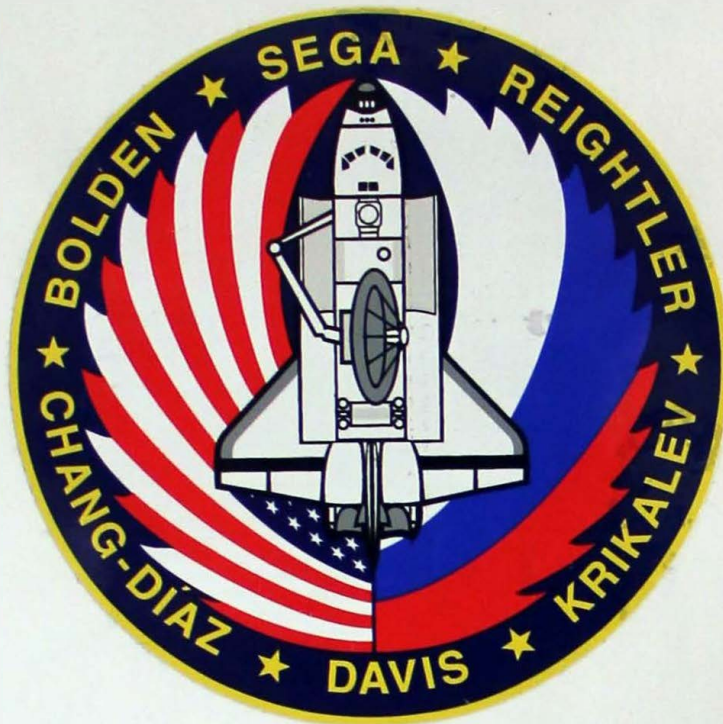


STS-60

Earth Observations

Debrief



March 7, 1994

STS-60 EARTH OBSERVATIONS

CREW DEBRIEF

March 7, 1994

STS-60 Earth Observations Crew Debrief

Crew Members

Charles Bolden — Commander

Kenneth Reightler — Pilot

Franklin Chang-Diaz — Mission Specialist

Jan Davis — Mission Specialist

Ronald Sega — Mission Specialist

Sergei Krikalev — Mission Specialist

Flight Science Branch

Solar System Exploration Division
Space and Life Sciences Directorate
Lyndon B. Johnson Space Center

March 7, 1994

STS-60 EARTH OBSERVATIONS DEBRIEFING
1-3 p.m., March 7, 1994
AGENDA

Introduction

Robert L. Gibson, Chief, Astronaut Office

Mission Planning and Operations Michael Helfert, SN5

**Tests, Comparisons, and Recommendations Concerning Russian
and NASA Earth Observations Films**
Richard Slater, JL2

Russian Earth Observations on Space Station Mir
**Lev Desinov, Russian
Academy of Sciences**

Global Vegetation Fires & Forest Phenomena
**Johann G. Goldammer,
University of Freiburg**

**STS-60 - Russian & American IR Film Pairs Illustrating Global
Phenomena And Documentation Opportunities**
SN5 Staff & Visitors

BREAK, and The Opportunity To Leave.

Global Ecological Observations Kamlesh Lulla, SN5

Tropical Whitings Cynthia Evans, SN5

Global Oceanographic Observations Susan Runco, SN5

Global Meteorology During STS-60 Susan Runco, SN5

Surficial Geology David Amsbury/SN5

Landforms, Duststorms, and Paleoclimatology
Justin Wilkinson, SN5

Volcanism and Tectonics Cynthia Evans, SN5

Crew Comments Crew

Where To From Here? Discussion

**Crew Incentive Program (CIP) will follow through the courtesy of
Capt. Goldammer, FGNR, at the rear of Mike Helfert's pickup truck.**

PREFACE

We consider Earth observations during your flight to be a valuable scientific activity. For the first time in the Shuttle program, there is a true international partnership for Earth observations. The photographs you take will continue our efforts to monitor changes around the world -- a process that both Russians and Americans have been engaged in for over 30 years. In that sense, your mission will add to the global data bases and facilitate the fine-tuning of models of Earth processes. Increasing numbers of scientists are using the NASA Space Shuttle Earth observations photography data base; many are downloading the Earth-viewing images acquired by Shuttle astronauts. The photographs from your flight will be added to this data base and enhance its value to the scientific community. Therefore, we encourage you to use this preflight manual as a tool for acquiring useful photographs.

The purpose of this Earth observations preflight training manual is twofold: to assist you in becoming familiar with the primary Earth-monitoring sites which have been selected jointly by Russian and NASA Earth scientists, and to serve as a guide to the types of landforms, vegetation patterns, and dynamic features we hope you will photograph anywhere you see them. For each selected site, this document presents a brief description, accompanying photographs and maps, and comments on how to observe and photograph the site. We hope this information can be extrapolated to other interesting phenomena observed but not specifically detailed in the manual.

Sources for some materials used in this document have been omitted in the interest of brevity. Specific sources may be obtained from the authors. This document is for internal NASA use.

Michael R. Helfert
NASA/Mission Lead Scientist

Cynthia A. Evans
LESC/Mission Lead Scientist

**STS-60 Debrief slides
March 7, 1994**

Introduction

Helfert

Mir photos
Earth photographs from Mir
Kamchatka
Aral Sea
St. Petersburg
Amazon in sunglint
Satellite orbits
Parameters of STS-60 mission, and Mir ground track during STS-60
Coverage of Space Shuttle Earth photography

STS061-98-05
STS061-97-0M

Meteosat image
STS060-101-38 Imperial valley

STS060-94-07
STS060-31-028 Crew photo

Vegetation Fires and Forest Phenomena Johann G. Goldammer
Fire Ecology Research Group, Freiburg, Germany

Introduction: T:Global Fire Map; T: Global Fire Coverage by Space Shuttle

SS Photography (#)	Object Description	Ground Photographs	Video/Transparency
82-095	India Burns Calcutta Region	8-India Fire Maharashtra State	
103-15 097-049	Somalia Fire Chad Fire	26-Mali Fire, Low Fuel Load 27-Sudan Fuels 29-Ivory Coast High-Intensity Burn 31-South Africa High-Intensity Burn	

19-11	Lake Chad Fire	32,33,34-South Africa SAFARI Fire 47-Landsat Mali	Video SAFARI 2-3 min
88-053 100 mm 90-057 250 mm	Ethiopia Deforestation	1-Deforestation Fire 4-Deforestation Fire 2-Deforestation Fire 3-Deforestation Fire	
93-072	Acre/Porto Velho Deforestation	45-Brazil-86 NOAA AVHRR 46-Borneo-82-83 NOAA AVHRR	T: DMSP Africa Fire Mapping
84-085	S-Venezuela Non-Forested Land		
097-005 075-039	Australia Fire Scars	11-Eucalyptus Burn 43-NZ-Conversion Fire	
87-019	Canada-1988 Fire Scar	13-Siberia Fire Scar 12-China-87 Scar 44-China Landsat	T: FIRESCAN Video FIRESCAN
112-037 87-013 87-044 102-038	-Middle River Basin - Front Range Rockies -Rocky Mountains Trench CVIS - Rocky Mts.Trench CIR		T: Regional Fire Campaigns T: SAFARI T: SEAFIRE T: CIS -- Nuclear Contamination

70-mm Russian (SN-10) and American (2443) Infrared Films

STS060-101-096	Burma
STS060-105-096	Burma
STS060-101-038	Imperial Valley
STS060-105-038	Imperial Valley
STS060-101-053	Baja
STS060-105-053	Baja
STS060-97-024	Sea of Galilee and Jordan R. irrigation
STS060-107-024	Galilee and Jordan R.
STS060-97-026	Dead Sea
STS060-107-026	Dead Sea
STS060-102-023	Lake Chad
STS060-104-023	Lake Chad
STS060-101-080	Russian scenes
STS060-101-094	Russian scenes
STS060-99-044	
STS060-99-041	
STS060-101-090	Ganges
STS060-105-090	Ganges
STS060-101-093	Sunderbans
STS060-105-093	Sunderbans
STS060-97-116	Godavari Delta, India
STS060-106-055	Godavari Delta, India
STS060-97-102	Indus
STS060-106-041	Indus
STS060-97-054	Lake Turkana
STS060-107-053	Lake Turkana
STS060-97-056	Kilimanjaro
STS060-107-055	Kilimanjaro
STS060-97-005	Australian fires

STS060-107-005	Australian fires
STS060-106-020	Australian burn scar
STS060-106-021	Australian burn scar
STS060-99-098	Congo Fires
STS060-101-092	Fires
STS060-102-024	Zaire
STS060-104-024	Zaire
STS060-101-027	Crater Lake, S. Cascades
STS060-105-026	Crater Lake to Three Sisters
STS060-102-033	Namibia
STS060-102-032	Namibia
STS060-107-067	Star dunes
STS060-107-044	Tombolo, Xaafuun Cape
STS060-102-013	Wind-blown Somali coast
STS060-104-013	Wind-blown Somali coast
STS060-97-097	Amu Darya dunes
STS060-107-011	Iranian volcanoes
STS060-99-031	Dry river and snow effects
STS060-106-035	
STS060-107-016	West coast India
STS060-097-016	
STS060-106-060	Sediment from Tigris/Euphrates
STS060-106-067	bloom?? in lake (45.1N 8.9E)

Ecology

Lulla

S93-42140	Satellite images of Mississippi R.
STS060-84-003	Mississippi River
STS060-42-015	St. Louis
STS060-42-014	St. Louis

S88-50445 Lake Chad water area
Satellite image taken during STS52

STS060-77-081 L. Chad
STS060-102-023 Chad

S91-2650003 Omo Delta
STS060-97-054 Omo Delta, Lake Turkana

STS060-97-055 Kilimanjaro (CIR)
STS060-34-016 Kilimanjaro

STS060-99-052 Kuwait
STS060-95-080 Kuwait

STS060-99-050 Baghdad
STS060-85-005 Baghdad

STS060-17-34
STS060-97-102 Indus

STS060-89-043
STS060-89-047

STS060-95-039 Sambhar, India
STS060-95-041 Kutch, India

STS060-11103-069 Sunderbans
STS060-101-093 Sunderbans

Tropical whittings **Evans**
STS060-86-023
Whittings off Andros I., Bahamas

STS056-100-78
Whittings off Andros I., Bahamas

STS060-86-019
Whittings in Great Abaco

STS060-84-027
Whittings in Great Abaco -- detail of above. Whittings are roughly 10 km long.

Oceanographic and Meteorology Observations **Runco**

STS060-95-80
Sediment from the Tigris-Euphrates river delta in the Persian Gulf.

STS060-82-28

Colorful sediment from Indonesian rivers. The larger city is Bintulu, Sarawak (shares the island with Borneo). Orbiter Nadir: 2.7N 114.2 E.

STS060-85-BT

Ice in the Sea of Azov with Kerchenskiy Strait seen in the distance.

STS060-42-19

Mississippi delta, with sediment streamlined by currents.

STS060-114-011

Internal Waves in the Mediterranean generated in the Strait of Gibraltar.

STS060-19-06

Gibraltar, 600 mm

STS060-74-39

Ice in the Great Lakes. Lake Erie, Lake St. Claire and Lake Huron surround snow covered Detroit Michigan.

STS060-85-BD - Ice strands perpendicular to the coast in the north Sea of Japan near the city of Samarga.

STS060-73-38

STS060-95-03

STS060-71-72

The land topography makes a unique snow pattern in the Dzungarian Basin of Xinjiang China. The snow-less line is a valley in the basin. The high peaks are the Bogda Shan Mtns. Orbiter nadir: 44.4N 91.9E

STS060-112-77

Southern hemisphere low pressure center in the central south Atlantic. Orbiter nadir: 54.5S 0.9E.

STS060-95-031

Optical Illusion. Troughs, Ridges or Clouds? These atmospheric gravity waves over ice in the Aral Sea provide an interesting photo for the first time viewer. An analysis of the cloud height by Dave Pitts puts these clouds at about 300 meters. Orbiter nadir: 43.8N 57.2E.

STS060-73-39

Gravity waves initiated at the east coastline central England near "The Wash" bay. Orbiter nadir: 52.4N 0.2W

STS060-65-09
Big Thunderstorm

Surficial Geology Amsbury

STS060-72-044
Wide angle of White Sands and Carizozo lavas.

STS060-83-016
White Sands, New Mexico, showing parabolic dunes of gypsum sand.

STS060-72-049
Coahuila & Texas viewed to west, including Amistad Reservoir and Big Bend National Park

STS060-83-034
Amistad Reservoir, showing different sizes of incised meanders on the Devils River, Pecos R., Sanderson Canyon and the Rio Grande

Ground photo of Devils River
SL4-93-315 Amistad Reservoir in January, 1974, using Kodak 2443 film in S-190B camera

SL4--52-014 W. Edwards Plateau
Data slide

Landforms, Dustorms, and Paleoclimatology Wilkinson

STS060-92-021
Basalt collapse country, S. Argentina

STS060-92-20
Basalt collapse country

several ground shots

STS048-152-205
Falklands and dust

STS060-73-084
Dust storm, western Pamirs

STS060-73-015
Dust tendrils, Anti Atlas

STS060-77-021, 022

Dust plumes over Mediterranean Sea

STS060-97-47

Dust

STS060-76-63

Dust pall, Tripolitania

STS063-103-47

Chinese alluvial fan

STS060-73-80

Bokhara Fan, Uzbekistan

STS060-82-094

Kosi R. fan, India

STS060-20-037

Aswan dam

STS060-38-024

Guyana Highlands

STS060-86-87 and -04

Grand Canyon

STS060-72-091

Kulunda

STS060-87-0J

Namib desert and fog

Volcanism and Tectonics

Evans

STS060-85-AE

wide angle of Patagonia from 40-43S

STS060-49-01

Detail of Puyehue volcano (1980 eruption); Carran volcanic group (1979 eruption).

STS060-92-07

Monte Tronador, Chile

STS060-49-05

Monte Tronador, Chile (detailed view)

STS060-85-AH
Yantales, Patagonia

STS060-49-06
Yantales, detail

STS060-87-74
Klyuchevskaya & Bezmianny (with plume), Kamchatka

STS060-112-105
Sheveluch, Kamchatka and discolored snow

STS060-87-083
South tip of Kamchatka

STS060-??
Asymmetric valleys, west coast Kamchatka

STS060-103-026
Colima, Mexico, smoking

STS060-71-006
Etna, Sicily, smoking

STS060-102-098
Natron and Oldoinyo Lengai, with plume

STS060-113-010 (CIR)
Natron and Oldoinyo Lengai, with plume

STS060-103-012
Afar triple junction

STS060-77-058
Amsterdam I (38 South)

STS060-87-088
Lake Baikal

STS060-035-31
Detail of Baikal ice