NASA
National Aeronautics and Space Administration

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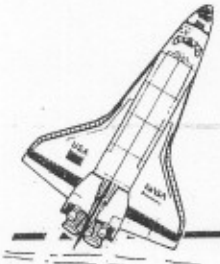
Teacher in Space Project

Teacher in Space



YOUR INVITATION FROM SPACE... Come aboard for a history-making educational opportunity to instruct using the first lessons taught live from the Space Shuttle. Teacher in Space, Christa McAuliffe, will teach two lessons that will be broadcast live via satellite to the classrooms and homes of television viewers from the Shuttle Challenger. The materials in this publication have been designed to help teachers and other adults maximize the learning experiences which will grow from the lessons and other educational events scheduled on Mission 51-L's historic flight!

CONTENTS

PROJECT BACKGROUND

Plans to make a teacher the first private citizen to fly on the Space Shuttle began with President Ronald Reagan's announcement of the program on August 27, 1984. Christa McAuliffe will fulfill that decision on Shuttle Mission 51-L slated for launch in January 1986. McAuliffe's flight is a part of NASA's Space Flight Participant Program which is designed to expand Shuttle opportunities to a wider segment of private citizens. Among her challenges will be communication of the experience and flight activities to the public through educational and public information programs.

The selection of Christa McAuliffe as primary candidate and Barbara Morgan as backup culminated a search process coordinated for NASA by the Council of Chief State School Officers. Some 11,000 teachers applied for the opportunity to become the Teacher in Space. State, territorial, and agency review panels each selected two nominees for a nomination slate of 104. These nominees are continuing to serve as NASA's educational Space Ambassadors in their areas.

The ten finalists announced on July 1, 1985 traveled to NASA's Johnson Space Center in Houston, Texas and Marshall Space Flight Center in Huntsville, Alabama for briefings and testing. A NASA Evaluation Committee interviewed them in Washington, D.C., and the final selection announcement was made by Vice President George Bush on July 19, 1985. Christa McAuliffe and Barbara Morgan began their training on September 9 at the Johnson Space Center.

The remaining eight finalists are working with NASA on a one-year assignment at Headquarters and NASA research centers. In August, they worked with McAuliffe and Morgan to design the lessons which the Teacher in Space will teach live during the mission. Their continued input will create an abundance of new space-related materials for the classroom.

MISSION BACKGROUND

The Crew:

Commander — Francis R. (Dick) Scobee
Pilot — Michael J. Smith
Mission Specialist — Judith A. Resnick, Ph.D.
Mission Specialist — Ellison S. Onizuka
Mission Specialist — Ronald E. McNair, Ph.D.
Payload Specialist — Gregory Jarvis (Hughes Communications)
Space Flight Participant (Teacher-Observer) — S. Christa McAuliffe

The Flight, Payload, and Experiments:

Shuttle Mission 51-L will be a six-day mission. Launch is scheduled for January 22, 1986 from the Kennedy Space Center, and landing is scheduled for January 28 at the same site. The mission carries two major payloads, the TDRS-B (Tracking and Data Relay Satellite-B) and the Spartan-Halley carrier. On the first flight day, the crew will deploy TDRS-B; on the third flight day, the Spartan-Halley carrier, which will be retrieved on the fifth flight day. In addition, the crew will be conducting and monitoring a series of scientific experiments during the Mission. McAuliffe may describe these activities during her live lessons from space.

Payload:

The TDRS-B will join TDRS-1 in geosynchronous orbit to provide communication and data links with the Space Shuttle and satellites. TDRS-2 (WEST) will be stationed over the Pacific; TDRS-1 (EAST) is stationed over the Atlantic.

The Spartan (Shuttle Pointed Autonomous Research Tool for Astronomy) mission is designed to observe the ultraviolet spectrum of Comet Halley. Two ultraviolet spectrometers will be mounted on the Spartan carrier which will scan the tail of Halley on each of its orbits. The Spartan will be deployed and retrieved with the Remote Manipulator System (RMS) and stowed in the payload bay for the remainder of the Shuttle flight.

The Shuttle Student Involvement Program, a competition managed by the National Science Teachers Association with NASA to encourage student-designed experiments that can qualify to fly on missions, will be flying three experiments on this mission:

A. *Chicken Embryo Development in Space* by John C. Vellinger of Lafayette, Indiana.

B. *The Effects of Weightlessness on Grain Formation and Strength in Metals* by Lloyd C. Bruce of St. Louis, Missouri.

C. *Utilizing a Semi-Permeable Membrane to Direct Crystal Growth* by Richard S. Cavoli of Marlboro, New York.

PREFACE

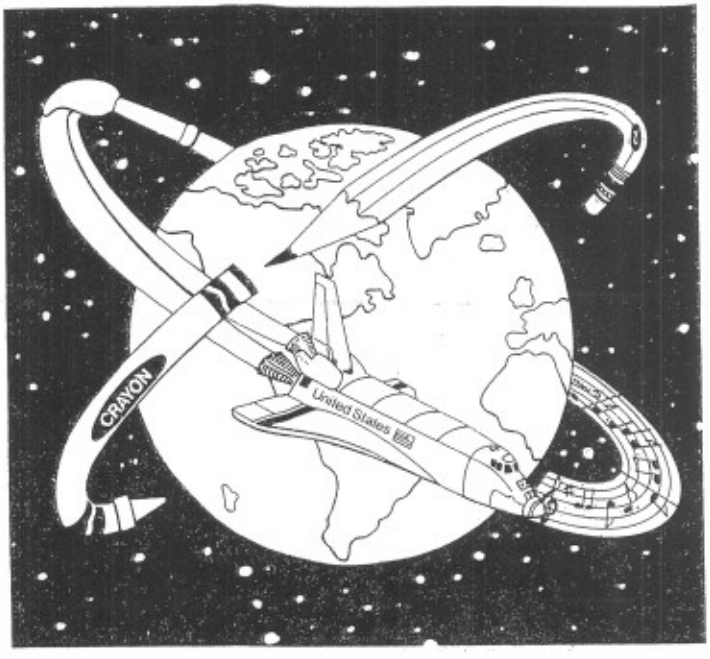
NASA is pleased to provide this Teacher's Guide to extend the learning experiences evolving from the Teacher in Space Project. The publication is the product of a team effort by NASA, the National Science Teachers Association (NSTA), the National Council for the Social Studies (NCSS), and curriculum professionals. It is based upon ideas contributed by the Teacher in Space finalists, the Space Ambassadors, and other practicing teachers.

We have sought to publish practical and mind-stretching teaching ideas, plans, and resources for a variety of curriculum areas and grade levels — all growing from aspects of Mission 51-L. The capsules and detailed activities are concept-based and are designed to strengthen critical thinking and problem-solving skills. We hope this Guide will help all of you, the people who teach live on Earth every day.

NASA wishes to thank the following individual teachers who wrote activities for this Guide: Charles Frederick, Marilyn Kirschner, Beverly Sutton, and Howard White. We wish to acknowledge the contributions of the following: William D. Nixon, Teacher in Space Project Manager; Dr. Doris K. Grigsby and Muriel M. Thorne of NASA Headquarters Educational Affairs; Dr. Helenmarie Hofman, NSTA; Frances Haley, NCSS; and Dr. June Scobee, University of Houston–Clear Lake. We also thank Joan Baraloto Communications, Inc. for coordinating the preparation, development, and publication of this guide.

Thomas P. DeCair

Thomas P. DeCair/Associate Administrator for External Relations, NASA



DESCRIPTION OF THE LIVE LESSONS

The Ultimate Field Trip

This lesson is based on a quotation by Teacher in Space Christa McAuliffe who described her opportunity to go into space as "the ultimate field trip."

Viewer Objectives:

1. To observe the major areas of the Shuttle and describe their functions
2. To list and describe the major kinds of activities crewmembers perform aboard the Shuttle
3. To compare and contrast daily activities in microgravity with those on Earth

Video Lesson Description:

This lesson from space will begin in the flight deck area of the Challenger where Christa McAuliffe will introduce the commander and pilot and will point out the Shuttle controls, computers, and payload bay.

When she arrives at the middeck, McAuliffe will show viewers the kinds of equipment and processes which help human beings live comfortably and safely in the microgravity environment of the Shuttle.

Where We've Been, Where We're Going, Why?

Viewer Objectives:

1. To explain some advantages and disadvantages of manufacturing in a microgravity environment
2. To describe spinoffs and other benefits which have evolved from the space program
3. To list ways in which the modular Space Station would change the lives of human beings

Video Lesson Description:

As this lesson from space begins, Christa McAuliffe will refer to models of the Wright Brothers' plane and of a proposed NASA Space Station to help viewers recall that only 82 years separate that early flight and today's life in space.

McAuliffe will discuss the reasons we are living and working in space, covering astronomy, Earth observations, experiments on-board the Shuttle, satellites on the mission, materials processing, and technological advances.

TEACHING-RELATED EVENTS OF MISSION 51-L

Live Lessons:

As part of the 51-L Mission, the Teacher in Space, Christa McAuliffe, will teach two live lessons from space. These lessons are currently scheduled on the sixth day of the Mission at 11:40 a.m. and 1:40 p.m. Eastern Standard Time.

PBS Broadcast:

The Public Broadcasting Service (PBS) will carry both lessons via Westar IV. PBS will offer the programs to member stations that will be requested to preempt regular classroom programming to carry the lessons live. Specific information about the PBS transmission may be obtained from local PBS stations or by writing to Elementary and Secondary Programs, PBS, 475 L'Enfant Plaza, SW, Washington, D.C. 20024 or calling 202/488-5080.

Mission Watch (Satellite Broadcast to Schools):

NASA will make available to schools equipped with satellite dish antennas daily activities conducted aboard the 51-L Mission. This effort will be coordinated by Classroom Earth, an organization dedicated to direct satellite transmission to elementary and secondary schools. Participating schools will receive in advance educational materials, television schedule, orbital map, Shuttle Prediction and Recognition Kit (SPARK), and other information that will prepare teachers and students to follow all aspects of the 51-L Mission. Barbara Morgan, backup candidate, will act as moderator for these daily special broadcasts. Specific information related to "Mission Watch" is available by writing to Classroom Earth, Spring Valley, IL 61362 or by calling 815/664-4500. Information can also be accessed on the National Computer Bulletin Board (300 baud) 817/526-8686.

Filmed Activities:

In addition to live lessons, McAuliffe will conduct a number of demonstrations during the flight. These filmed activities will be used as part of several educational packages to be prepared and distributed after the Mission.

KEY MISSION-RELATED TERMS

Comet Halley — comet which reappears near Earth approximately every 76 years

Communication satellite — orbiting spacecraft which sends messages, connects computers, and carries radio and television programs via microwaves

EMU (Extravehicular Mobility Unit) — space suit with its own portable life-support system

51-L — number of the Mission carrying the Teacher in Space project

Flight deck — upper Shuttle deck housing the controls and computers for the commander and pilot

Geosynchronous orbit — path 35,680 km from Earth in which a satellite's speed matches exactly Earth's rotation speed, so that the satellite stays over the same location on the ground at all times

Microgravity — 1/10,000 of the gravity force on Earth

Middeck — living and work area of Shuttle located below flight deck

Mission control — a room at the Johnson Space Center in Houston, Texas from which the crew's activities are directed

Mission specialist — scientist on crew responsible for experiments and deploying satellites

Mission Watch — daily satellite program transmission highlighting Mission events

NASA — National Aeronautics and Space Administration

Orbiter — reusable manned component of Space Shuttle; there are four; Mission 51-L uses Challenger

Payload — cargo; equipment

Payload bay — large section of the Shuttle where the payloads are stored

Payload specialist — scientist named for flight by a company or country sponsoring a payload; specialist is certified for flight by NASA

Principal investigator (PI) — scientist who designs and directs a mission experiment

Simulator — training equipment which gives trainees opportunities to experience flight-like activities and sensation

Space Shuttle — four-part vehicle: a reusable orbiter, an expendable liquid propellant external tank, and two recoverable and reusable solid rocket boosters

Spartan-Halley — payload designed to make observations of the ultraviolet spectrum of Comet Halley

Spinoffs — useful applications of space technologies different from their original aerospace function

TDRS (Tracking and Data Relay Satellite) — a communication satellite deployed by NASA for its communication system

SPACESHIP DECISION-MAKING MODEL

(see page 15)