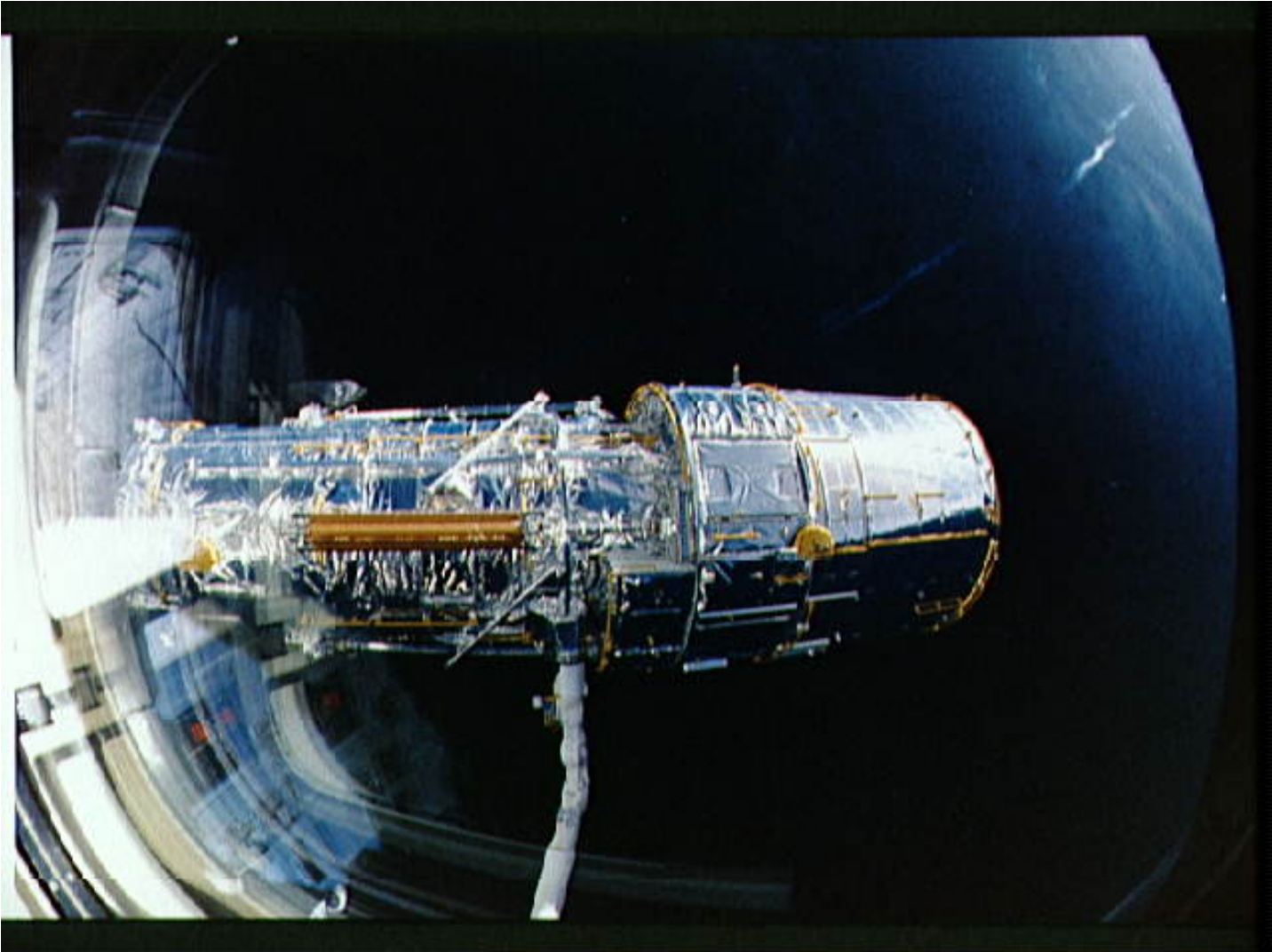
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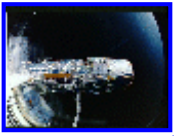
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NASA Photo ID: STS031-10-019

File Name: 10063585.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: Hubble Space Telescope (HST) grappled by OV-103's RMS during STS-31 checkout
Description:

The Hubble Space Telescope (HST), grappled by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS), is held in a pre-deployment position. During STS-31 checkout procedures, the solar array (SA) panels and the high gain antennae (HGA) will be deployed. The starboard SA (center) and the two HGA are stowed along side the Support System Module (SSM) forward shell. The sun highlights HST against the blackness of space.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

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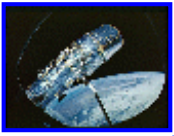
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NASA Photo ID: STS031-10-023

File Name: 10063586.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: Hubble Space Telescope (HST) solar array (SA) panel deployment during STS-31
Description:

During STS-31 pre-deployment procedures the Hubble Space Telescope (HST) is held by the remote manipulator system (RMS) in appendage deploy position above Discovery's, Orbiter Vehicle (OV) 103's, payload bay (PLB). HST solar array (SA) bistem cassette has been released from its stowed position along side the Support System Module (SSM) forward shell. The secondary deployment mechanism (SDM) handle is visible just above the SSM equipment section (on a diagonal line from the RMS grapple position). The high gain antennae (HGA) remain stowed along side the SSM forward shell. The Earth's limb creates the backdrop for the scene.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH SURFACE

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

REMOTE MANIPULATOR SYSTEM

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NASA Photo ID: STS031-10-027

File Name: 10063574.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 crew monitors Hubble Space Telescope (HST) from OV-103's flight deck

Description:

A "fish eye" lens captured this overall view of the aft flight deck of Discovery, Orbiter Vehicle (OV) 103, while the STS-31 crewmembers were monitoring the Hubble Space Telescope (HST) deployment checkout procedures. From front to back are Commander Loren J. Shriver, Mission Specialist (MS) Steven A. Hawley, and MS Bruce McCandless II looking up at overhead windows W7 and W8 and the HST on the remote manipulator system (RMS) outside them. The onorbit station control panels appear in front of the crewmembers and the ongoing scene outside the crew cabin is mirrored in the closed circuit television (CCTV) screens on McCandless' right.

Subject terms:

ASTRONAUTS

CONTROL BOARDS

CREW OBSERVATION STATIONS

CREW PROCEDURES (INFLIGHT)

CREW WORKSTATIONS

CREWS

DISCOVERY (ORBITER)

FLIGHT DECK

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NASA Photo ID: STS031-10-035

File Name: 10063587.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) solar array panel deploy aboard OV-103

Description:

Held in appendage deploy position by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS), the Hubble Space Telescope's (HST's) starboard solar array (SA) bistem cassette is released from its stowed position on the Support System Module (SSM) forward shell. The spreader bar & bistem begin to unfurl the SA wing. View was taken by an STS-31 crewmember through an overhead window & is backdropped against the surface of the Earth.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH SURFACE

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

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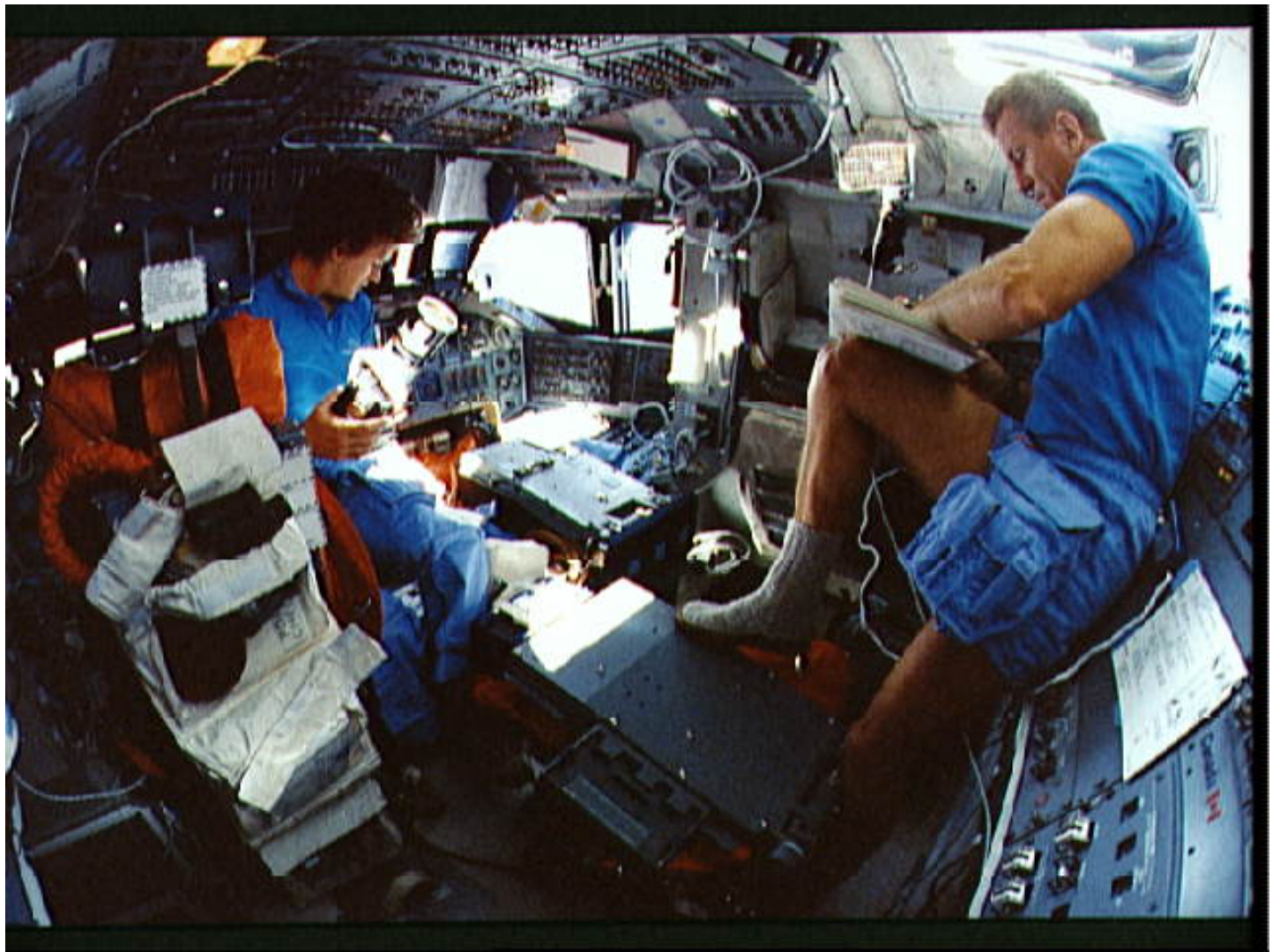
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NASA Photo ID: STS031-101-053

File Name: 10063572.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS Sullivan and Commander Shriver work on the OV-103's flight deck
Description:

This overall view of Discovery's, Orbiter Vehicle (OV) 103's, flight deck shows STS-31 crewmembers at work. It was taken with a "fish eye" lens. Mission Specialist (MS) Kathryn D. Sullivan, holding a camera, is positioned between the commanders and pilots stations above the center console. Commander Loren J. Shriver leans against the aft flight deck onorbit station as he reviews a checklist. His foot is propped on the seat back of the stowed mission specialist seat. Sunlight through forward windows W5 and W6 and overhead window W7 highlights the shadowy scene.

Subject terms:

ASTRONAUTS

CAMERAS

CREW PROCEDURES (INFLIGHT)

CREW WORKSTATIONS

CREWS

DISCOVERY (ORBITER)

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NASA Photo ID: STS031-11-033

File Name: 10063575.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 MS Sullivan poses next to stowed EMU in OV-103's airlock

Description:

STS-31 Mission Specialist (MS) Kathryn D. Sullivan poses for a picture before beginning extravehicular mobility unit (EMU) donning procedures in the airlock of Discovery, Orbiter Vehicle (OV) 103. Sullivan will remove the lower torso restraint and don EMU which is supported on an airlock adapter plate (AAP). When suited, Sullivan will be ready for contingency extravehicular activity (EVA) in the event that problems arise with the Hubble Space Telescope (HST) deployment. Displayed on the front of the EMU are the STS-31 mission insignia and the JSC Weightless Environment Training Facility (WETF) insignia.

Subject terms:

AIR LOCKS

ASTRONAUTS

CREW PROCEDURES (INFLIGHT)

CREWS

DISCOVERY (ORBITER)

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HELMETS

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NASA Photo ID: STS031-12-031

File Name: 10063562.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 Discovery, OV-103, onboard (in-space) crew portrait

Description:

STS-31 crewmembers, wearing mission t-shirts, pose for their onboard crew portrait on the middeck of Discovery, Orbiter Vehicle (OV) 103. Mission Specialist (MS) Bruce McCandless II displays the mission insignia and MS Steven A. Hawley holds a model of the Hubble Space Telescope (HST). Left to right are Pilot Charles F. Bolden (top left), Commander Loren J. Shriver, MS Kathryn D. Sullivan, McCandless, and Hawley. The crew is in front of the port side wall and the orbiter galley which is decorated with a HST art concept and a sign reading "HST is open for business!".

Subject terms:

ASTRONAUTS

CREWS

DISCOVERY (ORBITER)

INSIGNIAS

MIDDECK

ONBOARD ACTIVITIES

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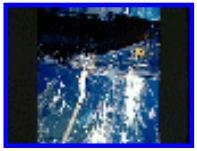
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NASA Photo ID: STS031-151-008 File Name: 10063590.jpg

Film Type: 4x5

Date Taken: 04/29/90

Title: Hubble Space Telescope Deploy, Eastern Cuba, Haiti

Description:

A close up deploy view of the Hubble Space Telescope on the end of the space shuttle remote manipulator system (RMS) with Eastern Cuba, (20.0N, 74.0W) seen on the left side of the telescope and northern Haiti seen on the right side of the telescope. The light colored blue feature in the water north of Haiti is the shallow waters of the Caicos Bank.

Subject terms:

CUBA

EARTH OBSERVATIONS (FROM SPACE)

HAITI

ISLANDS

OCEANS

STS-31

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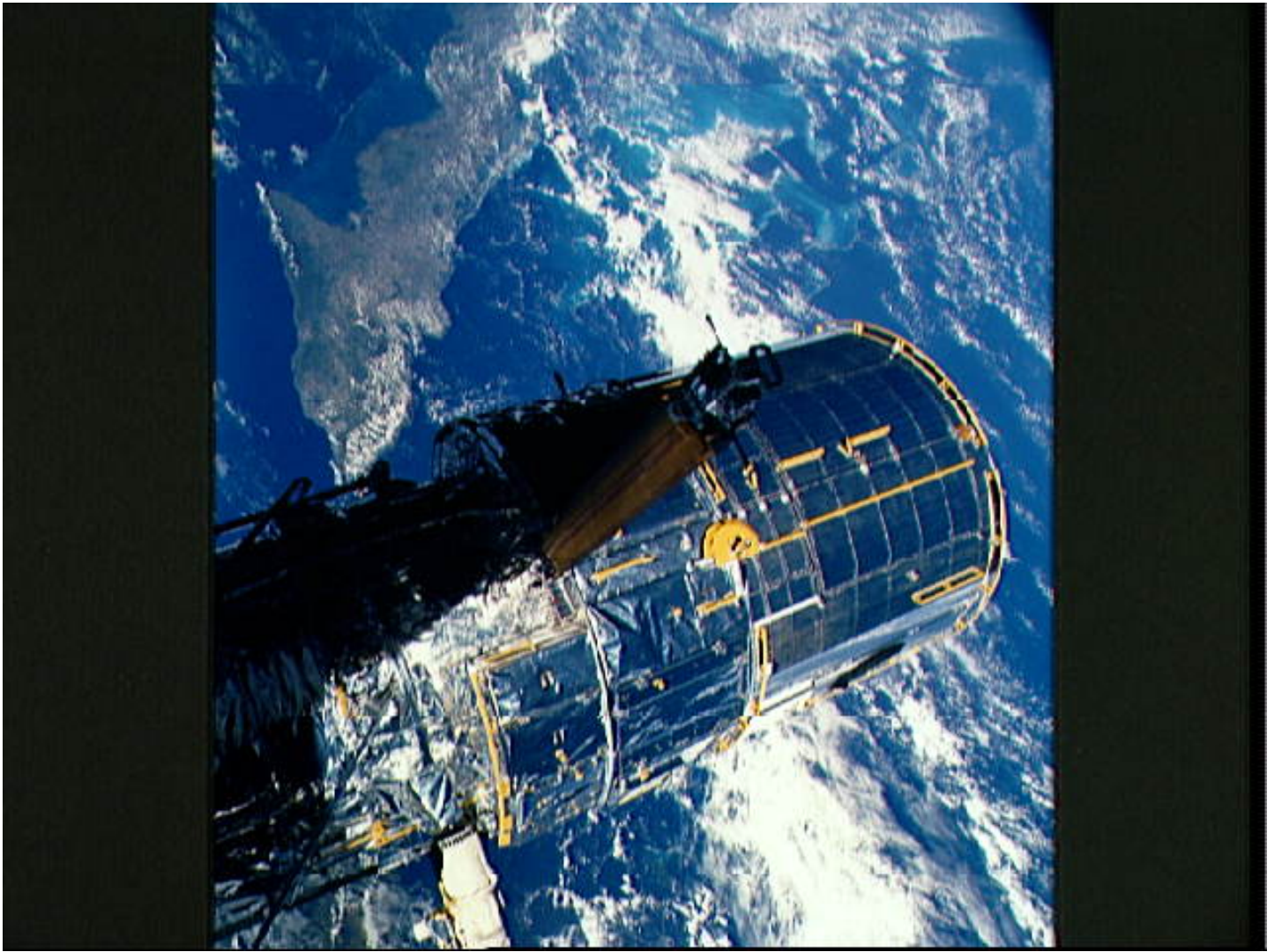
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NASA Photo ID: STS031-151-010 File Name: 10063589.jpg
Film Type: 4x5 Date Taken: 04/29/90
Title: Hubble Space Telescope Deploy, Cuba, Bahamas and Gulf of Mexico
Description:
Hubble Space Telescope Deploy with the entire island of Cuba, Bahamas and Gulf of Mexico in the background (22.0N, 78.0W).

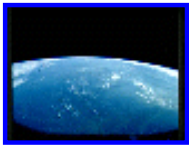
Subject terms:

BAHAMAS
CUBA
EARTH OBSERVATIONS (FROM SPACE)
ISLANDS
OCEANS
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NASA Photo ID: STS031-151-113

File Name: 10063606.jpg

Film Type: 4x5

Date Taken: 04/29/90

Title: Southern Appalachia, USA

Description:

In this oblique view of the Georgia and South Carolina coast, the southern most Appalachians (32.0N, 83.0W) dominate the foreground. Contrails criss cross over Atlanta, a major airline hub. The coastal plain which wraps around the southern Appalachians, is well delineated. Faintly visible under the haze toward Earth's limb are the Great lakes (Lake Michigan near center), the folded belts of the central Appalachians and Long Island, New York.

Subject terms:

APPALACHIAN MOUNTAINS (NORTH AMERICA)

CONTRAILS

EARTH OBSERVATIONS (FROM SPACE)

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NASA Photo ID: STS031-151-164

File Name: 10063605.jpg

Film Type: 4x5

Date Taken: 04/29/90

Title: Namib Desert, Namibia, Africa

Description:

One of the driest regions on Earth, the Namib Desert, Namibia, Africa (23.0N, 15.0E) lies adjacent to the Atlantic coast but the upwelling oceanic water causes a very stable rainless atmosphere. The few local inland rivers do not reach the sea but instead, appear as long indentations where they penetrate the dune fields and end as small dry lakes. The vast dune fields are the result of sands deposited over millions of years by the stream flow.

Subject terms:

AFRICA

DESERTS

EARTH OBSERVATIONS (FROM SPACE)

MOUNTAINS

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NASA Photo ID: STS031-152-000DL File Name: 10063607.jpg

Film Type: 4x5 Date Taken: 04/29/90

Title: Hammersley Range, northern Western Australia

Description:

The oval shaped basin of the sedimentary rocks of the Hammersley Range, northern Western Australia (23.0S, 119.0E) dominates the center of this near nadir view. The Fortescue River is the remarkably straight, fault controlled feature bordering the Hammersley on the north. Sand dunes are the main surface features in the northeast and southwest. Many dry lakebeds can be seen to the east as light grey colored patches along the watercourses.

Subject terms:

DESERTS

EARTH OBSERVATIONS (FROM SPACE)

EXTINCT LAKES

MOUNTAINS

RIVERS

SAND DUNES

STS-31

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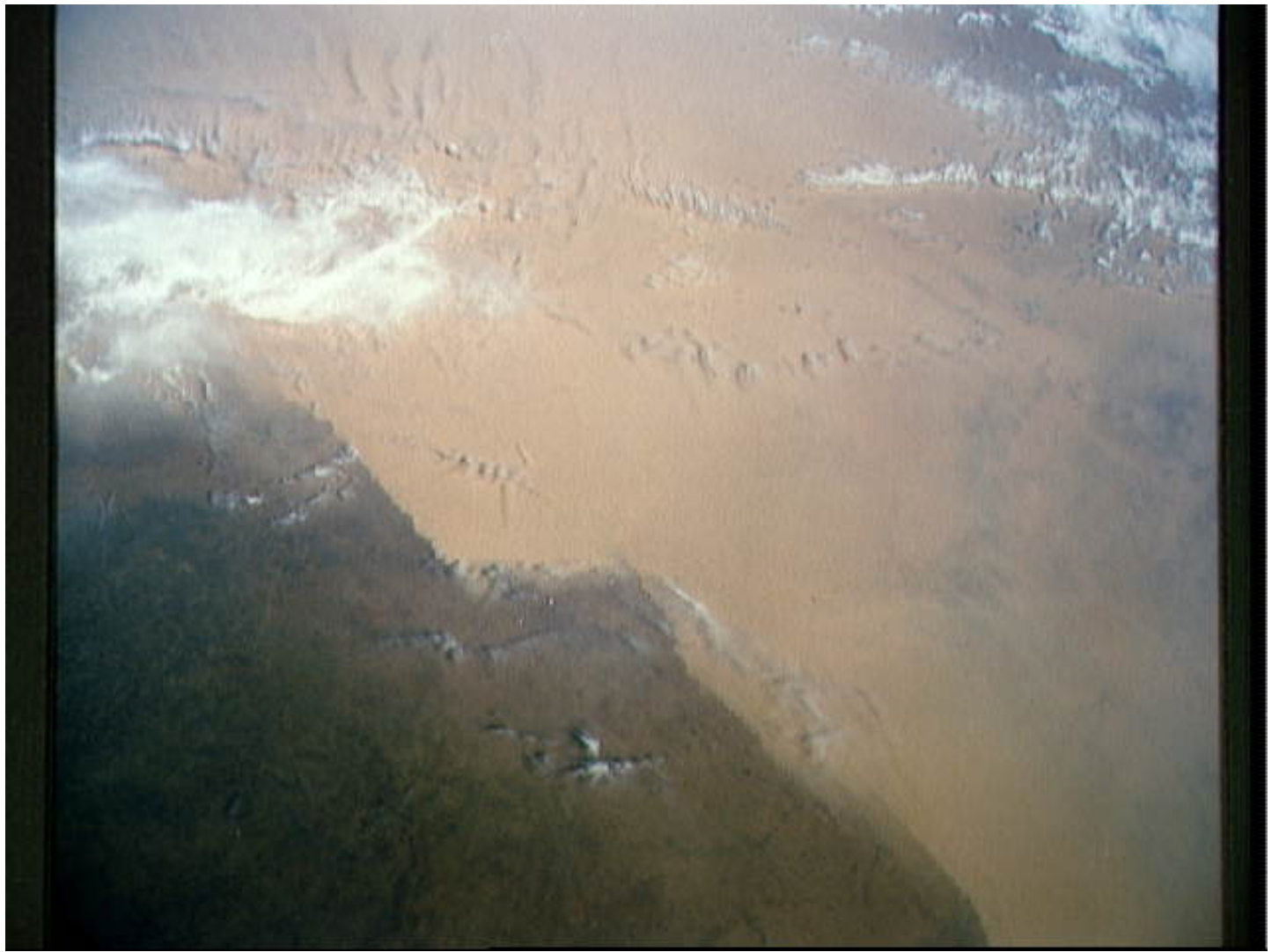
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NASA Photo ID: STS031-152-000FN File Name: 10063608.jpg

Film Type: 4x5

Date Taken: 04/29/90

Title: Sahara Desert Sand Storm, Mali, Africa

Description:

In this view of the southern Sahara Desert in Mali, Africa (16.5N, 3.0W), unusually strong surface winds accompanied by an unstable atmosphere produced a large area of blowing sand over western Africa. Between 26 and 29 April, observers in the area noted a dense cloud of sand appeared from out of central Mali and migrated offshore of the African coast near Guinea. Satellite measurements of the extent of the storm was 270, 000 square miles.

Subject terms:

DUST STORMS

EARTH OBSERVATIONS (FROM SPACE)

MALI

MOUNTAINS

SAHARA DESERT (AFRICA)

STS-31

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NASA Photo ID: STS031-152-000HS File Name: 10063600.jpg

Film Type: 4x5

Date Taken: 04/29/90

Title: Deforestation, Madagascar

Description:

This high oblique view shows the majority of the island of Madagascar (19.0S, 47.5E). This Texas sized island is now largely deforested and is suffering from severe soil erosion as well as a declining biological species diversity and productivity. At the turn of the century, the island was almost totally forested but now, forests cover only about 10 percent of the surface. Evidence of soil erosion can be seen in the offshore sediment plumes.

Subject terms:

DEFORESTATION

EARTH OBSERVATIONS (FROM SPACE)

ISLANDS

MADAGASCAR

MOUNTAINS

STS-31

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NASA Photo ID: STS031-29-029

File Name: 10063569.jpg

Film Type: 35mm

Date Taken: 04/29/90

Title: STS-31 closeup of crystals developing in Protein Crystal Growth III module
Description:

This closeup of crystals developing inside the Protein Crystal Growth III experiment apparatus module was taken aboard the Earth-orbiting Discovery, Orbiter Vehicle (OV) 103, during STS-31.

Subject terms:

CRYSTAL GROWTH

CRYSTALS

DISCOVERY (ORBITER)

PROTEINS

SPACEBORNE EXPERIMENTS

STS-31

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NASA Photo ID: STS031-71-095

File Name: 10063581.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 pre-deploy check of the Hubble Space Telescope (HST) in OV-103's PLB
Description:

The Hubble Space Telescope (HST) is suspended above Discovery's, Orbiter Vehicle (OV) 103's, payload bay (PLB) some 332 nautical miles above Earth. The Canadian-built remote manipulator system (RMS) arm (out of frame), controlled from in-cabin by the STS-31 astronaut crewmembers, held the huge telescope in low hover position during pre-deployment procedures, which included extension of the solar array (SA) panels and high gain antennae (HGA). In the foreground is the closed HST aperture door and the Support System Module (SSM) forward shell with stowed SA (left) and HGA (center) visible. The orbital maneuvering system (OMS) pods appear behind the HST with the entire scene backdropped against the cloud-covered surface of the Earth.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH SURFACE

HUBBLE SPACE TELESCOPE

PAYLOAD BAY

SOLAR ARRAYS

STS-31

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NASA Photo ID: STS031-72-017
Film Type: 70mm
Title: Lake Chad, Chad, Africa
Description:

File Name: 10063599.jpg
Date Taken: 04/29/90

Africa's Lake Chad where the borders of Chad, Niger, Nigeria and Cameroon merge (13.0N, 14.0E) has been undergoing change for the past 25 to 30 years when it was first noticed that the lake is drying up. Since then, astronauts have been photographing it on a regular basis to record the diminishing lake bed. This lake was once the approximate size of Lake Erie but is now only about half that size and is still receding.

Subject terms:

DESERTS
EARTH OBSERVATIONS (FROM SPACE)
EXTINCT LAKES
LAKES
SAHARA DESERT (AFRICA)
STS-31

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NASA Photo ID: STS031-76-016

File Name: 10063588.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) solar array (SA) deploy aboard OV-103

Description:

During STS-31, the Hubble Space Telescope (HST) is held in appendage deploy position by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS) above the payload bay (PLB) and crew compartment cabin. While in this position the solar array (SA) wing bistem cassette (HST center) is deployed from its stowed location along side the Support System Module (SSM) forward shell. A high gain antenna (HGA) remains stowed along the SSM. The Earth's surface and the Earth limb creates a dramatic backdrop.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH SURFACE

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

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NASA Photo ID: STS031-76-023

File Name: 10063591.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) pre-deployment procedures aboard OV-103

Description:

During STS-31, the Hubble Space Telescope (HST) grappled by the remote manipulator system (RMS) end effector is held in appendage deploy position above Discovery, Orbiter Vehicle (OV) 103. The solar array (SA) bistem cassette has been released from its latch fittings. The bistem spreader bars begin to unfurl the SA wing. The secondary deployment mechanism (SDM) handle is visible at the SA end. Stowed against either side of the HST System Support Module (SSM) forward shell are the high-gain antennae (HGA). Puerto Rico and the Dominican Republic are recognizable at the left of the frame.

Subject terms:

DISCOVERY (ORBITER)

DOMINICAN REPUBLIC

EARTH OBSERVATIONS (FROM SPACE)

EARTH SURFACE

END EFFECTORS

HUBBLE SPACE TELESCOPE

PUERTO RICO

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

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NASA Photo ID: STS031-76-026

File Name: 10063595.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) (SA & HGA deployed) is grappled by RMS
Description:

With the starboard solar array (SA) wing and the two high gain antennae (HGA) fully extended, the Hubble Space Telescope (HST) is grappled by Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS) during STS-31 predeployment checkout operations. SA bistem cassette and secondary deployment mechanism (SDM) detail is clearly visible. The scene is backdropped against the Earth's limb and cloud-covered surface.

Subject terms:

ANTENNAS

DISCOVERY (ORBITER)

EARTH LIMB

END EFFECTORS

HUBBLE SPACE TELESCOPE

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

SPACECRAFT ANTENNAS

STS-31

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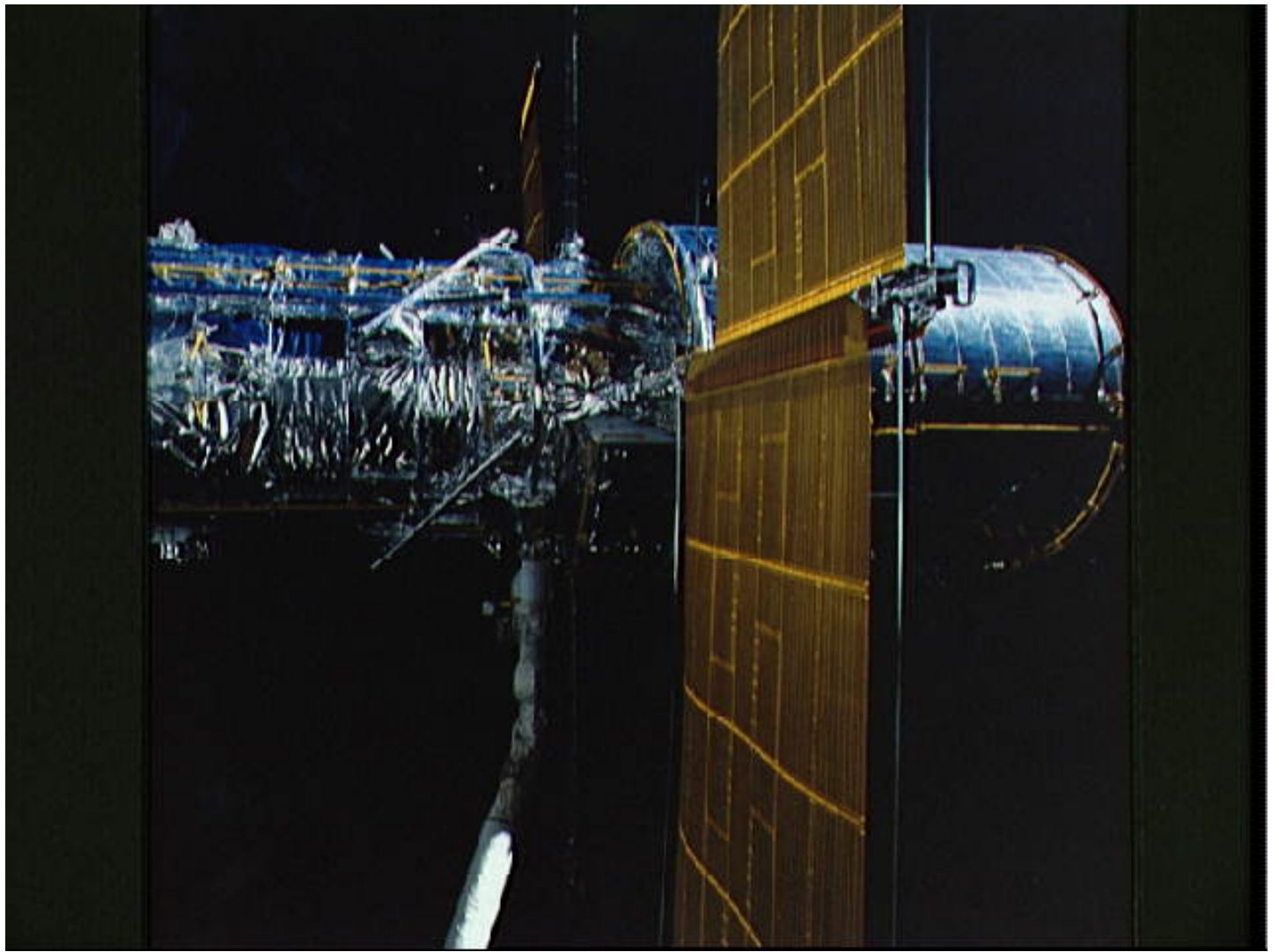
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NASA Photo ID: STS031-76-034

File Name: 10063596.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) is grappled by OV-103 RMS

Description:

During STS-31, the Hubble Space Telescope (HST), grappled by the remote manipulator system (RMS) end effector, is held against the blackness of space. The two solar array (SA) wings (large gold panels) are fully extended with bistem cassette and secondary deployment mechanism (SDM) handle clearly visible. The two deployed high gain antennae (HGA) masts are parallel to the SA panels. RMS end effector is positioned on the starboard fixture during the predeployment checkout operations above Discovery's, Orbiter Vehicle (OV) 103's, payload bay (PLB).

Subject terms:

DISCOVERY (ORBITER)

END EFFECTORS

HUBBLE SPACE TELESCOPE

REMOTE MANIPULATOR SYSTEM

SOLAR ARRAYS

STS-31

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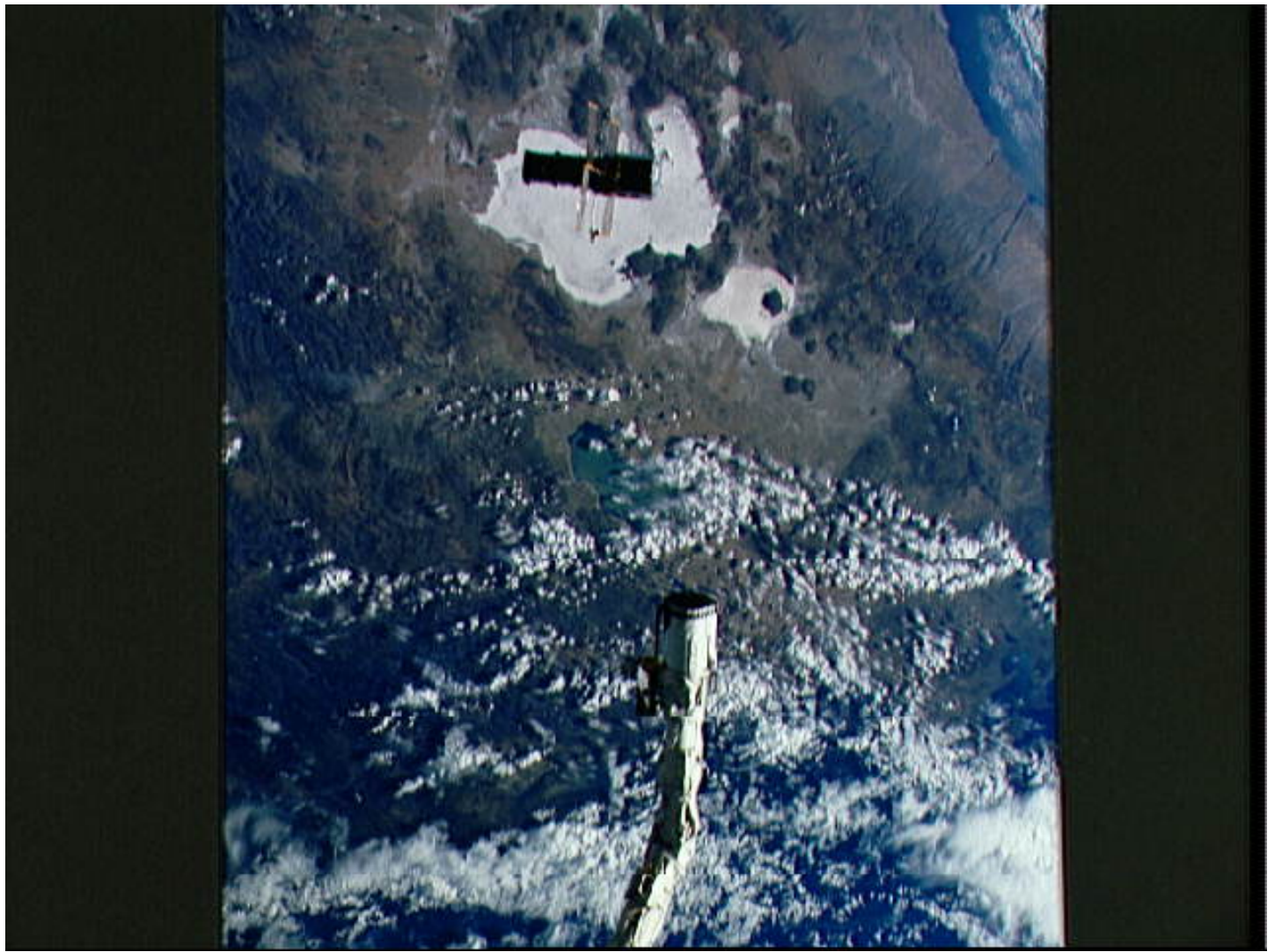
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NASA Photo ID: STS031-76-039

File Name: 10063597.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Hubble Space Telescope (HST) drifts away from OV-103's RMS

Description:

Hubble Space Telescope (HST), with its solar array (SA) wings and high gain antennae (HGA) fully extended, is released from Discovery's, Orbiter Vehicle (OV) 103's, remote manipulator system (RMS) end effector and is set free into Earth orbit by the STS-31 crew. HST drifts away from the end effector over the Andes Mountains. Parts of Bolivia, Peru, Chile, and Argentina are visible. The view covers a huge area of the western half of South America stretching from 14 degrees south latitude to 23 degrees, about 1,000 kilometers.

Subject terms:

ANDES MOUNTAINS (SOUTH AMERICA)

ARGENTINA

BOLIVIA

CHILE

DISCOVERY (ORBITER)

EARTH OBSERVATIONS (FROM SPACE)

END EFFECTORS

HUBBLE SPACE TELESCOPE

PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM

PERU

REMOTE MANIPULATOR SYSTEM

SOUTH AMERICA

STS-31

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NASA Photo ID: STS031-76-040 File Name: 10063598.jpg
Film Type: 70mm Date Taken: 04/29/90
Title: STS-31 Hubble Space Telescope (HST) is released by RMS over Andes Mountains
Description:

The Hubble Space Telescope (HST), with solar array (SA) wings and high gain antennae (HGA) masts fully extended, is released by the remote manipulator system (RMS) end effector. The STS-31 crew aboard Discovery, Orbiter Vehicle (OV) 103, set the HST into Earth orbit high above the Andes Mountains. Parts of Bolivia, Peru, Chile, and Argentina are visible. This picture covers a huge area of the western half of South America stretching from 14 degrees south latitude to 23 degrees, about 1,000 kilometers.

Subject terms:
ANDES MOUNTAINS (SOUTH AMERICA)
ARGENTINA
BOLIVIA
CHILE
DISCOVERY (ORBITER)
EARTH OBSERVATIONS (FROM SPACE)
END EFFECTORS
HUBBLE SPACE TELESCOPE
PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM
PERU
REMOTE MANIPULATOR SYSTEM
SOUTH AMERICA
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NASA Photo ID: STS031-76-074 File Name: 10063604.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Desert Landscape, Mauritania, Africa

Description:

The hyperarid western extremity of the Sahara Desert of Mauritania (19.0N, 15.0W). The foreground is dominated by a series of dramatic, elongated linear dunes and the richat depression. Desert winds regularly blow desert sand towards the coast parallel with the dunes and much of it is actually blown out to sea. Dust storms often move hundreds of miles out into the Atlantic Ocean, sometimes even reaching South America and the Caribbean.

Subject terms:

DESERTS

DUST STORMS

EARTH OBSERVATIONS (FROM SPACE)

MAURITANIA

SAHARA DESERT (AFRICA)

SAND DUNES

STS-31

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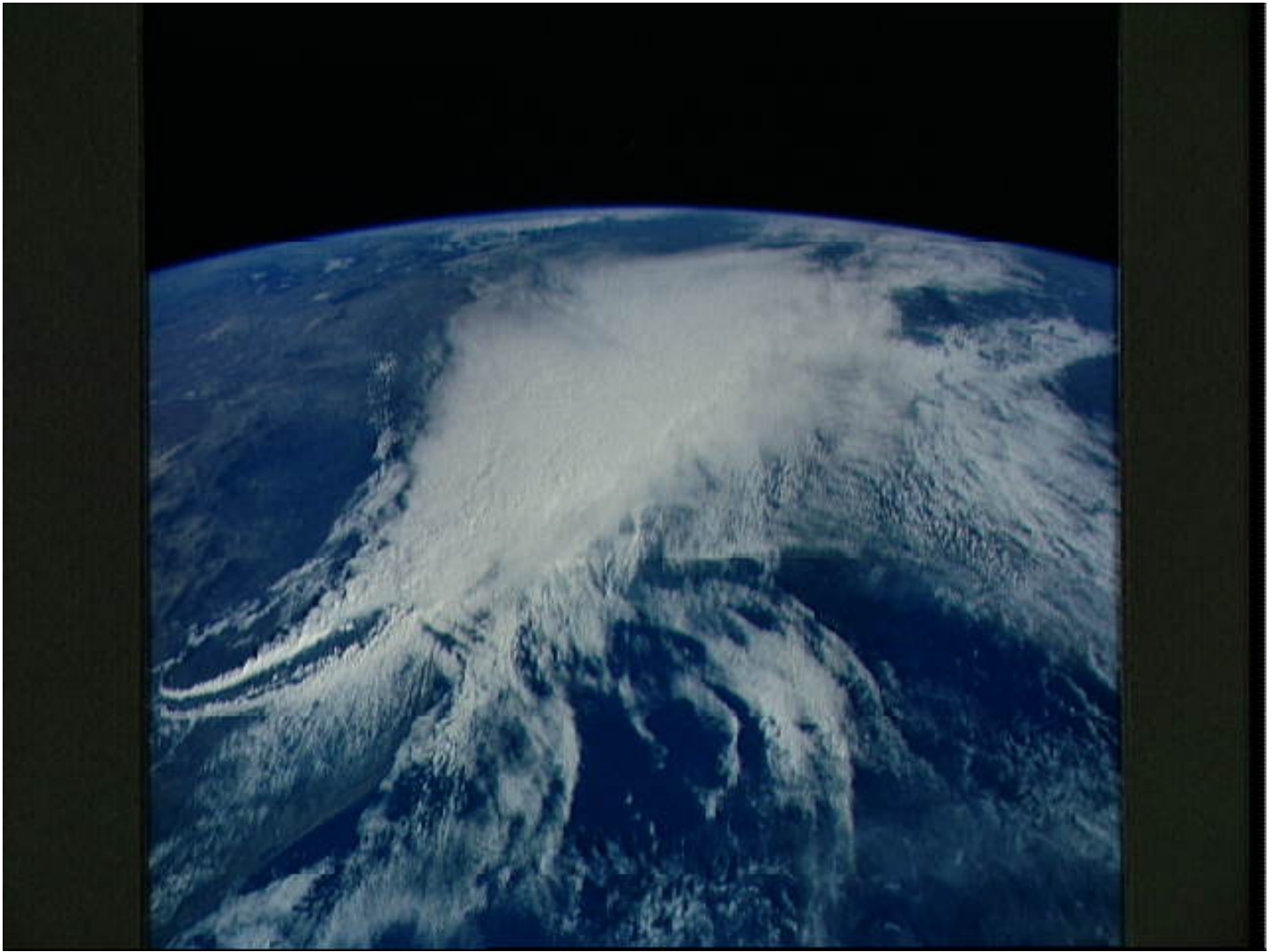
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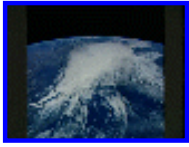
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NASA Photo ID: STS031-77-078

File Name: 10063603.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: Thunderstorm, Texas Gulf Coast, USA

Description:

This thunderstorm along the Texas Gulf Coast (29.0N, 95.0W), USA is seen as the trailing edge of a large cloud mass formed along the leading edge of a spring frontal system stretching northwest to southeast across the Texas Gulf Coast. This system brought extensive severe weather and flooding to parts of Texas and surrounding states. Muddy water discharging from coastal streams can be seen in the shallow Gulf of Mexico as far south as Lavaca Bay.

Subject terms:

EARTH OBSERVATIONS (FROM SPACE)

GULF OF MEXICO

STS-31

TEXAS

THUNDERSTORMS

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NASA Photo ID: STS031-77-087 File Name: 10063601.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Thunderstorm, Florida, Bahamas and Cuba

Description:

This decaying thunderstorm, seen as the trailing edge of a cloud mass over the Gulf of Mexico and approaching Florida, Bahamas and Cuba (24.0N, 81.0W) has lost much of its force but still dropped a considerable amount of rainfall over most of Cuba and Florida. The storm, remnants of the same front described in scene STS031-77-078, is seen as a thin front stretching northwest to southeast over the Gulf of Mexico just west of Florida.

Subject terms:

BAHAMAS

CLOUDS

CUBA

EARTH OBSERVATIONS (FROM SPACE)

FLORIDA

OCEANS

STS-31

THUNDERSTORMS

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NASA Photo ID: STS031-78-000C File Name: 10063602.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Sunlint and Florida Peninsula, USA

Description:

The Gulf coast and the Florida peninsula (30.0N, 81.5W) seen in sunlint. The lakes of central Florida are highlighted in reflected light in this scene. The view extends up along the Georgia and South Carolina Coast and clouds cast shadows in the sunlint. The sunlint off the east coast also highlights shears in the Atlantic related to the Gulf Stream. To the south, Andros Island and the Grand Bahama Bank are visible.

Subject terms:

ATLANTIC OCEAN

BAHAMAS

EARTH OBSERVATIONS (FROM SPACE)

FLORIDA

GULF OF MEXICO

STS-31

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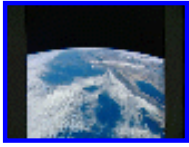
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NASA Photo ID: STS031-78-017

File Name: 10063616.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: West Coast, United States and Mexico

Description:

This view shows the west coast of the United States and Mexico (32.5N, 118.0W) and gives an indication of the range of view from orbital altitude. The visual range of this particular scene is from Skammon's Lagoon on Baja to the northern tip of California's Central Valley and Sierra Nevada, a range of over 15 degrees of latitude. Coastal fog drapes over southern California and northern Baja California. White Sands, New Mexico is at far right center.

Subject terms:

CALIFORNIA

DESERTS

EARTH OBSERVATIONS (FROM SPACE)

MEXICO

MOUNTAINS

STS-31

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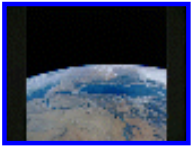
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NASA Photo ID: STS031-79-015 File Name: 10063614.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Eastern Egypt, Red Sea and Saudi Arabia

Description:

Eastern Egypt, the Red Sea and Saudi Arabia can all be seen in this single view of the Near East (26.5N, 36.5E). Not since The Gemini XI photo taken in 1966, have NASA astronauts been able to capture such a scope of the Earth's surface as this mission provided from its 330 nautical mile orbit. Easily seen from this vantage point is eastern Egypt, the Nile River, Lake Nassar, the Red Sea and almost half of Saudi Arabia.

Subject terms:

DESERTS

EARTH OBSERVATIONS (FROM SPACE)

EGYPT

LAKES

MOUNTAINS

OCEANS

RIVERS

SAUDI ARABIA

STS-31

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NASA Photo ID: STS031-79-063

File Name: 10063617.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: Indian Ocean, Maldive Islands, India, and Sri Lanka

Description:

This scene shows a fantastic view of the Indian Ocean with oblique views of the southern portion of India, Palk Strait and Sri Lanka (1.5N, 77.5E). The bottom portion of the photo shows the complete chain of the Maldive Islands. This is a rare detailed view of the atolls that form the Maldives. The dusty atmosphere over India is clearly visible as it extends towards the Bay of Bengal but the atmosphere over the Maldives appears to be clear at this time.

Subject terms:

ATOLLS

EARTH OBSERVATIONS (FROM SPACE)

INDIA

INDIAN OCEAN

ISLANDS

OCEANS

SRI LANKA

STS-31

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NASA Photo ID: STS031-80-088

File Name: 10063611.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: Island of Luzon, Philippines

Description:

In this north to south view of the Island of Luzon, Philippines (13.0N, 120.0E), the prominent Cordillera Central mountain range where gold, copper and silver are mined. The several large rivers that drain this region normally carry a heavy silt load to the sea but the absence of sediment plumes in this view is evidence of hot dry weather and lack of recent rains. Manila, the capital city is just visible at the south end of the island.

Subject terms:

EARTH OBSERVATIONS (FROM SPACE)

ISLANDS

OCEANS

PACIFIC ISLANDS

PACIFIC OCEAN

PHILLIPINES

STS-31

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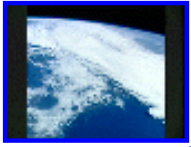
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NASA Photo ID: STS031-81-000AT File Name: 10063612.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Thunderstorm, Texas Gulf Coast, USA

Description:

This thunderstorm along the Texas Gulf Coast (29.0N, 95.0W), USA is seen as the trailing edge of a large cloud mass formed along the leading edge of a spring frontal system stretching northwest to southeast across the Texas Gulf Coast. This system brought extensive severe weather and flooding to parts of Texas and surrounding states. Muddy water discharging from coastal streams can be seen in the shallow Gulf of Mexico as far south as Lavaca Bay.

Subject terms:

EARTH OBSERVATIONS (FROM SPACE)

GULF OF MEXICO

STS-31

TEXAS

THUNDERSTORMS

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NASA Photo ID: STS031-83-090

File Name: 10063613.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: STS-31 Earth observation of the Andes Mountains

Description:

STS-31 Earth observation taken aboard Discovery, Orbiter Vehicle (OV) 103, during late afternoon shows the Andes Mountains and features sun glare, heavy cloud illumination, and a sunglint against the Pacific Ocean.

Subject terms:

ANDES MOUNTAINS (SOUTH AMERICA)

CLOUDS

DISCOVERY (ORBITER)

EARTH LIMB

EARTH OBSERVATIONS (FROM SPACE)

PACIFIC OCEAN

STS-31

SUN

SUNLIGHT

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NASA Photo ID: STS031-86-010

File Name: 10063609.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: Egypt and Sudan, Africa

Description:

From their orbital altitude of 332 nautical miles, the Space Shuttle DISCOVERY's crew could easily recognize land features more than a thousand kilometers distant from its ground track. In this view of Egypt and northern Sudan (21.0N, 30.0E), ground features such as the Nile River, Lake Nassar and the Nile Delta as well as the coast of the Mediterranean Sea can be easily seen near the Earth's limb.

Subject terms:

EARTH OBSERVATIONS (FROM SPACE)

EGYPT

LAKES

RIVERS

STS-31

SUDAN

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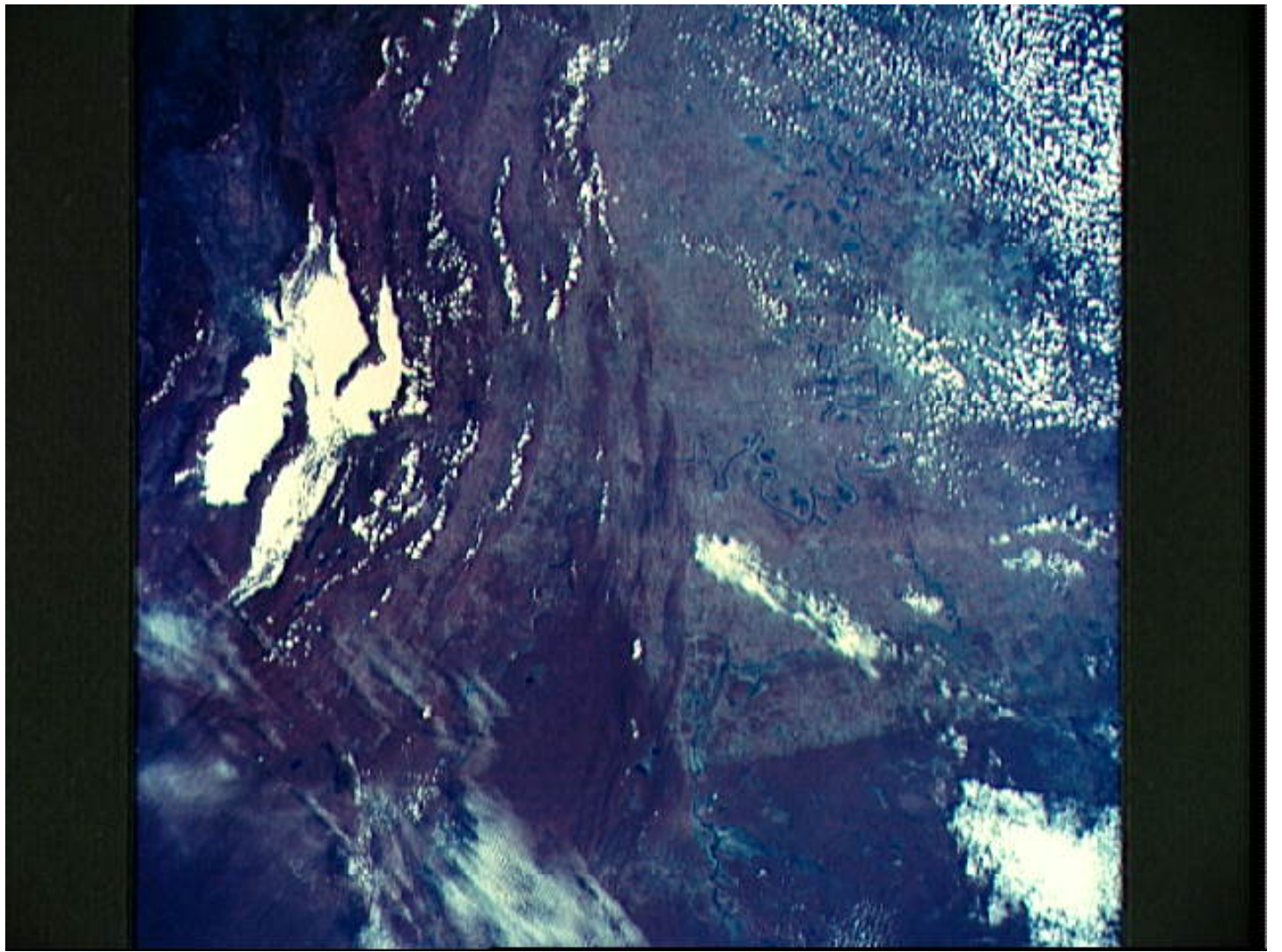
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NASA Photo ID: STS031-91-080

File Name: 10063610.jpg

Film Type: 70mm

Date Taken: 04/29/90

Title: Chiapas Forest, Mexico and Guatemala border

Description:

This color infrared view of the Chiapas Forest, Mexico and Guatemala border (17.0N, 92.0W) illustrates the usefulness of this type of film in determining vegetated vs non vegetated areas. As can be seen, most of this part of Guatemala remains in closed canopy woodland (dark red), while most of the Mexican land to the north has been cleared for pasture and farmland (pink). The pale green areas north of the river are bare soil or fallow fields.

Subject terms:

AGRICULTURE

BORDERS

COLOR INFRARED PHOTOGRAPHY

DEFORESTATION

EARTH OBSERVATIONS (FROM SPACE)

FORESTS

GUATEMALA

MEXICO

RAIN FORESTS

STS-31

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Houston, TX 77058

Fax: (713) 483-2000





NASA Photo ID: STS031-92-045 File Name: 10063615.jpg

Film Type: 70mm Date Taken: 04/29/90

Title: Agriculture, Rio Sao Francisco, Brazil

Description:

This infrared scene of agriculture and ranching enterprises along the middle portion of the Rio Sao Francisco basin of Brazil (13.0S, 43.5 W) shows the usefulness of infrared film in determining types of vegetation. This region of Brazil has been under study for agriculture and ranching enterprises for several years. However, unpredictable rainfall and frequent severe droughts have limited the success of these enterprises.

Subject terms:

AGRICULTURE

BRAZIL

COLOR INFRARED PHOTOGRAPHY

DEFORESTATION

EARTH OBSERVATIONS (FROM SPACE)

LAND MANAGEMENT

RIVERS

STS-31

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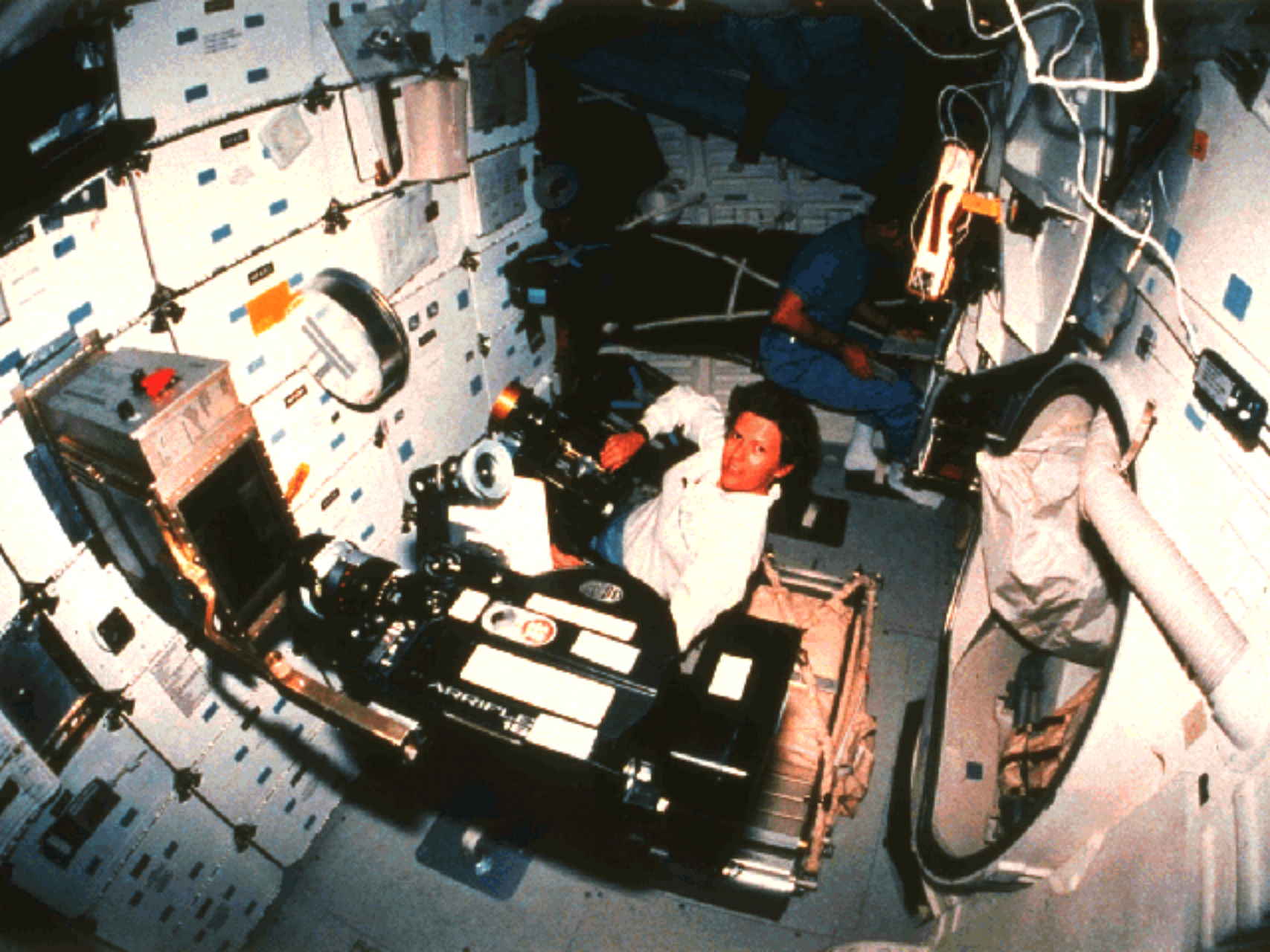
External Affairs Branch

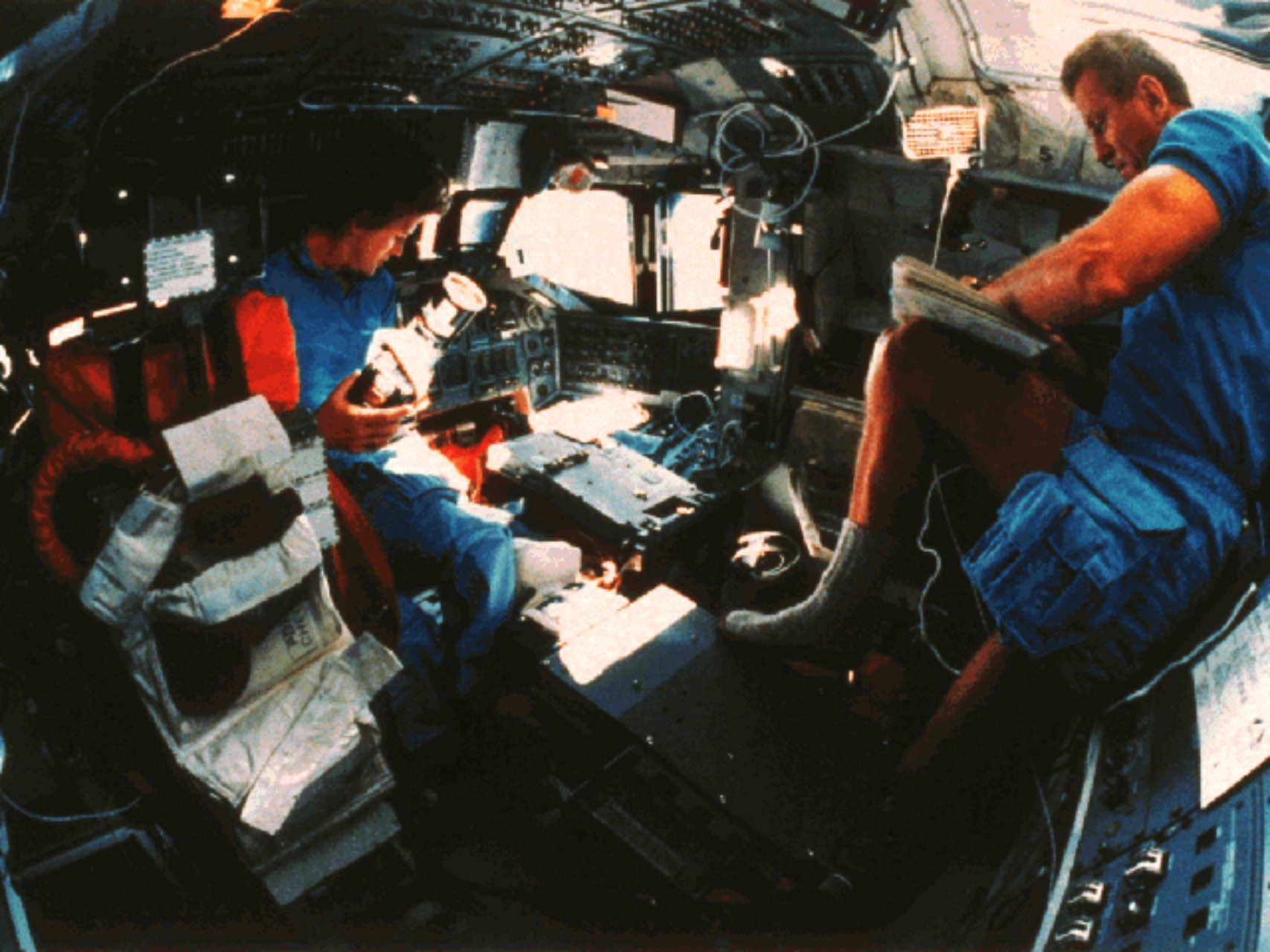
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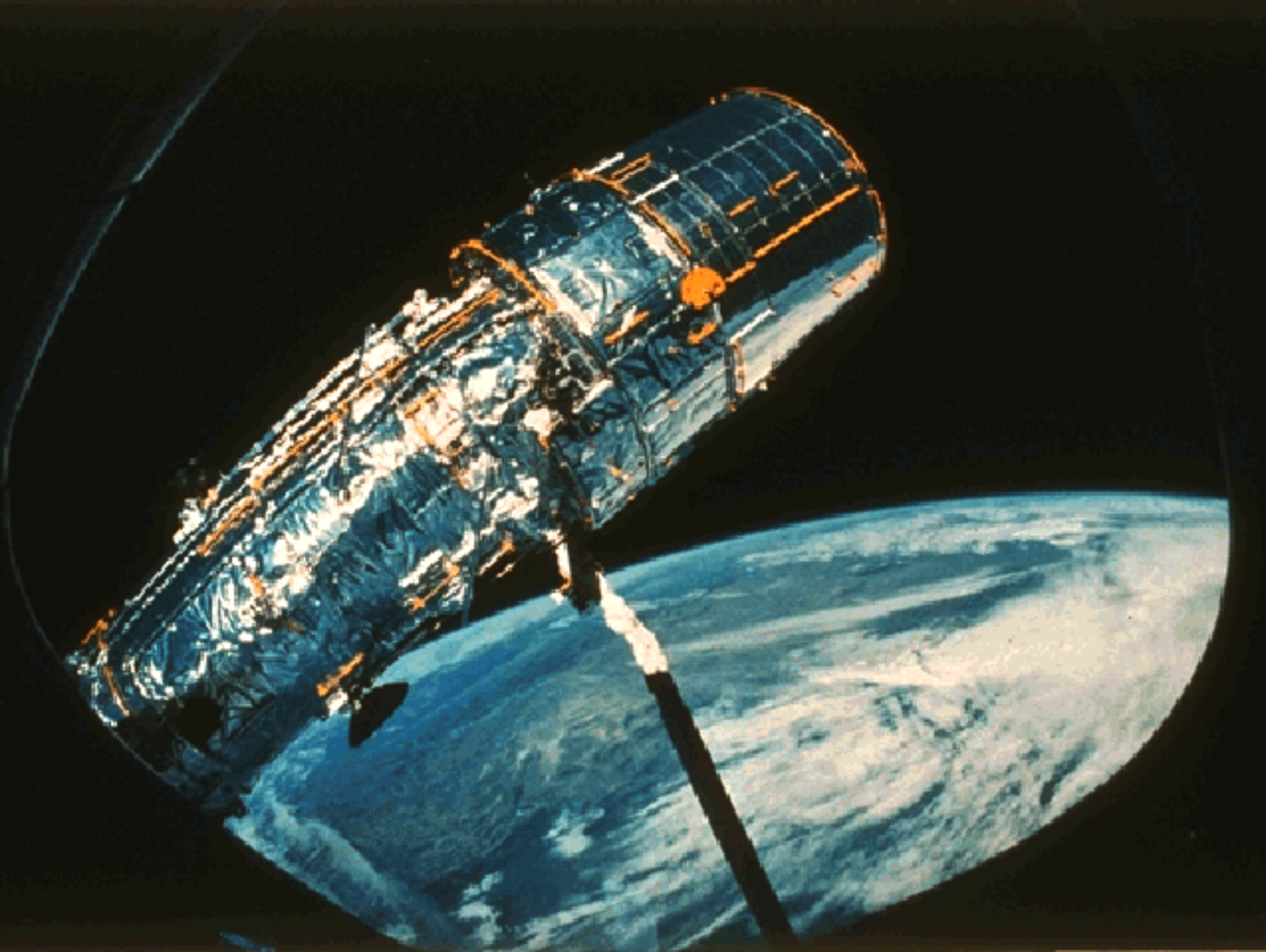
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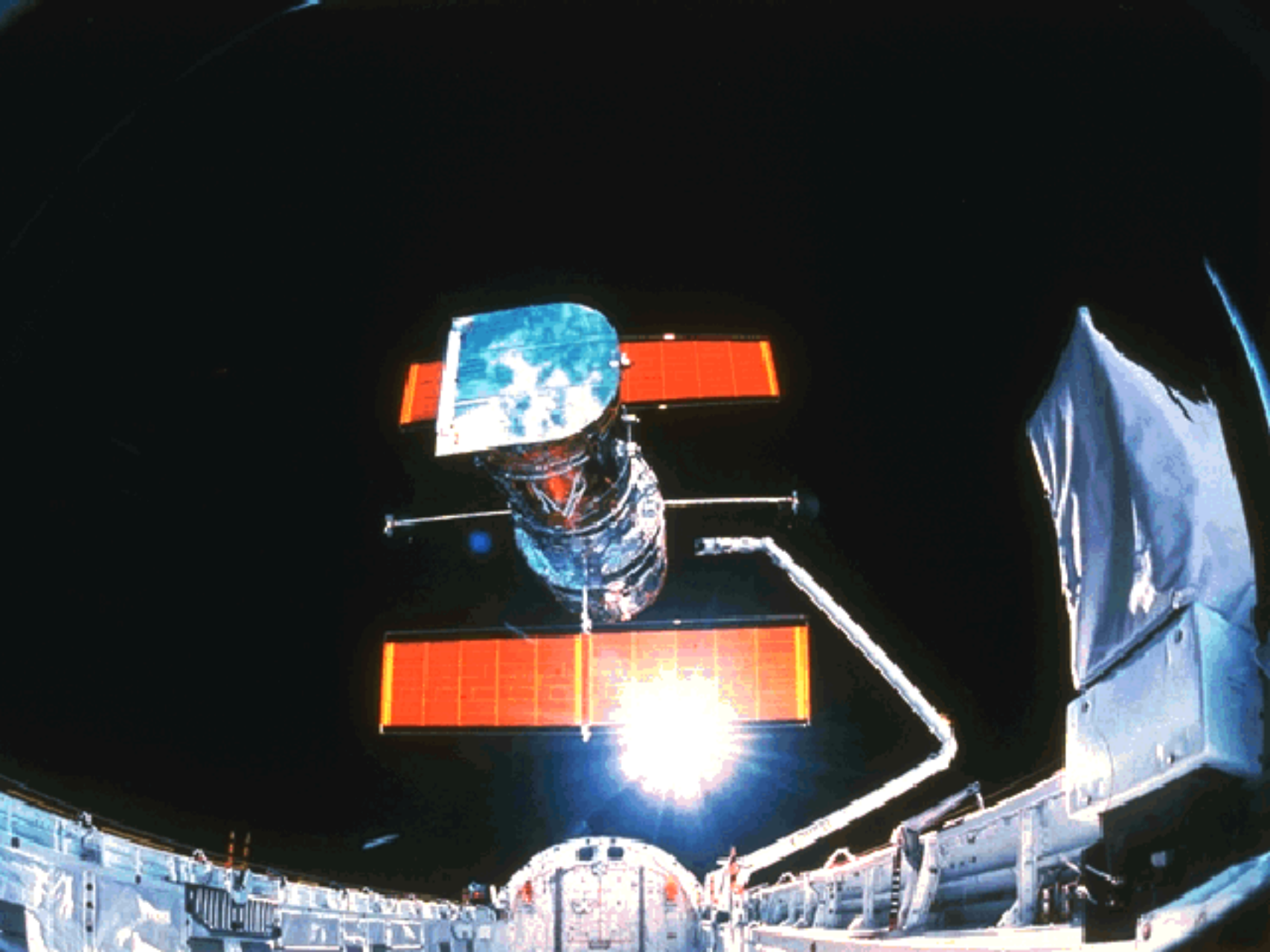


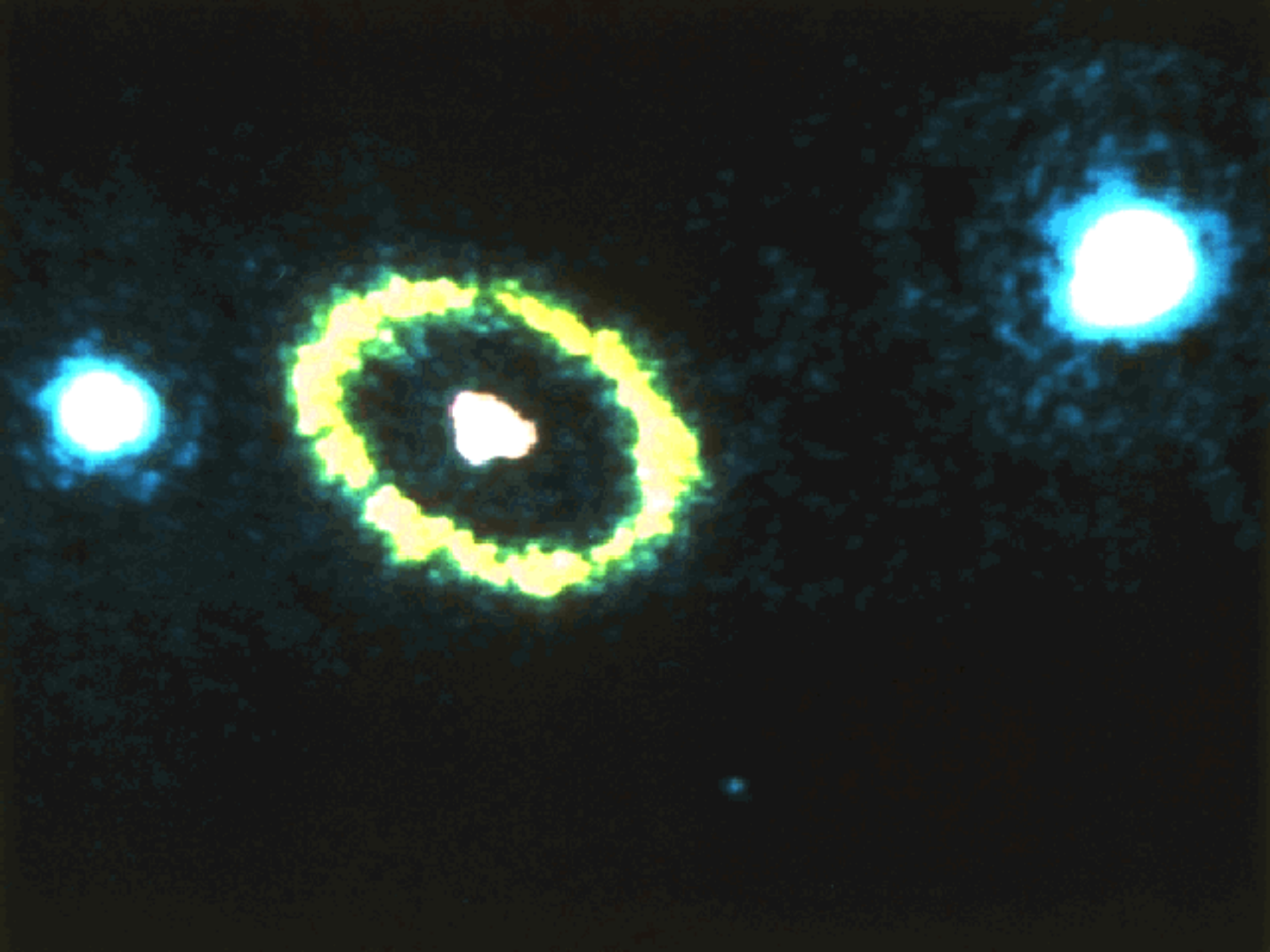
Landsat satellite in space.













SHRIVER + BOLDEN



HAWLEY + M^cCANDLESS + SULLIVAN