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Title:

Flags in Space: NASA Symbols and Flags in the U.S. Manned Space Program

Journal Issue:

The Flag Bulletin: the International Journal of Vexillology, XLVI(5-6)

Author:

[Platoff, Anne M.](#), UC Santa Barbara

Publication Date:

2007 [2010]

Series:

[UC Santa Barbara Previously Published Works](#)

Permalink:

<http://escholarship.org/uc/item/1tt282fs>

Preferred Citation:

Anne M. Platoff, "Flags in Space: NASA Symbols and Flags in the U.S. Manned Space Program", The Flag Bulletin: the International Journal of Vexillology, No. 230, Vol. XLVI, Nos. 5-6 (September-December 2007) [published 2010], p. 143-221.

Keywords:

NASA symbols, NASA seal, NASA insignia, NASA logotype, NASA meatball, NASA worm, NASA flag, flags in the space program, U.S. Space Program, United States space program, human spaceflight, manned spaceflight, flown flags, space shuttle flags, space station flags, payload flags, mission flags, program flags, Shuttle-Mir flag, Columbia orbiter, Endeavour orbiter, Discovery orbiter, Atlantis orbiter, space shuttle orbiters, Project Mercury, Project Gemini, Apollo Program, flags on spacecraft, flags on space suits, mission patches, Space Shuttle Program, International Space Station, flags on the Moon, lunar flags, lunar flag assembly, space-flown souvenirs, National Aeronautics and Space Administration, NASA

Abstract:

One of the most memorable images from the Apollo missions to the moon is the picture of the astronaut standing next to the U.S. flag. Throughout the history of America's space program flags have been prevalent symbols on space suits, spacecraft, and mission patches. Since the early days of manned space flight "flown" flags have been used as mementos to commemorate



important flights and to recognize the contributions of individuals to the success of the program. Other symbols besides flags also have played an important role as the program has evolved. This paper will discuss some of the ways that flags have been used in the manned space program, unique flags that have been used to represent the National Aeronautics and Space Administration and its programs, and other symbols unique to NASA.

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SEPTEMBER-DECEMBER 2007

#230



THE FLAG BULLETIN

THE INTERNATIONAL JOURNAL OF VEXILLOLOGY

THE FLAG BULLETIN

THE INTERNATIONAL JOURNAL OF
VEXILLOLOGY

September-December 2007 No. 230 Volume XLVI, Nos. 5-6

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*The Flag Bulletin is officially recognized
by the International Federation of Vexillological Associations
for the publication of scholarly articles relating to vexillology*

Art layout for this issue by Terri Malgieri

Funding for addition of color pages and binding of this combined issue was provided by the University of California, Santa Barbara Library and by the University of California Research Grants for Librarians Program.

The Flag Bulletin at the time of publication was behind schedule and therefore the references in the article to dates after December 2007 reflect events that occurred after that date but before the publication of this issue in 2010.

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Postmaster: Send address changes to THE FLAG BULLETIN, 3 Edgehill Rd., Winchester, Mass. 01890 U.S.A.
THE FLAG BULLETIN (ISSN 0015-3370) is published bimonthly; the annual subscription rate is \$68.00.
Periodicals postage paid at Winchester. www.flagresearchcenter.com

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THIS WORK WAS ORIGINALLY PRESENTED TO NAVA 36 (DENVER CO 2002)

FLAGS IN SPACE: NASA SYMBOLS AND FLAGS IN THE U.S. MANNED SPACE PROGRAM

Anne M. Platoff

INTRODUCTION

When the National Aeronautics and Space Administration (NASA) was established in 1958 new symbols were created to represent the agency. These symbols have been used in all aspects of America's¹ space program. As NASA launched its first manned mission in 1961 it established a tradition of human space exploration that has captured the imagination of people around the world. In July 1969 astronauts Neil Armstrong and Buzz Aldrin became the first human beings to set foot on the Moon. During their short stay on the lunar surface the astronauts deployed a specially-designed U.S. flag, making this event significant not only in the history of manned space flight, but also in the field of vexillology. The first flag on the Moon was a logical continuation of the use of flags in exploration and represents an example of how flags have been used in the history of the U.S. space program. Flags have been used as a national identifier on American manned spacecraft, on space suits, and on launch vehicles. They have been flown into space and given as mementos and awards. Specialized flags have been designed to represent the programs carried out as part of manned space exploration. There have also been flags to represent different missions and payloads flown on the space shuttle. This combination of flags and emblems illustrates

the importance of the use of symbols to America's manned space program. Though the space shuttles are scheduled for retirement sometime in 2011, human space exploration will continue as a multinational venture as new crews are launched to the International Space Station using Russian rockets.

SYMBOLS OF NASA

Scientists from the Soviet Union won the first heat of the "space race" when they launched Sputnik, the first artificial satellite, on 4 October 1957. President Dwight D. Eisenhower, influenced by the phenomenon of "Sputnik shock" that swept the country, called for the creation of a civilian agency to manage a space program of the United States. Congress passed the National Aeronautics and Space Act and it was signed into law on 29 July 1958. The National Aeronautics and Space Administration was established on 1 October 1958 and immediately work began to catch up with and surpass Soviet accomplishments in space.

Creation of a new government agency led to the creation of new symbols including a new flag. The seal of the National Aeronautics and Space Administration (**front cover and Fig. 1**) was created by the U.S. Army Institute of Heraldry, based upon a design submitted by a designer at the Lewis Research Center. It was formally established by Executive Order 10849 on 27 November 1959 and was announced in the *Federal Register* on 1 December 1959. The executive order described the seal in the following way:

On a disc of the blue sky strewn with white stars, to dexter a large yellow sphere bearing a red flight symbol apex in upper sinister and

Fig. 1: NASA SEAL



wings enveloping and casting a gray-blue shadow upon the sphere, all partially encircled with a horizontal white orbit, in sinister a small light-blue sphere; circumscribing the disc a white band edged gold inscribed "National Aeronautics and Space Administration U.S.A." in red letters.

On 19 May 1961, the description of the seal was slightly amended by Executive Order 10942. The new seal design differed only in that it called for "wings enveloping and casting a *brown* shadow upon the sphere." Acceptable uses of the seal and other NASA symbols are described in the *Code of Federal Regulations* (14 CFR 1221.1) and have been outlined in a NASA directive (NPD/NMI 1020.1). The policy allows

for use of the seal on award certificates, security credentials, official documents, NASA publications, plaques, and flags.²

From the perspective of the public, NASA's seal is probably its least-recognizable symbol. After Astronaut Alan Shepard was awarded the agency's Distinguished Service Medal, which featured the seal, *Time* magazine criticized the design, noting that the award "looked as if it might have come out of a Cracker Jack box." The article quoted a member of the American Numismatic Society who commented that there was a "tendency in U.S. medals to go too much for symbolism, regardless of good design." Thirty years later Philip B. Meggs, a professor of graphic design, called the seal "a consummate example of bureaucratic design stereotype." Meggs further disparaged the seal, noting that "one can interpret the [design] as a giant Meatball flying between the spread prongs of a chicken's wishbone, or read the Meatball as earth while the wishbone symbolizes a zooming space craft. By any rational measure of design and communication, it was and is a failure." The Institute of Heraldry files note that the design had been submitted to the Commission on Fine Arts for their comments. Comparing the NASA seal to that of the National Advisory Committee for Aeronautics, NASA's predecessor (which showed the Wright Brothers' plane), illustrates the difficulties faced by the designers. Unlike NACA, which could draw upon the history of American aviation for its symbolism, the newly created agency was entering a new frontier. Few of those involved in the designing of the seal could have imagined the direction that the U.S. space program would take.³

NASA FLAGS

As with many federal agencies, NASA's flag incorporates the agency's seal on a field of blue (Fig. 2). Following the NASA policy that governs the use of agency symbols, the NASA Administrator created the flag in January 1960. The technical description of the flag reads:

The color of the National Aeronautics and Space Administration flag will be of blue bemberg taffeta-weave rayon, four (4) feet, four (4) inches [1.32 m] on the hoist by five (5) feet, six inches [1.67 m] fly. In the center of the color will be the Official Seal of the National Aeronautics and Space

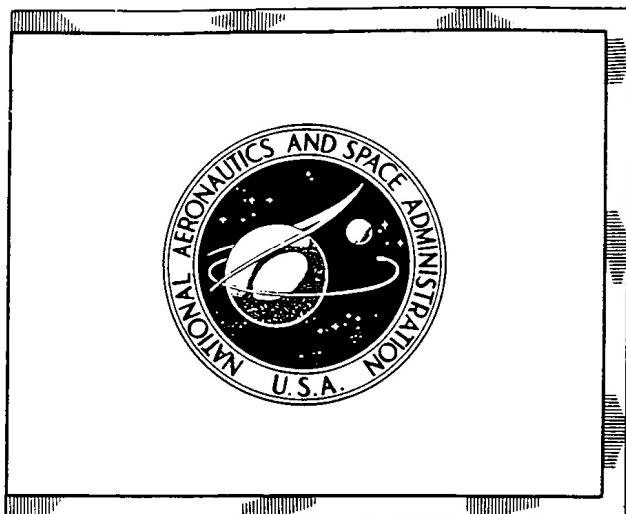


Fig. 2: NASA FLAG

Administration thirty inches in diameter. The devices and stars of the Seal will be embroidered by the Bonnaz Process. The color will be trimmed on three edges with a knotted fringe of rayon two and one half (2 1/2) inches [6 cm] wide. Cord and tassels will be of yellow rayon strands.

Later versions of the regulation describe exterior versions of the unfringed flag available in two sizes: 5' x 9'6" [1.52 x 2.89 m]; and 10' x 19' [3.05 x 5.79 m]. The agency flag is flown at all official NASA installations and at NASA-affiliated visitor centers. NASA policy authorizes use of the flag at NASA ceremonies, conferences, and at public appearances by NASA executives. The Administrator authorizes special uses of the flag. One example is a large production of a small version, 4" x 6" [10 x 15 cm], flying on at least one space shuttle mission and presented to employees on certificates commemorating the flight.⁴

There are also special flags designed to represent the NASA Administrator and his staff. These flags are 3' x 4' [.91 x 1.22 m] in size and resemble the NASA flag except for the addition of four stars for the Administrator, three stars for Deputy Administrator, and two stars for Associate Deputy Administrators. According to regulations these flags are to be displayed in the appropriate offices alongside the flag of the United States. The stars on the flags are white and are placed in the corners of the flags.⁵

NASA INSIGNIA

While few people would recognize the NASA seal or flag, the NASA Insignia has become known worldwide as the symbol of America's space agency. Affectionately referred to as "the Meatball" by NASA employees, the Insignia is described as having a "dark blue sky background; solid wing configuration; white inner elliptical flight path, stars, and letters NASA" (Fig. 3). NASA sources credit James J. Modarelli with the Insignia design. According to a brief history of the "Meatball," Moderelli was the head of the Research Reports Division at NACA's Lewis Research Center when designs were solicited for the new NASA seal. After a de-

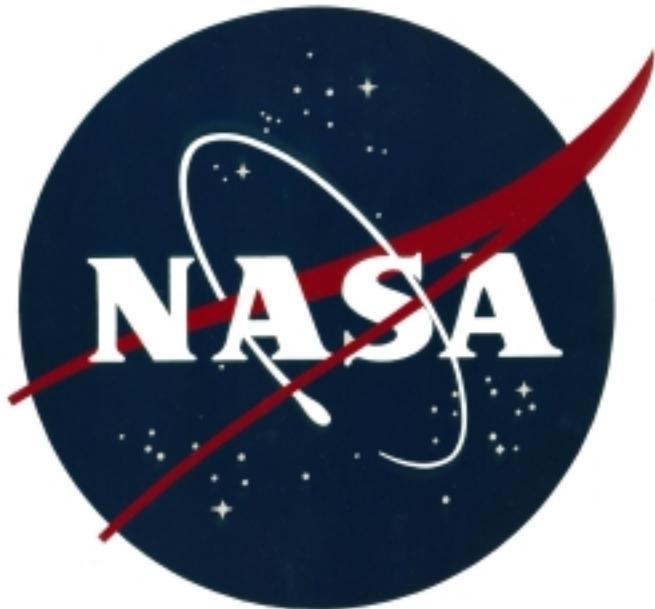


Fig. 3: NASA INSIGNIA

sign sent in by the team from Lewis was selected, the NACA executive secretary asked Modarelli to create a second symbol to be used in addition to the formal agency seal. Modarelli simplified the seal, leaving only the white stars and orbital path on a round field of blue with a red airfoil. Then he added white N-A-S-A lettering. There are several accounts for the origin of this symbol. The original policy directive governing NASA symbols says that the Insignia was "established by the Administrator on 15 July 1959. Later versions of the directive credit the U.S. Army Institute of Heraldry and note that the Commission of Fine Arts and the NASA Administrator approved the design. Most likely, Modarelli's suggestion was reworked by the Institute of Heraldry leading to the conflicting accounts.⁶

The technical description defines the Insignia as having a "dark blue background; solid red wing configuration; white inner elliptical flight path, stars, and letters NASA." This symbol is authorized for use on NASA-issued clothing and uniforms, aircraft and ground vehicles, publications, recognitions such as service pins and certificates, and on buildings. In addition, the Insignia can be used on business cards and on items for sale to NASA employees. It has been found on everything from flight suits, spacecraft, official publications, and letterhead to NASA souvenir items and toys sold around the world. This is the emblem that has represented the agency during some of the most significant achievements of the manned space program - the first flight of an American astronaut, the U.S. space program's first space walk, and six Moon landings. While the Insignia is once again the preeminent graphic symbol used by the agency, it did fall out of favor for seventeen years.⁷

NASA LOGOTYPE

In the early 1970s the U.S. government began to modernize the symbols used by federal agencies. As part of the Federal Graphics Improvement Program, the National Endowment for the Arts (NEA) recommended that government agencies adopt “unified visual communications systems” that not only would produce contemporary symbols, but also would be more cost effective. The NEA audited the use of symbols across NASA and found that there was no standardization. Each NASA center produced its own products without any consistency across the agency. To rectify the situation, NASA awarded a contract to the design firm Danne & Blackburn, Inc. to give the space agency a new graphic standard and a new symbol to represent NASA in the post-Apollo era.⁸

The designers from Danne & Blackburn found that the agency’s acronym was more recognizable than the full name. Playing on this, they designed a new NASA symbol that was approved by the Commission of Fine Arts in November 1975 (Fig. 4).

In the logotype, the letters N-A-S-A are reduced to their most simplified form. The



Fig. 4: NASA LOGOTYPE

strokes are all of one width, evoking the qualities of unity and technical precision. Elimination of cross-strokes in the two "A" letters imparts a vertical thrust to the logotype and lends it a quality of uniqueness and contemporary character.

Officially designated as the NASA Logotype, it became known by the less-than-affectionate nickname "the Worm." In an attempt to promote a unified graphic identity, the agency adopted the NASA Unified Visual Communications System and the NMI was rewritten to prohibit the use of the NASA Insignia without the approval of the Administrator. The publication of a standard graphics manual further promoted the use of the Logotype. This action was highly successful in promoting a standard graphic image for the agency among the general public. In 1984 NASA's graphics program was awarded the Presidential Award for Design Excellence. However, despite the success of the Logotype as an external communications tool, the purging of the Insignia also caused resentment among NASA employees who associated "the Meatball" with the glory days of the Apollo Program.⁹

THE MEATBALL VS. THE WORM

During the Logotype era NASA developed a new, reusable space shuttle orbiter to ferry astronauts and cargo into orbit. As space travel seemed to become routine much of the public lost interest in the program. Support for NASA in Congress also waned. Although the shuttle continued to fly there was little press coverage of the missions. On a cold

winter's day in January 1986 NASA was once again in the headlines. Unfortunately, it took the deaths of seven crewmembers in the explosion of the Challenger to bring the agency back into the spotlight. For many NASA employees, the Logotype represented the decline of the agency since the end of Apollo, as underscored by the Challenger disaster. Their concerns were heard when a new administrator, Daniel Goldin, took charge in April 1992. A month after joining the agency Goldin announced to employees: "the can-do spirit of the past is alive and well. In honor of this spirit, it seems only fitting that the original NASA Insignia, affectionately known as the 'Meatball', be part of our future." On 4 June, he sent a memo to the Center directors instructing them to phase out use of the Logotype in favor of the NASA Insignia.¹⁰

While Goldin's decision was popular with many at NASA, the logo change brought harsh condemnation from those in the design community. The director of the NEA's design program, Mina Wright Berryman, sent a letter to the NASA administrator urging him to reconsider his decision. She cautioned him that he was "jeopardizing (NASA's) entire visual communication program." Other graphics professionals, including the president of the American Institute of Graphic Artists, also threw their support behind the Logotype. In spite of the criticism, Goldin's decision had been made and the graphics design manual was rewritten to favor the use of the NASA Insignia. According to the new regulation the Logotype is now "reserved for special use (such as for commercial merchandising purposes)". Perhaps to quiet those who were concerned about the cost of a logo change, Goldin instructed employees to convert over to the Insignia only when replacing supplies or refurbishing vehicles. Little by little the original NASA Insignia replaced

the Logotype on nearly everything, including the agency's fleet of space shuttles.¹¹

FLAGS AS NATIONAL IDENTIFIERS

The symbols of the National Aeronautics and Space Administration – the NASA seal, the agency flag, the Meatball insignia, and the Logotype – are but a fraction of the symbols used throughout the history of America's manned space program. Almost as prevalent as the agency symbols, the United States flag has been used as a potent representation of America's achievements in human space flight. The U.S. flag has been painted on spacecraft, has adorned the space suits of American astronauts, and has been featured on a number of mission patches. The flags of other nations have also been used on international payloads and on mission patches to honor astronauts from a number of countries that have flown aboard the space shuttle.

FLAGS ON EARLY SPACECRAFT

While the original symbols of the space agency were being created and standardized, the National Aeronautics and Space Administration was occupied with organizing the nation's civilian activities in space. As part of the new program, NASA began a search for test pilots who would participate in the agency's first human space flights. Known as Project Mercury, this program was designed to launch a single astronaut and return him safely to Earth. In April 1959 the first group of seven astronauts was selected. As they trained for their missions, NASA scientists and engineers rushed to develop spacecraft and launch vehicles that could safely transport a human to orbit.

The Mercury spacecraft were piloted capsules equipped with one seat. The first two black capsules were labeled with the spacecraft name and the words "United States". On later flights, an American flag was added beneath the white letters of the country name (Fig. 5, p. 156). When John Glenn became the first American to orbit the Earth on 20 February 1962, his Friendship 7 capsule became the first manned spacecraft decorated with the U.S. flag. This tradition has been continued on every piloted spacecraft launched by the United States since that historic flight. By May 1963, with six successful Mercury flights completed and a mandate from the President to send astronauts to the moon by the end of the decade, the agency initiated the second manned program, Project Gemini. The Gemini spacecraft were similar to those of Mercury except that they were designed to carry two astronauts. Like the Mercury capsules, those of Gemini featured the American flag underneath white lettering reading UNITED STATES (Fig. 6, p. 156).¹²

With the completion of ten Gemini flights, the agency was ready for the next stage of human space flight – the race to the moon. Flag usage on Apollo spacecraft and vehicles far exceeded the use in the previous two programs. The U.S. flag was painted on the command modules (Fig. 7, p. 157) and on the command service modules (Fig. 8, p. 157), just below the words UNITED STATES. On the lunar modules used to land on the moon, the flag was above the country name on the descent stage of the spacecraft. The lunar roving vehicles used on the final three lunar missions featured the flag on each of their four fenders. In addition, flag decals were added to the S-IC stage of the massive Saturn V launch vehicle. There were four decals that encircled the rocket above the letters USA. The silk-screened, adhesive backed



**Fig. 5: US FLAG
ON MERCURY
SPACECRAFT**



**Fig. 6: US FLAG
ON GEMINI
SPACECRAFT**

Fig. 7: U.S. FLAG ON APOLLO COMMAND MODULE



Fig. 8: U.S. FLAG ON COMMAND SERVICE MODULE

decals were approximately 6' x 12' [1.83 x 3.66 m] in size. Stripes on the flag were about 6" wide [15 cm] and the canton was 42" x 60" [1.07 x 1.52 m]. As the fully fueled rocket sat on the pad prior to launch, frost from the cold of the liquid oxygen in the fuel tank obscured the flags. Today the Apollo command modules can be seen on exhibit in museums around the country and Saturn Vs that were built for cancelled missions are on display at several NASA visitor centers. The descent portions of six lunar modules, each adorned with a U.S. flag on the gold foil insulation still remain on the lunar surface. In addition to the Moon missions, flags were also present on the three Apollo spacecraft used for the Skylab Project and on the one used for the Apollo-Soyuz Test Project.¹³

FLAGS ON SPACE SHUTTLES AND THE INTERNATIONAL SPACE STATION

The next manned spacecraft developed by NASA differed dramatically from those used in previous programs. While the flights of the first two decades of U.S. human space flight were accomplished using "disposable" vehicles, the space shuttle orbiters that debuted in the 1980s were designed to be reusable. Shuttles are launched vertically like a rocket, but return to Earth and land on a runway like a glider. Therefore, the markings on the new spacecraft were designed in the traditions of both launch vehicles and aircraft. As the orbiter sits on the launch pad, mated to an external fuel tank and two solid rocket boosters, the most prominent markings are those painted on the wings. All space shuttles have featured the American flag on their wings. There have been three different configurations of wing markings. Columbia,

the first operational orbiter, originally featured the flag on the port (or left) wing and the letters *USA* on the starboard (or right) wing. As four new orbiters were added to the fleet they also had the flag on the port wing, but it was underneath the letters *USA*. On the starboard wing the new space shuttles included the orbiter name under the NASA Logotype. Since the 1992 decision to restore the use of the “Meatball”, the Logotype has been replaced with the NASA Insignia as each orbiter has undergone standard refits (Fig. 9, p. 161). The current configuration features the NASA Insignia on the port wing with the U.S. flag over the orbiter name on the starboard wing. There was some discussion of retaining the original markings on Columbia to preserve its unique appearance, but when the orbiter launched for the STS-109 mission on 1 March 2002 it sported markings which matched those of the other shuttles.¹⁴

There are two other U.S. flags on the exterior of the space shuttles. These conform to the markings used on aircraft. Flags appear on each side of the spacecraft between the top of the wings and the bottom of the payload bay doors. As the shuttle lands, the flags precede the words *United States*. On the port side the flag appears normally with the canton on the left, but the flag is reversed at starboard so that the canton is seen to the right of the stripes (Fig. 10, p. 161). While NASA receives many questions from the public about the “backwards” flag, this practice is consistent with markings on both government and commercial aircraft. According to one NASA publication, “the star field precedes the stripes in the direction of aircraft movement. The flag is placed on the aircraft in this manner so as to appear to be flying.” Orbiter markings are applied using a special paint made by adding pigments to a Dow Corning 3140 silicon base.¹⁵

Since 1981 another national flag has been a regular feature on many flights of the space shuttle. That flag is part of the “Canada wordmark” that is located on Canadarm, the Remote Manipulator System (or robot arm) that is used to maneuver cargo and astronauts in the orbiter’s payload bay. The arm was contributed by the Canadian Space Agency. In addition, payloads have often featured flags indicating the country that owns the hardware. Most notable was the European Space Agency’s Spacelab module that was used as an add-on laboratory on numerous space shuttle missions from 1983-1998. Spacelab was decorated with a logo that included the Spacelab emblem in the center surrounded by the national flags of ESA’s member nations and the ESA emblem. At the time that Spacelab was in use, ESA included 15 members – Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. When flags or other markings have appeared on payloads they have usually been arranged so that they will appear in photographs taken from the direction of the crew compartment.¹⁶

The flag tradition has continued as NASA and its international partners have worked to assemble the International Space Station since the first element was launched in 1998. NASA’s regulations specify, “U.S. components of the International Space Station (ISS) will carry only the U.S. national colors, the words *United States*, and/or *USA* and the NASA Insignia.” Likewise, the components contributed by other nations and space agencies display national colors and the emblems of those agencies. Russian elements feature the Russian tricolor, Canadarm2 includes the Canada wordmark with the maple leaf flag, and other modules have also included flags as national identifiers. Partners in the

Fig. 9: US FLAG AS SEEN IN THE CURRENT WING MARKINGS OF THE SPACE SHUTTLE

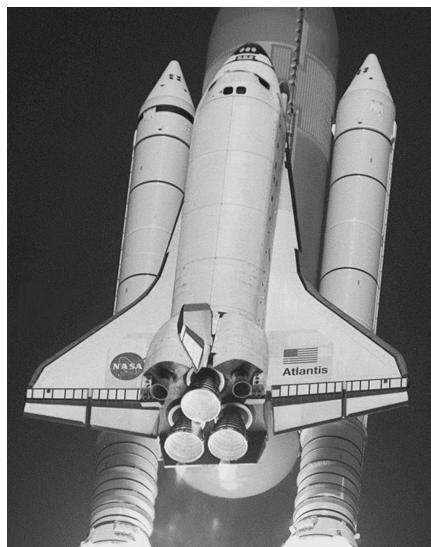


Fig. 10: U.S. FLAG AS SEEN IN THE CURRENT STARBOARD MARKINGS OF THE ORBITER

International Space Station include the United States, Canada, Japan, Russia, Brazil, and members of the European Space Agency.¹⁷

FLAGS ON SPACE SUITS AND MISSION PATCHES

On the second manned Gemini flight (Gemini 4) the U.S. flag as a national identifier on space equipment took on a new dimension. During that mission Edward H. White II became the first American astronaut to perform an extravehicular activity, or “space walk”, on 4 June 1965. To take advantage of the photo opportunity presented by this historic event, White and crewmate James A. McDivitt suggested the addition of flag patches to their space suits – the first time flags were used in this way by NASA. The astronauts purchased the flags themselves, but following their flight the space agency made the flag patch a regular feature on the space suits. Following this tradition, flags patches are now a regular feature of the flight suits and pressure suits of astronauts from many countries.¹⁸

Flags are also used as a national identifier on the patches designed for each mission. While the Gemini 4 crew chose to wear the U.S. flag on their space suits and thus started the tradition of flags on pressure suits, the crew of Gemini 5 adopted a special emblem to personalize their flight. A new tradition was established and every crew since then has had a unique mission patch. In the early days, patch design was an informal process with the crews choosing a simple design and obtaining approval from NASA. The process soon became more formal and the designs more professional. However, the crew is still responsible for the design concept for their patch. Today’s shuttle crews begin to design their

emblem almost immediately after they are assigned to a flight. They work together to determine what symbols they want on the patch to represent the nature of their mission. One member of the crew serves as the graphics coordinator to convey their ideas to one of the agency's graphic artists. NASA management always approves the finished designs before they are used. During the Gemini Program, the patches were embroidered onto the space suits. However, after the Apollo 1 crew died in a fire during a training exercise the patches were silk-screened onto fire resistant Beta cloth. All mission and flag patches used on space suits during the Apollo, Skylab, and Apollo-Soyuz missions were made of this special material. Shuttle and International Space Station astronauts display their emblems on embroidered shirts and on patches sewn to their launch/entry suits and to their flight suits.¹⁹

Many mission patches have featured patriotic emblems and motifs. Flags eventually became a part of mission patch designs, as well. Two Apollo crews used the first flag-motif patches. The patch for Apollo 1 had an implied U.S. flag as the border for their emblem while the Apollo 12 design showed a tall ship with a U.S. flag flying on its mast. Use of flags in mission patch designs became prominent when the development of the space shuttle allowed for frequent space flights. Flags have been used in several different ways in space shuttle mission patch designs. Some flag-based designs have included the U.S. flag as an emblem of national pride. These flags often appear as a background image, are substituted for the Earth, or are just placed somewhere on the patch. Other designs have incorporated an implied flag where features of a national flag appear in some way in the image to suggest the presence of a flag. In many of these

cases, the flag is incorporated into a flight path. Finally, flags of different nations have been used to represent the nationality of crewmembers or the international nature of a particular mission (**Figs. 11 and 12**). This final use of flags illustrates the variety of partners that NASA has worked with during the shuttle era: Canada, France, Germany, Italy, Japan, Russia, and other countries. Crew patch designs for International Space Station expeditions have incorporated similar flag motifs to those used during the Space Shuttle program.²⁰

THE BIGGEST FLAG OF ALL

Another flag used by NASA is worthy of note because of its massive size. For decades, the sight of a gigantic American flag painted on the side of the Vehicle Assembly Building (VAB) impressed visitors to the Kennedy Space Center in Florida. That building, originally designed for assembling the Saturn V rockets, was later adapted for combining the elements of the space transportation system – the orbiter (commonly called the space shuttle), external tanks, and solid rocket boosters. In 1976 as part of the nation's bicentennial celebration, the flag and the American Revolution Bicentennial Administration's emblem were painted on the building. The VAB became the focal point of the Bicentennial Exposition on Science and Technology, 3rd Century America that was held at the center that year. NASA sources say the flag is 209' x 110' [64 x 33.5 m] and covers an area of 23,437 square feet [2177 sq m]. Each of the fifty stars is approximately 6' [1.83 m] in diameter. The stripes are about 9' [2.74 m] wide and, according to NASA, are “as big as one of the buses used to transport visitors around KSC.” In 1998 the flag was re-

Fig. 11: THE FRENCH AND SAUDI FLAGS INDICATE THE CITIZENSHIP OF TWO CREWMEMBERS ON THE STS-51G PATCH



Fig. 12: WINGS BEHIND THE SHUTTLE ON THE PATCH FOR STS-60 FEATURE THE NATIONAL FLAGS OF THE UNITED STATES AND RUSSIA

painted and the NASA Insignia replaced the bicentennial emblem in honor of NASA's fortieth anniversary celebration (**Fig. 13**). The new flag required 510 gallons [1931 liters] of Devflex 4208 waterborne acrylic gloss enamel paint. Devoe Coatings donated all 550 gallons [2082 liters] of paint required for the operation. Painters working on six two-person platforms applied all of the paint using hand rollers and brushes. They could not use sprayers for fear that there could be damage to the vehicles and equipment housed inside of the building.²¹

FLOWN FLAGS

An interesting aspect of the use of flags in U.S. manned space flight is the phenomenon of "flown flags". Throughout the history of the program thousands of flags have been carried into space as mementos of specific flights. In the early days of Mercury and Gemini, NASA was fairly lenient about what the astronauts were allowed to carry on their missions. Many crewmembers chose to carry flags with them. Those flags were usually flown and then given to individuals or organizations. By the time of the Apollo Program the agency had formalized the procedures for flying mementos aboard spacecraft. Astronauts were allowed to carry personal items in their "Personal Preference Kit" or "PPK" (sometimes called an Astronaut Preference Kit or APK). These items were subject to approval by NASA officials before the flight. There was an unwritten understanding that items were not to be flown for profit. After an unfortunate incident on Apollo 15 where the crew carried 400 unauthorized first-day postal covers to the Moon, NASA began enforcing strict policies and procedures governing preference kit contents. Accord-

Fig. 13: U.S. FLAG AND THE NASA INSIGNIA AFTER THE VEHICLE ASSEMBLY BUILDING WAS REPAINTED



ing to the policy, each PPK carried in the Apollo lunar module was limited to 0.5 pounds and those in the command module could not exceed 5 pounds. All contents were limited to items for the astronaut's own use or for their use as personal gifts. Today astronauts are allowed to carry up to 20 items in their PPK. These items must fit in a bag 5" x 8" x 2" [13 x 20 x 5 cm] and the total weight must be less than 1.5 pounds. All contents are logged with the intended recipient's name and approved before the flight. Occasionally shuttle astronauts have carried flags in their PPKs, but most flags flown during the shuttle program have been part of the "Official Flight Kit" or OFK for shuttle missions. The OFKs have included items flown by the agency for use as official presentation items and at the request of an organization. While

the contents of the OFK are considered public information, the contents of the PPKs are private and are not released by NASA. Most astronauts do not choose to reveal information about their PPKs, making it impossible to compile a list of everything ever flown aboard manned U.S. spacecraft.²²

MERCURY AND GEMINI

The first reported U.S. flag flown in space and returned to Earth actually preceded the first manned flight of Project Mercury. On 11 August 1960, an 85-pound capsule that was flown for 16 orbits aboard the Discoverer XIII satellite was recovered after it splashed down in the Pacific Ocean off the coast of Hawaii. Among the contents of the capsule was a 50-star American flag that was presented to the U.S. president four days later. Alan Shepard's historic Mercury flight in 1961 was the first manned mission to carry a U.S. flag into space. As the story goes, the flag was purchased at Ann's Variety Store in Cocoa Beach on behalf of the faculty and students of Cocoa Beach Elementary School. Local reporter Doug Dederer passed it on to some McDonnell Douglas workers at the launch site, who rolled it up and placed it between some cables behind Shepard's head. After the flight, the flag was returned to the school and displayed in the library. Alan Shepard himself visited the school for the flag's dedication. The flag eventually ended up at the Smithsonian Institution. It was retrieved and flown again aboard NASA's 100th manned flight, STS-71, in 1995. It was then placed on exhibit in the lobby of the Astronaut Hall of Fame near the Kennedy Space Center in Florida.²³

There were other flags flown aboard later Mercury missions. For example, a small American flag carried by John

Glenn on his flight in 1962 was presented to the Smithsonian along with his Friendship 7 spacecraft and his flight suit. Glenn also carried a small National Geographic Society flag that had been sent to him by his friend, Geographic writer Kenneth Weaver, in January 1962. Weaver's note said, "With this letter you will find a tiny Geographic flag. I am most seriously suggesting and urging that you find some way to carry this with you on your flight. It is so tiny and so light that it could not possibly be a problem...". In August, Glenn sent the flag to Geographic Society President Melville Bell Grosvenor with a handwritten note and a small U.S. flag that had also flown aboard the flight. NASA also flew flags on the early manned missions that were intended for official presentations. Examples of that type of flag include a United Nations flag that was carried aboard Gemini 4 and then was presented to the U.N. Secretary General and a NASA flag that was flown aboard the Gemini 8 mission and presented to the NASA Flight Research Facility. However, after the sixteen missions of Mercury and Gemini "flown" flags were still considered to be rare items.²⁴

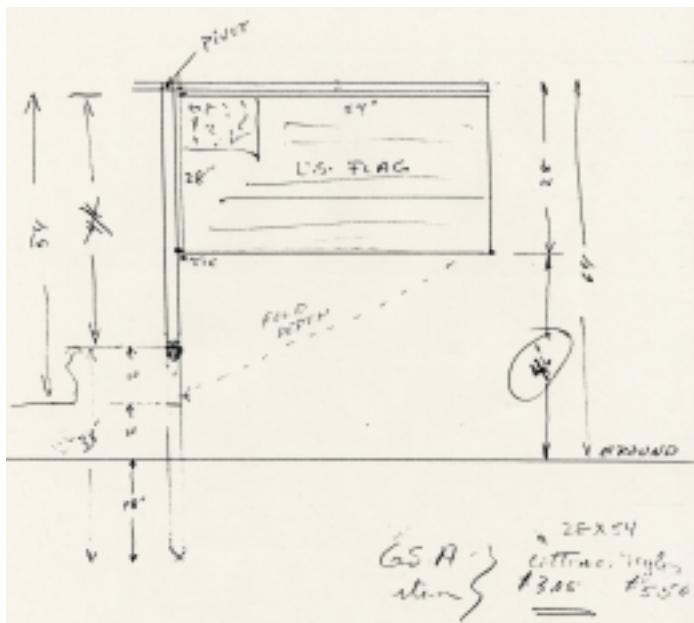
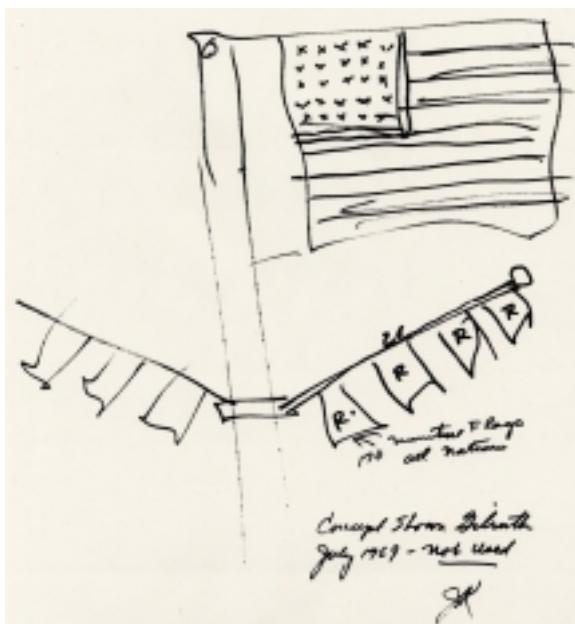
FLAGS ON THE MOON

As the Apollo manned lunar program progressed through the initial lunar orbital missions, spacecraft continued to carry flags without attracting attention. However, when it became apparent that a flag might be planted on the Moon a controversy occurred over NASA's use of flags. As planning progressed for the Apollo 11 moon landing, NASA Acting Administrator Thomas O. Paine created a Committee on Symbolic Activities for the First Lunar Landing. The committee was instructed to select symbolic activities that would "sig-

nalize the first lunar landing as an historic forward step of all mankind that has been accomplished by the United States" without giving the impression that the United States was "taking possession of the Moon" in violation of the United Nations Treaty on the Peaceful Uses of Outer Space. The committee considered several options including the possibilities of leaving a U.N. flag, a U.S. flag, or leaving a set of miniature flags of all nations on the surface. One preliminary sketch showed a flagpole on which a large U.S. flag would have been mounted above several crossbars that held miniature flags of other nations (Fig. 14). Another idea involved leaving a round carbon dioxide scrubbing canister with 4"x6" [10 x 15 cm] flags rolled up around the outside edge.²⁵

As the discussions continued, politicians and average citizens lobbied NASA to either carry, or not carry, specific flags. In particular, there was much heated discussion about the proposal that a United Nations flag be placed on the Moon. While the State Department urged that hoisting a U.N. flag would be a significant gesture of good will, members of the U.S. Congress threatened that such a plan would jeopardize continued funding of NASA activities. The House of Representatives even passed an amendment to the appropriations bill for fiscal year 1970 prohibiting NASA from deploying any flag other than that of the United States on missions paid for by the U.S. government. In the end, the Committee on

Figs. 14 and 15: PRELIMINARY SKETCHES FOR LUNAR FLAGPOLES SHOW A MULTI-FLAGPOLE THAT WOULD HAVE INCLUDED FOREIGN FLAGS BELOW THE U.S. FLAG (TOP) AND THE DESIGN THAT WAS ADOPTED FOR THE LUNAR FLAG ASSEMBLY (BOTTOM)



Symbolic Activities recommended planting only the flag of the United States and leaving a plaque (reading HERE MEN FROM THE PLANET EARTH FIRST SET FOOT UPON THE MOON JULY 1969, A.D. WE CAME IN PEACE FOR ALL MANKIND) to emphasize that the United States was not claiming the moon.²⁶

NASA engineers designed the “lunar flag assembly,” a flagpole with a horizontal bar at the top that allowed the flag to “fly” since there is no wind due to the Moon’s nearly non-existent atmosphere (Fig. 15, p. 171). The crossbar was threaded through a hem at the top of the flag and then hinged to the upper section of the pole. Made of anodized aluminum tubing, the lunar flag assembly incorporated a standard 3' x5' [.91 x 1.52 m] nylon flag. In all, the apparatus weighed 9 pounds and 7 ounces. It was stowed in a special insulating shroud on the left handrail of the ladder on the lunar module. Once on the Moon, the astronauts removed the protective cover and deployed the flag assembly. To “unfurl” the flag, the crew extended the crossbar and raised it up past a catch that was designed to keep it in position. They then placed the pole into the base section that they had driven into the lunar surface using their rock hammer. On 20 July 1969 people around the world watched as the Apollo 11 astronauts set up the first of six American flags to be planted on the lunar surface. Following the Apollo 12 mission when the catch failed to hold up the crossbar, NASA made some changes to the horizontal bar mechanisms. They also changed the storage location so that the flag assembly was flown in the modularized equipment stowage assembly of the lunar module descent stage.²⁷

Since the end of the Apollo missions, NASA has received numerous inquiries about the status of the flags left on the

moon. While no one can know the condition of the flags for certain, there are a number of conclusions that can be drawn based upon the evidence we have and what we have learned about the lunar environment. One possibility is that one or more of the flags may have been blown over by the engine blast when the astronauts left the lunar surface. The Apollo 11 flag is one that most likely met this fate. During the crew's technical debriefing, astronauts Neil Armstrong and Edwin "Buzz" Aldrin noted that they had some difficulties in deploying the flag. During the Apollo 11 Post-flight Crew Press Conference, Aldrin commented on problems with planting the flag:

We had some difficulty at first getting the pole of the flag to remain into [sic] the surface. In penetrating the surface, we found that most objects would go down about 5" [13 cm] maybe 6" [15 cm], and then it would meet with a gradual resistance. At the same time there was not much of a support force on either side, so we had to lean the flag back slightly in order for it to maintain this position.

In his memoirs, Aldrin recalled that the flag "didn't look very sturdy." On some occasions, he reportedly has said that he saw it fall, although these comments have only been reported second-hand. Since there is no footage of the Apollo 11 liftoff from the lunar surface that shows the flag, it is difficult to know for sure. As for the flags from the other Apollo missions, the crews usually erected the flags farther away from the lunar module than on the first landing mission. Since there is no video of the Apollo 12 ascent, so again there

is no evidence that the flag either remained standing or that it fell. The flag for the aborted Apollo 13 mission was still attached to the lunar module when the crew jettisoned the vehicle that served as a lifeboat to get them back to Earth. Apollo 14 mission film (JSC-563) clearly showed that the flag from that mission remained standing after liftoff even though it was shaking violently from the engine blast. Another video taken during the Apollo 16 mission also showed the flag standing as the crew left the surface.²⁸

Assuming that one or more of the flags remained standing, it is likely that the condition of each flag has changed significantly after decades of exposure to the harsh lunar environment. Nylon on the Earth's surface will deteriorate as a result of prolonged exposure to ultraviolet light, a phenomenon commonly referred to as "sun rot." While it is uncertain whether or not sun rot requires an oxygen atmosphere, it is clear that materials on the lunar surface are prone to damage from high levels of cosmic radiation. On Earth, the magnetic field and the atmosphere prevent most of these particles from reaching the surface – protection that is not provided by the Moon's weak magnetic field and tenuous atmosphere. The primary damage from radiation can be seen as radiation darkening, a process that will make white objects appear tan. This discoloration was evident on items from the Surveyor 3 robotic spacecraft that were retrieved by the crew of Apollo 12. Scientists examining the Surveyor parts noted that nylon ties from the spacecraft were discolored after exposure to radiation for 942 Earth days. The Apollo flags have been on the lunar surface significantly longer and, if they have not experienced sun rot, have surely been discolored as a result of radiation exposure.²⁹

Another threat to the flags is bombardment by micrometeoroids, small particles less than a millimeter in diameter that hit the lunar surface frequently. Again, the Earth is spared because these objects burn up in the atmosphere. Micrometeoroids would most likely go right through a flag as they travel at a velocity of 13 to 18 kilometers per second (13,000-18,000 m/sec). For comparison, air guns usually fire a bb that is 4.5 millimeters in diameter at a velocity of 83 to 99 meters per second. Micrometeoroids are about one quarter the size of a bb and travel 130-180 times faster. Experts on the lunar environment frequently name micrometeoroids as one of the biggest threats to materials on the lunar surface. In fact, even at the time of the Apollo 11 mission *Business Week* quoted a “high NASA official” who implied that the flag would probably not last long because “it isn’t protected against damage by micrometeoroids.” Regardless of whether or not the flags survived, their significance as symbols of the accomplishments of the U.S. manned space program remains.³⁰

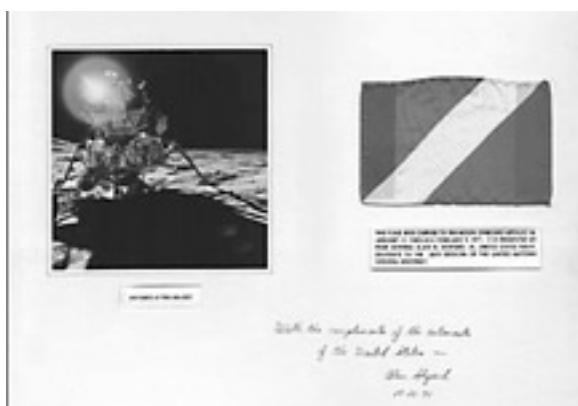
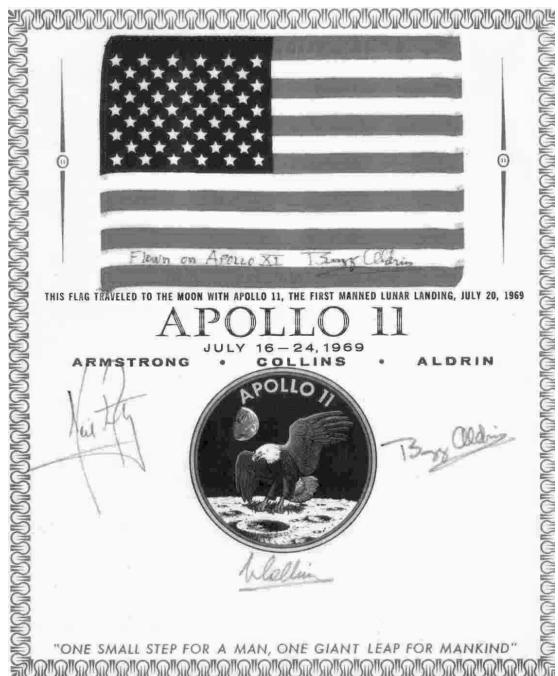
OTHER FLAGS OF APOLLO

There were two other large U.S. flags flown on the Apollo 11 mission. These were 5' x 8' [1.52 x 2.44 m] flags carried in the command module. Both flags were flown over the national Capitol before the mission and then again after the flight. They were then presented to the House and the Senate. Besides the large flags there were also a number of 4" x 6" [10 x 15 cm] flags carried to the surface in the lunar module and returned to Earth for presentation to governors and heads of state. Included were the flags of 136 nations (including members of the UN) and flags for each of the 50 states,

the District of Columbia, and U.S. territories. The flag list also included the flag of the United Nations. Following the flight, these flags were mounted on plaques along with clear orbs containing small amounts of lunar material. Today many of these displays can be found on exhibit in museums around the world.³¹

Small flags flown as part of the official flight kit on the Apollo missions were packed in a small pouch and were listed on the manifest as the "flag kit." The flag kit for Apollo 12 contained the same set of flags as that of Apollo 11. It weighed 0.7 pounds and was initially stowed in the lower lunar overshoe compartment of the lunar module ascent stage. Once the Moon walkers had docked with the command module the astronauts transferred the flag kit to that spacecraft for the return trip to Earth. Similar flag kits were flown on later Apollo missions as well, but the contents varied. The Apollo 13 mission omitted the national flags, carrying 25 small U.S. flags and a flag for each of the 50 states. Apollo 14 and Apollo 15 each carried 25 4" x 6" [10 x 15 cm] U.S. flags, sets of U.S. state and territorial flags, and flags of U.N. members. For the Apollo 16 flight, scheduled for April 1972, the State Department recommended inclusion of a number of flags that had not been flown on earlier Apollo missions. Some of the additions were newly independent nations, but others were politically inspired. Among these were the inclusion of the flags for the Byelorussian S.S.R. and Ukrainian S.S.R. that had been omitted from earlier flights in spite of their status as members of the United Nations. Three other Soviet Republics (Estonia, Latvia, and Lithuania) were also added to the list, but their pre-Soviet flags were flown because the United States never recognized their annexation to the Soviet Union. The press kit for the mission subtly emphasized

Figs. 16 and 17: EXAMPLES OF FLOWN FLAGS FROM APOLLO MISSIONS. FLAGS WERE ATTACHED TO CERTIFICATES AND PLACED ON DISPLAYS FOR FORMAL PRESENTATIONS.



this point by stating that the mission would carry the "flags of other national states which are generally accepted as independent in the world community." Perhaps the most significant change was that flags were flown both for the Republic of China (Taiwan) and for the People's Republic of China. This reflected the warming of relations between the United States and the mainland that culminated in President Richard M. Nixon's visit to China in the months before the flight. Flags of international organizations besides the UN were also on the list, including those of the Council of Europe, the Olympic Games, the Organization of African Unity, and the Organization of American States. In addition, a 4' x 6' [1.22 x 1.83 m] flag of the Olympic Games was flown in the Command Module in anticipation of the summer games which were to be held in Munich that summer. Apollo 17, the last mission to the moon, also carried a variety of flags. Flags flown on the Apollo missions were usually mounted on certificates after the flights or incorporated into formal presentation items (*Figs. 16 and 17, p. 177*).³²

Another interesting use of flown flags came during the Apollo-Soyuz Test Project in which the spacecraft of two nations docked for the first time in orbit. Three astronauts from the United States and two cosmonauts from the Soviet Union joined together in a display of international cooperation in space. Of course, flags played a prominent role in the ceremonial greetings. While the two spacecraft were docked in orbit, the crews exchanged five U.S. flags (8" x 12", 20 x 30 cm) for five Soviet flags (205 x 410 mm, 8" x 16"). Each nation also flew flags that were not exchanged. These included a 3' x 5' [.91 x 1.52 m] U.S. flag, a 3' x 6' Soviet flag, and five of each flag the same size as the exchange items.

Perhaps the most significant flag flown as part of Apollo-Soyuz, in terms of representing the importance of the first international docking mission, was a 3' x 5' [.91 x 1.52 m] flag of the United Nations that was carried up on the Soyuz spacecraft and returned to Earth with the Apollo crew.³³

FLAGS FLOWN ON THE SPACE SHUTTLE

As human space flight became more frequent with the introduction of the space shuttle, the number of flags flown in space increased dramatically. NASA regularly flew flags for organizations and stockpiled hundreds of flown flags to be used as presentation items and awards. These flags have been listed on the manifest for the Official Flight Kit for each flight. The OFK manifest for STS-105, flown in 2001, listed over 1500 flags and banners including the following 4" x 6" [10 x 15 cm] flags: 322 U.S. flags; 2 sets of flags for U.S. states and territories; 3 sets of flags for UN members; 5 Russian flags; 5 Ukrainian flags; 6 Texas flags; 1 set of Russian territorial flags; 22 California flags; 2 Georgia (state) flags; 2 Hawaii flags; 5 Virginia flags; 5 Massachusetts flags; 2 Vermont flags; 1 Delaware flag; 20 U.S. Air Force flags; 20 Army flags; 20 Marine Corps flags; 3 U.S. Army Space Command flags; 20 U.S. Coast Guard flags; 20 U.S. Navy flags; 10 Alabama flags; 100 Discovery (orbiter) flags; and 100 International Space Station flags. In addition there were 5 Canadian flag patches; 15 3½" x 5" [8.89 x 12.7 cm] Italian flags; 30 5" x 8" [12.7 x 20.32 cm] Italian flags; 15 3½" x 5" [8.89 x 12.7 cm] Italian Space Agency (ASI) flags; a 2' x 3' [.61 x .91 m] banner for Hawaiian Airlines; a 2' x 3' [.61 x .91 m] banner for Acacia Elementary School (Thousand Oaks, CA); an

Instructor's flag (12" x 19½" [.30 x .50 m]) for the Hawaii Life-guard Surf Instructors; a 3' x 5' [.91 x 1.52 m] United States flag for Ventura County Discovery Center (Thousand Oaks, CA); a 3' x 5' [.91 x 1.52 m] banner of the United States Tennis Association; a 2' x 3' [.61 x .91 m] American Legion banner for the South Hadley (Massachusetts) American Legion; a 3' x 5' [.91 x 1.52 m] university banner for Princeton University; a 3' x 5' [.91 x 1.52 m] banner for the Sylvan Rodriguez Foundation (Houston, TX); a 3' x 4'2" [.91 x 1.22 m]; guidon for the U.S.A. Aviation Technical Test Center (Fort Rucker, AL); an 18" x 24" [.46 x .61 m] school banner for Keene Mill Elementary School (Springfield, Virginia); a 20" x 26" [.51 x .66 m] guidon for Company A-2 at West Point (U.S. Military Academy); a 24" x 40½" [.61 x 1.03 m] U.S. Military Academy bicentennial flag; and a 2½' x 3½' [.76 x 1.07 m]; International Space Station banner that was launched on STS-104 and returned to Earth on STS-105. Manifests for other shuttle flights have included a similar collection of flags and banners.³⁴

While NASA regularly flies flags for different organizations, one "flown" flag has been given a lot of attention because of the events associated with its flight. The National School Public Relations Association introduced the "Flag of Learning and Liberty" in 1985. When Christa McAuliffe was selected to be NASA's first teacher in space it opened the door for this flag to fly on the shuttle. However, when Challenger exploded shortly after takeoff, killing McAuliffe and her crewmates, this flag took on new significance. It was one of the items recovered among the debris of the space-craft. Over a year after the accident, NASA returned the flag to the NSPRA attached to a certificate memorializing the Challenger crew.³⁵

The most significant mission in the context of flown flags was STS-108, launched in December 2001. That mission included the "Flags for Heroes and Families" program that was initiated in response to the terrorist attacks of 11 September 2001 ("9/11"). In addition to the normal horde of flags flown on board the shuttle were 6000 U.S. flags (4" x 6" [10 x 15 cm]) intended for presentation to families of the victims and to members of emergency response teams. Following the flight, the flags were assembled into commemorative packages that were sent to the New York Mayor's office for distribution. This unprecedented distribution of flown flags was not NASA's only recognition of the events of 9/11. In addition to patches and badges representing New York's emergency services agencies, a damaged flag recovered from the debris of the World Trade Center was flown on the mission. Mission Commander Dom Gorie described the flag and what it meant to fly it on the shuttle:

This was found among the rubble and it has a few tears in it. You can still smell the ashes. It is a tremendous symbol of our country... Just like our country, it was a little battered and bruised and torn, but with a little bit of repair it is going to fly as high and as beautiful as it ever did. And that is just what our country is doing.

After the mission, this flag was presented to the city of New York in a special ceremony held on Flag Day, 14 June 2002, at the American Museum of Natural History.³⁶

PROGRAM, MISSION, AND PAYLOAD FLAGS

Another special use of flags in the manned space program has been the creation of flags to represent particular programs, missions, or payloads. The first documented program flag was the one for Project Gemini. This flag was swallow tailed with the Gemini program identifier (Fig. 18) on a light blue field. Constructed of lightweight parachute nylon, the flag was made by the Parachute Support Section of the Manned Spacecraft Center's Technical Services Division. The flag, along with a U.S. flag made at the same time, was carried aboard the Gemini 3 spacecraft that completed three orbits of the Earth on 23 March 1965. Following splashdown the flags were used to welcome the astronauts back to Houston. Both flags were flown on a pole outside Building 1 at MSC for the duration of each subsequent Gemini mission. The flags were lowered after the splashdown of Gemini 12 and were retired to a display case in the lobby of the center's auditorium (Fig. 19). For many years, the Gemini flag was exhibited in a museum located behind the auditorium in Building 2. When a new visitor center, Space Center Houston, was constructed the exhibits in Building 2 were retired and the flag was placed in storage. Eventually the flag's significance was forgotten and it was loaned or given to some institution for an exhibit on Project Gemini. Unfortunately, the JSC Public Affairs Office does not know the current location of the Gemini flag.³⁷

During the Space Shuttle Program, the use of program flags became more formal. They became a symbolic focal point of NASA's Space Flight Awareness Motivation and Recognition Program. Originally referred to as the "Manned



Figs. 18 and 19: DETAIL OF THE GEMINI PROGRAM
IDENTIFIER AND THE GEMINI FLAG AS IT WAS
LOWERED AFTER THE FINAL MISSION



Flight Awareness" program, it was established after Gemini "to infuse the space program with a renewed and strengthened consciousness of quality and flight safety." During the shuttle era, NASA began to use new program flags and created a different flag for each orbiter. All Shuttle orbiter flags have a white field with a blue triangle on top and a red triangle on the bottom. Two sides of the blue triangle meet at the top of the hoist with one side forming the top of the flag and the other angling down toward the fly. The final side of the triangle forms one quarter of the fly end of the flag. At the bottom of the flag, the red triangle runs just the opposite with one side running one quarter of the way up the hoist and the other two sides meeting at the lower corner at the fly. The combination of the triangles forms a large white stripe that angles down from the upper hoist to the lower fly of the flag. Each flag features the name of the orbiter in blue upper-case letters written horizontally across the white background. A silhouette of an orbiter in flight with open payload doors substitutes for one letter in the shuttle name or is superimposed over it. For example, it substitutes for the second "A" on the Atlantis flag and for the "A" in "Endeavour" on the flag for that orbiter (**Figs. 20 and 21**). On the flags for Columbia and Discovery the silhouette overlaps the "O" in each name (**Figs. 22 and 23**). In the upper left-hand corner of each flag there is a red logo that features the Earth with an elliptical orbit. Lettering in front of the orbit reads "Manned Flight Awareness" above the NASA Logotype. Full-sized versions of the orbiter flags were flown at various installations such as the Johnson Space Center throughout the duration of each space shuttle mission. At the Kennedy Space Center they were seen on display while the shuttle is on the pad awaiting launch. In addition, numerous 4" x 6" [10 x 15

Figs. 20-23: THE ORBITER FLAGS



cm] versions of these flags have been flown on space shuttle missions and awarded to NASA and contractor employees in recognition of their contributions to the program.³⁸

With the inception of the International Space Station Program, new flags were created for that program. The first was the “Phase 1 Flag” named for the preliminary program in which American astronauts served aboard the Russian Space Station Mir and the space shuttle made several trips to dock with the space station (Fig. 24). That flag was slightly similar to the orbiter flags in that the field is white with red and blue “stripes”. However, instead of triangles forming a modified horizontal tricolor, the red and blue portions are angled stripes at hoist and fly, giving the impression of a vertical tricolor. At the hoist, the red stripe begins at a point 1/6th of the length at the bottom of the flag and angles up to a point 1/4th of the length at the top. The blue stripe at the fly begins at a point 1/4th of the length at the bottom and angles up to a point 1/6th of the length from the fly above. On the angled white stripe was the complex Phase 1 insignia (Fig. 25) that featured the shuttle docked to Mir in orbit above the Earth. Writing on the outside read “NASA SHUTTLE” in English at left and RKA (for the Russian Space Agency) and MIR in Russian at right (PKA МИР). The Shuttle-Mir flag did not include the Space Flight Awareness logo. The flag was flown at NASA installations while the Americans were present on Mir and small versions of the flag were carried aboard the orbiters on the docking missions for use on recognition certificates.³⁹

There are also several unofficial flags of the International Space Station. Two different designs have been flown on one of the main flagpoles at the Johnson Space Center. During shuttle missions the orbiter flag has been flown beneath

Figs. 24 and 25: THE PHASE 1 (SHUTTLE-MIR) FLAG
AND DETAIL OF THE PHASE 1 INSIGNIA



this ISS flag. The first flag was white and featured an emblem for the International Space Station that had been widely used at the Johnson Space Center (Fig. 26). As with the other Space Flight Awareness Flags, shuttle manifests show that small versions of this ISS flag have been flown on shuttle missions as mementos. The second JSC space station flag is blue with a disc-shaped ISS emblem (Fig. 27). Flags of the participating countries border the outside edge of the badge. The flag is currently in use at the Johnson Space Center. However, NASA has not considered these flags to be official, apparently because the emblems had not been approved to represent the program. With no official flag for the program, at least one variant has appeared at another NASA center. An article in *USA Today* (online) revealed a second unofficial ISS flag in use at the Glenn Research Center in 2006 (Fig. 28). On a blue field, a darker blue rectangle is offset toward the hoist. In the rectangle are an illustration of the International Space Station and a star field in white. At the upper left-hand portion of the rectangle, nearest the hoist, is the NASA insignia and in the upper right-hand corner of this area is the Space Flight Awareness logo. Two rows of lettering, running parallel to the fly, fill the area between the rectangle and the fly of the flag. The lettering in the first row is white and reads "INTERNATIONAL", while the second row reads "SPACE STATION" in yellow. Presumably, if an official emblem is ever issued there will also be an official flag for the International Space Station Program. Until that time, multiple flags will likely be used to represent the program.⁴⁰

In addition to program flags, there have also been unofficial flags made to represent specific shuttle missions or payloads. The three mission flags documented by the author were all used after the Columbia disaster in 2003, in

Figs. 26-28: DETAIL OF ISS LOGOS USED AT JSC AND PHOTO OF ISS FLAG FLOWN AT GLENN RESEARCH CENTER



which the Space Shuttle Columbia disintegrated during re-entry. It is impossible to document whether similar flags were used before the accident or if there have been flags for other missions than those described. The three flags found were purchased on e-Bay from a seller who received them from an employee at the Kennedy Space Center. They were distributed in celebration of the launches. All three flags were blue with the NASA Insignia over the Space Flight Awareness logo in the upper and middle hoist. Flags for STS-115 and STS-116 featured the mission patch running from top to bottom at the hoist and taking up approximately half the area of the flag (**Figs. 29 and 30**). The mission name ran along the bottom of the flag between the patch and the fly (in orange for STS-115 and in yellow for STS-116). The flag for STS-121 had the mission patch centered over the words STS-121 LAUNCH in yellow running the length of the flag along the bottom. White lettering reading "National Aeronautics and Space Administration" ran above the patch starting at the hoist and ending just before the NASA Insignia (**Fig. 31**).⁴¹

Payload flags are flags designed for specific payloads which have flown on the Space Shuttle. These 4" x 6" [10 x 15 cm] flags have been seen displayed at some of the workstations in the Mission Control Center during missions and have been flown as mementos for employees who contributed to the work required to fly the payload on the shuttle. Four examples of payload flags are the flag for the U.S. Microgravity Laboratory 1 (USML-1) flown on STS-50, one for the United States Microgravity Payload 1 (USMP-1) flown on STS-52, the flag for USMP-2 (STS-62), and a flag for the first flight of the Tethered Satellite System (TSS) on STS-46. All these flags featured payload logos on a white field. The USML-1 flag included the logo at the hoist with lettering at

Figs. 29-31: MISSION FLAGS FOR STS-115, STS-116, AND STS-121



the fly. Large letters filled with a “U.S. flag” pattern spelled “USML-1” above smaller letters that read “COLUMBIA” over “STS-50” in light blue (Fig. 32). USMP-1 was represented by a flag that incorporated the diamond-shaped logo for the payload in the center with light blue lettering that ran down the hoist that read “COLUMBIA” and down the fly that read “STS 52” (Fig. 33). The flag for USMP-2 was similar to the one for the previous USMP mission, except that the USMP-2 logo was included and the flight name was updated to “STS-62” (Fig. 34, p. 195). The TSS flag had the payload logo with “Atlantis” in black letters running parallel to the hoist and “STS-46” running parallel to the fly. Because this last payload was a cooperative program between NASA and the Italian Space Agency, both the U.S. and Italian flags appeared on the payload logo (Fig. 35, p. 195).⁴²

HOW MUCH IS A “FLOWN” FLAG WORTH?

In recent years, a number of “flown” flags have been sold as part of the booming market in space collectables. While NASA regulations prohibit astronauts from selling items flown in their personal preference kits, there is no such regulation to prevent recipients of mementos from selling these objects. Items from early missions, because of their relative rarity, fetch the highest prices. A search of space collector’s sites on the World Wide Web in 2002 turned up a number of “flown flags” for sale. For example, several 4" x 6" [10 x 15 cm] flags flown on various Apollo missions were available: a U.S. flag from Apollo 11 was offered for \$25,000; a Nevada flag flown during the Apollo-Soyuz mission was listed at \$1950; and a U.S. flag from Apollo 7 was for sale for \$3995. Other flags besides those in the flag kit have also come on

Figs. 32-33: PAYLOAD FLAGS FOR USML-1 AND USMP-1



the market. An example of one of these is a 7" x 10" [.18 x .25 m] Associated Press flag that was in a bag carried on the lunar surface during the Apollo 15 mission and later presented to an AP space reporter. That flag was available for \$9500. Even though flags flown aboard the shuttle are more common, the fact that they were flown in space increases their value. A Shuttle-Mir program flag flown in 1998 aboard STS-91, the last shuttle mission to dock with the Mir space station, was posted for \$300 – a high price for a recently flown 4" x 6" [10 x 15 cm] flag. Collectors are often willing to pay such prices because most recipients of flown flags are hesitant to part with them, thereby reducing availability.⁴³

The popular online auction site, eBay, is also a frequent venue for the sale of flown flags. A sampling over a two-month period in 2007 found that over 20 such flags flown on NASA flights were sold during that period. One flag from Project Mercury sold for \$4750. Five flags from Gemini flights all sold for over \$1000 – one from Gemini 4 sold for \$1200, one from Gemini 5 sold for \$1450, one from Gemini 7 went for \$8000, and two from Gemini 9 sold for \$8000 and \$8500. Apollo flags ranged in price from \$1000 to \$8000 – two from Apollo 7 (\$1700 and \$6000), one from Apollo 9 (\$5000), two from Apollo 11 (\$2500 and \$5250), one from Apollo 12 (\$8000), as well as two from Apollo 15 (\$2000 and \$3600). A flag from Skylab sold for \$525 and one from Apollo-Soyuz had a winning bid of \$700. Six flags flown on space shuttle flights ranged in prices from \$87 to \$190.⁴⁴

Online auctions are not the only venue for selling “flown” flags. A number of these flags have shown up on the live auction circuit as well. When Christie’s held its Space Exploration auction on 18 September 1999, 12 flags were offered for sale. While some of the flags did not sell because no bids

Figs. 34-35: PAYLOAD FLAGS FOR USMP-2 AND TSS



reached the set reserve price, other flags fetched impressive prices. A flag flown on Apollo 12 brought the highest price - \$11,500 (including the buyer's premium). Three other flags, assumed to be 4" x 6" [10 x 15 cm] flags since these are most common, were sold. These were a U.S. flag carried on Apollo 7 (\$4025), a mission patch and U.S. flag flown on Apollo 9 (\$4200), and a Texas state flag carried aboard Apollo 11 (\$8625). At an auction held by Aurora Galleries International in April 2002, a total of 12 "flown" flags were sold. Flags from the Apollo Program produced the highest bids. Among these were several 4" x 6" [10 x 15 cm] flags: a U.S. flag from Apollo 9 (\$2500), a U.S. flag flown on Apollo 12 (\$3250), a Canadian flag carried on Apollo 13 (\$2400), a U.S. flag flown in the Apollo 15 command module (\$2000), and a U.S. flag that was carried on the lunar surface by Astronaut David Scott during Apollo 15 (\$12,000). In addition, a 6" x 9" [.15 x .23 m] Kansas flag flown on the Apollo 16 mission sold for \$1000. Shuttle-era flags brought lower prices. Of the 4" x 6" [10 x 15 cm] flags, a U.S. flag flown aboard STS-30, and a set with flags of the U.S. and of the American Institute for Aeronautics and Astronautics from STS-41B, each fetched a price of \$275. Two flags flown to the International Space Station on STS-105 and returned to Earth on STS-108 by a Russian cosmonaut also were sold (3" x 6" [.08 x .15 m] U.S. for \$425 and 3" x 6" Russia for \$350). The value of these items will doubtless continue to increase.⁴⁵

CONCLUSION

As with many government agencies, the National Aeronautics and Space Administration has developed a complex system of symbols to represent itself and its programs. Ini-

tially, NASA was represented by an official seal, a flag featuring that seal, and an insignia. When the agency updated its symbols and introduced the NASA Logotype, it stopped using the NASA Insignia that had been associated with many of the Agency's successes. That decision was unpopular with NASA employees and eventually the decision was made to phase out the logotype in favor of the insignia.

Because the U.S. space program was a product of the Cold War it is not surprising that the United States flag became an important symbol used by NASA. Flags were used as national identifiers on manned spacecraft as early as Project Mercury. That practice has continued to the present, and most manned spacecraft that have been used in the American space program have been marked with a United States flag. As NASA began to partner with other nations, their flags also were incorporated as national identifiers on space hardware such as the Canadarm, Spacelab, and elements of the International Space Station. National flags have also been used on NASA's space suits since Project Gemini and on numerous mission patches since the Apollo Program.

Flags have been carried as souvenirs on every manned space flight of the American space program. During the Mercury and Gemini flights, a very small number of flags were flown on each flight. As part of the extravehicular activity for each of the six Apollo Moon landing missions, a large United States flag was left on the lunar surface. While those six flags were the most visible of the Apollo flown flags, there were many more flags flown during this program than had been during the earlier ones. During the time of the Apollo Program the agency began an organized program of flag presentation and some flights carried flags from every U.S. state and from every member nation of the United Na-

tions. This tradition continued into the Space Shuttle era and it was not unusual for hundreds of flags to be flown on any given mission.

It is this use of flags as mementos that is perhaps the most interesting aspect of flags in space. Although thousands of flags have been flown on spaceflights, for the recipients of "flown" flags and for collectors of space memorabilia these flags are seen as items of great value. In this context, the "flown" flags have now become souvenirs and collectables, as well as symbols of nations and human achievements in manned space flight.

NOTES

At the time that much of the archival research for this paper was conducted, the Johnson Space Center History Office held an extensive collection of materials about the manned space program. Since then, budget cuts have resulted in the dispersal of this collection to a number of locations. In 2001 the University of Houston - Clear Lake (UHCL) signed a memorandum of understanding with NASA JSC and the National Archives and Records Administration (NARA) to house the collection. The bulk of the JSC History Collection — materials on Apollo, Skylab, Apollo-Soyuz, MSC/JSC, and general history of human spaceflight — is now located in the library at UHCL. The materials from the collection dealing with Mercury and Gemini are in the custody of NARA.

1. While the term "American" can properly be applied to describe anything pertaining to the American continents, for the purpose of this paper it will be used to refer to the United States of America.
2. NASA Headquarters History Office, "NASA 'Meatball' Logo," web page, <http://history.nasa.gov/meatball.htm> [accessed 21 May 2002, URL no longer valid]; "Establishing a Seal for the National Aeronautics and Space Administration," Executive Order 10849, *Federal Register* 24 no. 233 (1 December 1959), p. 1; "Amendment of Executive Order 10849 Establishing a Seal for the National Aeronautics and Space Administration," Executive Order 10942, *Federal Register*, vol. 26 (23 May 1961), p. 4419; James S. Cook, Jr., letter to the Commission of Fine Arts, 17 February 1959, on file at the U.S. Army Institute of Heraldry; NASA Policy Directive (NPD) 1020.1, 12 December 1963, p. 1, Attachment A; NASA Policy Directive

(NPD) 1020.1/NASA Management Instruction (NMI) 1020.1, revisions A-G, 13 September 1967 through November 24, 1987, all on file in the JSC History Collection. "Establishment of the NASA Seal," *Code of Federal Regulations* Title 14, Pt. 1221.102, 2002 ed.; "Use of the NASA Seal," *Code of Federal Regulations* Title 14, Pt. 1221.109, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002]; NASA Image S73-33151.

3. "Lackluster Medals," *Time*, vol 77 (19 May 1961), p. 84; Philip B. Meggs, "The Crash of the NASA Logo: It Could Have Been Worse!" *AIGA Journal of Graphic Design*, vol. 10, no. 4 (1992), reprinted in *Design Culture: An Anthology of Writing From the AIGA Journal of Graphic Design*, ed. by Steven Heller and Marie Finamore (New York: Allworth Press, 1997) p. 62-65. Meggs' use of the term "Meatball" refers to the nickname that NASA employees use to describe the NASA Insignia. This symbol is discussed in a later section.

The design of the NACA seal featured "a pictorial representation of the Wright brothers' first airplane, with pilot, taking off from a launching rail laid on the sand at Kitty Hawk, North Carolina, equipment in the foreground, and a man running by the side of the airplane." Files of the U.S. Army Institute of Heraldry regarding the seal of the National Advisory Committee for Aeronautics.

4. NASA Policy Directive (NPD) 1020.1, 12 December 1963, p. 4-5, Attachment C; NASA Management Instruction (NMI) 1020.1E, 18 March 1976, p. 3-4, 6-7, Attachment D. "Establishment of the NASA Flags," *Code of Federal Regulations* Title 14, Pt. 1221.106, 2002 ed.; "Use of the NASA Flags," *Code of Federal Regulations* Title 14, Pt. 1221.113, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002]. The small NASA flags were flown aboard STS-26, the first mission after the Challenger accident, to celebrate NASA's "Return to Flight." STS-26 certificate with flown flag in the possession of Richard O. Drake; 4" x 6" flag in the collection of the author.

5. NASA Policy Directive (NPD) 1020.1, 12 December 1963, p. 5; Andrew Pedrick, NASA Headquarters Library, personal communication, 3 July 2002. "Establishment of the NASA Administrator's, Deputy Administrator's and Associate Deputy Administrator's Flags," *Code of Federal Regulations* Title 14, Pt. 1221.107, 2002 ed.; "Use of the NASA Flags," *Code of Federal Regulations* Title 14, Pt. 1221.113, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002].

6. Most sources date the nickname "Meatball" to 1975 and attribute the term to the dissatisfaction of many NASA employees with the NASA Logotype insignia introduced that year. More discussion of the Logotype

follows later in this paper. NASA Policy Directive (NPD) 1020.1, 12 December 1963, p. 2-4; NASA Policy Directive (NPD) 1020.1A, 13 September 1967, p. 1-4; NASA Management Instruction (NMI) 1020.1G, 24 November 1987, p. A-4; NASA Headquarters History Office, "NASA 'Meatball' Logo," web page, <http://history.nasa.gov/meatball.htm> [accessed 21 May 2002, URL no longer valid]; NASA Office of Policy and Plans, "Biographies of Aerospace Officials and Policymakers, K-N," web page, <http://www.hq.nasa.gov/office/pao/History/biosk-n.html> [accessed 21 May 2002]; NASA Headquarters, Office of Public Affairs, "History of the Insignia," web page, <http://www.hq.nasa.gov/office/pao/insignia/text/insignia.html> [accessed 21 May 2002]; "It's Back to the Future: Old NASA Logo Better," *Florida Today* (29 May 1992). "Establishment of the NASA Insignia," *Code of Federal Regulations* Title 14, Pt. 1221.103, 2002 ed.; "Use of the NASA Insignia," *Code of Federal Regulations* Title 14, Pt. 1221.110, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002]; NASA Image S63-12359.

7. NASA Policy Directive (NPD) 1020.1, 12 December 1963, p. 2-4; NASA Policy Directive (NPD) 1020.1A, 13 September 1967, p. 1-4; NASA Management Instruction (NMI) 1020.1G, November 24, 1987, p. A-4. "Establishment of the NASA Insignia," *Code of Federal Regulations* Title 14, Pt. 1221.103, 2002 ed.; "Use of the NASA Insignia," *Code of Federal Regulations* Title 14, Pt. 1221.110, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002].

8. *Manager's Guide to NASA Graphics Standards*, NASA Handbook (NHB) 1430.2, 1983, p. 6-9; Meggs, "The Crash of the NASA Logo: It Could Have Been Worse!". "Establishment of the NASA Logotype," *Code of Federal Regulations* Title 14, Pt. 1221.104, 2002 ed.; "Use of the NASA Logotype," *Code of Federal Regulations* Title 14, Pt. 1221.111, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002].

9. NASA Management Instruction (NMI) 1020.1E, 18 March 1976, p. 2, 4-6, Attachment C; Bruce Blackburn, "Design Standards Manuals: Their Meaning and Use for Federal Designers," based upon a presentation to the Second Studio Seminar for Federal Graphic Designers, 9 November 1976, web page hosted by the USGS, <http://www.usgs.gov/visual-id/dsm/index.html> [accessed 28 May 2002, URL no longer valid]; Meggs, "The Crash of the NASA Logo: It Could Have Been Worse!"; Kathy Sawyer, "Logo Change Sends NEA Into Orbit: Federal Design Director Urges NASA Chief to Reassess Decision," *Washington Post* (15 June 1992), p. 15. "Establishment of the NASA Unified Visual Communications System," *Code of Federal Regulations* Title 14, Pt. 1221.108, 2002 ed.; available online

at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002].

10. Meggs, "The Crash of the NASA Logo: It Could Have Been Worse!"; Kathy Sawyer, "Logo Change Sends NEA Into Orbit: Federal Design Director Urges NASA Chief to Reassess Decision"; NASA Headquarters History Office, "NASA 'Meatball' Logo," web page; Kathy Sawyer, "New Chief Vows 'Cultural Revolution' to Revamp NASA," *Washington Post* (16 June 1992), p. A19; "NEA Nixes Meatball, Lauds Worm," *Space News*, vol. 3, no. 23 (15-21 June 1992), p. 2; "Let the Logo Go," *Space News*, vol. 3, no. 23 (6-19 June 1992), p. 18; "The Meatball ... Not the Worm," letters to the editor, *Space News*, vol. 3, no. 27 (27 July - 9 August 1992), p. 18; "Meatball' Official Logo," *Space News Roundup*, vol. 34 #40 (6 October 1995), p. 1; Michael Rock, "Logo Wars: Should NASA go Back to the Future With its Visual Identity?" *I.D.*, vol. 40, no. 5 (September-October 1993), p. 24-26; "It's Back to the Future: Old NASA Logo Better," *Florida Today*. "Establishment of the NASA Logotype," *Code of Federal Regulations* Title 14, Pt. 1221.104, 2002 ed.; "Use of the NASA Logotype," *Code of Federal Regulations* Title 14, Pt. 1221.111, 2002 ed.; available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfrv5_02.html [accessed 24 July 2002].

11. Meggs, "The Crash of the NASA Logo: It Could Have Been Worse!"; Kathy Sawyer, "Logo Change Sends NEA Into Orbit: Federal Design Director Urges NASA Chief to Reassess Decision"; NASA Headquarters History Office, "NASA 'Meatball' Logo," web page; Kathy Sawyer, "New Chief Vows 'Cultural Revolution' to Revamp NASA"; "NEA Nixes Meatball, Lauds Worm," *Space News*; "Let the Logo Go," *Space News*; "Meatball' Official Logo," *Space News Roundup*; Michael Rock, "Logo Wars: Should NASA go Back to the Future With its Visual Identity?"; *NASA Graphics Standards: NASA Insignia*, [n.d., published after 1992]; NASA Headquarters, Office of Public Affairs, "New Logo Policy," web page, <http://www.hq.nasa.gov/pao/insignia/text/newlogopolicy.html> [accessed 22 June 2010]; NASA Headquarters, Office of Public Affairs, "NASA Insignia: Correct Use," web page, <http://www.hq.nasa.gov/pao/insignia/text/correct.html> [accessed 22 June 2010]; NASA Headquarters, Office of Public Affairs, "History of the Insignia," web page.

12. In his paper presented to the Eighteenth International Congress of Vexillology, Andreas Herzfeld noted an error that this author made in her history of the lunar flag assembly. This author acknowledges that her introductory statement "NASA's spacecraft and launch vehicles have always been decorated with flags" was an inaccurate simplification. However, as demonstrated in this study, the first U.S. spacecraft to carry flag markings was the third crewed Mercury spacecraft rather than a Gemini spacecraft as Herzfeld asserted. Andreas Herzfeld, "Space

Vexillology: Thirty Years After the First Moon Landing," IN Kevin Harrington, Ed., *Flags From Sea to Sea: the Proceedings of the XVIII International Congress of Vexillology*, Victoria, B.C., Canada, July 1999; (n.p.: Canadian Flag Association, n.d.), p. C49-C52.

Shepard's Mercury spacecraft is in the collection of the National Air and Space Museum. It is on loan to the United States Naval Academy, of which Shepard was a graduate. While the author could not find a photograph of Freedom 7 showing the flag, an employee of the U.S. Naval Academy visitor center stated that the capsule "appeared" to have a flag painted on it. However, the author was not convinced. The lack of photographic evidence made the presence of the flag unlikely. NAVA member Peter Ansoff visited the USNA visitor center and confirmed that there was no evidence of a flag painted on the spacecraft. Peter Ansoff, NAVA member, personal communication, 5 January 2003; Marcia Soffer, Assistant Administrator, Information and Guide Service, United States Naval Academy, personal communication, 17 June 2002. The next capsule to be investigated was Liberty Bell 7, which was lost when it sunk during recovery. Fortunately, the spacecraft has been recovered and was restored at the Kansas Cosmosphere and Space Center. The author contacted Jim Remar, Director of Collections, Exhibits and Buildings, to see if the second manned Mercury capsule had been decorated with a flag. His response was that there was no flag on Liberty Bell 7 (again, photographs taken before launch and after recovery do not show a flag). The third crewed Mercury mission was that of John Glenn. A NASA photograph clearly shows a flag painted on that spacecraft. Photograph of John Glenn's Friendship 7 spacecraft, <http://grin.hq.nasa.gov/IMAGES/SMALL/GPN-2000-000652.jpg> [accessed 29 May 2002]; NASA Photos KSC-63-MA9-88, KSC-87PC-0069, and S66-47635.

13. "Betsy Ross Wouldn't Recognize It," *Roundup* (NASA Manned Spacecraft Center), vol. 6, no. 24 (15 September 1967), p.1; "Saturn V Markings," web page, <http://www.apollo saturn.com/markings/mguide.htm> [accessed 29 May 2002]; photograph of Saturn V launch vehicle, <http://grin.hq.nasa.gov//IMAGES/SMALL/GPN-2000-000960.jpg> [accessed 29 May 2002]. When asked about flags that might be used on the Apollo 11 mission, NASA's Astronaut Spokesman Don Lind noted that "...the first flag that will be put down is one painted on the side of the lunar module and that's the one that is going to be preserved far longer than the fabric flag...". Apollo News Center, "Lunar Surface Operation's Plan," conference at the Manned Spacecraft Center, 4 July 1969, p. 21/2, on file in the JSC History Collection. Astronaut Buzz Aldrin also pointed out that there would be an American flag left on the moon - the one on the lunar module descent stage. "Apollo 11 Crew Press Conference," 10 January 1969, p. 1J/1, transcript on file in the JSC History Collection; NASA Photos S66-

49413 (Command Module), S68-42513 (Command Service Module), AS16-116-18578 (Lunar Module), AS17-147-22526 (Lunar Rover), KSC-69P-0551 (Saturn V), KSC-69PC-0109 (Saturn V), and S67-43603 (Saturn V).

14. "Graphic Markings on Space Transportation Vehicles, U.S. Components of the International Space Station Component Systems, and Payloads," NASA Policy Directive NPD 8610.6D, 14 July 1997, revised version available at <http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPD&c=8610&s=6G> [accessed 22 June 2010]; "NASA Insignia, Correct Use: Motor Vehicles, Aircraft, Spacecraft & Shuttle," web page, <http://www.hq.nasa.gov/office/pao/insignia/motor.html> [accessed 21 June 2002]; Justin Ray, "Midlife Makeover," *Spaceflight Now* (14 April 2000), web page, <http://spaceflightnow.com/shuttle/features/000414overhaul/makeover.html> [accessed 21 June 2002]. Columbia was lost in an accident during reentry on February 1, 2003; NASA Photos S86-41692 (Columbia, original markings); S86-41701 (Discovery, original markings), and KSC-00PP-1271 (Atlantis, current markings).

15. "Graphic Markings on Space Transportation Vehicles, U.S. Components of the International Space Station Component Systems, and Payloads," NASA Policy Directive NPD 8610.6D; Justin Ray, "Midlife Makeover," *Spaceflight Now*; "Flag Displayed Properly," *Spaceport News* (Kennedy Space Center), vol. 20 no. 14, p. 2? (from the files of the JSC PAO Information Services Office); "Space Shuttle Orbiter Systems: Flags and Letters," web page, http://science.ksc.nasa.gov/shuttle/technology/sts-newsref/sts_sys.html [accessed 18 June 2002]; Paul Dye, Flight Director for the Planning Team, response to Mark Filetti, "Mission Control Answers Your Questions," http://spaceflight.nasa.gov/feedback/expert/answer/mcc/sts-102/03_14_10_19_19.html [accessed 22 June 2010]; NASA Photo STS092-S-021 (Discovery, current markings).

16. "The 'Canada' wordmark is the Federal Identity Program (FIP) symbol that serves as the global symbol of the Government of Canada." Industry Canada, "Canada Wordmark," web page, 12 March 2002, <http://stategis.ic.gc.ca/SSG/ab00103e.html> [accessed 30 June 2002, URL no longer valid]. For examples of the Canada wordmark, see <http://www.ic.gc.ca/eic/site/pt-te.nsf/eng/00055.html>. NASA Photo STS087-341-004 (Canadarm).

17. "Graphic Markings on Space Transportation Vehicles, U.S. Components of the International Space Station Component Systems, and Payloads," NASA Policy Directive NPD 8610.6D; NASA Photo STS088-703-019 (Zarya and Unity Modules).

18. Dick Lattimer, *"All We Did Was Fly to the Moon"* (Gainesville, FL: Whispering Eagle Press, 1983), p. 23; "Stars & Stripes Flew High on Gemini 4," *Dispatch: a Newsletter for Members of the Space Patch Collectors Club*,

vol. 1, no. 8 (June 1986), p. 1; Buzz Aldrin, *Men From Earth* (New York: Bantam Books, 1989), p. 129; corroborated by Robert Spann, 1964-66 Project Engineer for the Gemini Support Office of the Space Suit Office at the Manned Spacecraft Center (MSC), personal communication, 10 September 1992; Photographs of Ed White during extravehicular activity, http://nssdc.gsfc.nasa.gov/planetary/gemini_4_eva.html [accessed 22 June 2010]; NASA Photo S65-30427 (Ed White); NASA Photo STS061-98-050 (Shuttle EVA Suit).

19. Travis K. Kircher, "More Than Just a Merit Badge," *Ad Astra* (November-December 2000), available online with corrections, http://www.collectspace.com/resources/patches_astronauts.html [accessed 25 June 2002]; "History of Patches," web page, <http://genedoor/patches/History.html> [accessed 22 June 2010]; "How Patches are Designed," web page, <http://genedorr.com/patches/About.html> [accessed 22 June 2010]; Charles D. Benson and William Barnaby Faherty, *Moonport: a History of Apollo Launch Facilities and Operations*, NASA-SP-4204 (Washington, DC: 1978), p. 400, available online at <http://www.hq.nasa.gov/office/pao/History/SP-4204/ch18-8.html> [accessed 27 June 2002]. While it is possible to purchase patches for flights before Gemini 5, these emblems were not used on flight suits or space suits for those missions.

20. The following is a list of flag motifs used on shuttle patches by type, listing flights that used the motif. Flags as a background image: STS-41G, STS-51L, STS-61C, STS-104, STS-36, STS-53, STS-57; flags substituted for the Earth: STS-51B, STS-76; flags placed somewhere on the patch: STS-73, STS-119, STS-123, STS-124; implied flags: STS-91, STS-117, STS-118, STS-127, STS-141; flags incorporated into a flight path: STS-2, STS-51D, STS-51I, STS-44, STS-51, STS-105, STS-118, STS-119; flags representing the nationality of crewmembers: STS-41G, STS-51G, STS-61B, STS-87, STS-107, STS-114, STS-116, STS-120, STS-128, STS-131. Flags have also been used on shuttle patches to illustrate the variety of partners that NASA has worked with during the shuttle era: Canada (STS-74, STS-100, STS-118, STS-13, STS-127), France (STS-93), Germany (STS-61A, STS-55, STS-68), Israel (STS-107), Italy (STS-46, STS-68, STS-100, STS-102, STS-120), Japan (STS-47, STS-114, STS-123, STS-124, STS-131, STS-141), Russia (STS-60, STS-63, STS-71, STS-74, STS-79, STS-81, STS-89, STS-91, STS-100, STS-101, STS-102, STS-106, STS-113), Sweden (STS-116, STS-128), and other countries.

Images of patches found through links at http://www.hq.nasa.gov/office/pao/History/mission_patches.html and http://www.hq.nasa.gov/office/pao/History/apollo_patches.html [accessed 14 June 2002]; Images of Space Shuttle mission patches available through links at http://www.hq.nasa.gov/office/pao/History/shuttle_patches.html [accessed 14 June 2002]. Updated by using press kits for each mission available through

pages located at http://www.nasa.gov/mission_pages/shuttle/shuttlemissions/list_main.html [accessed 22 September 2007] and through links to Wikipedia articles on specific missions at http://en.wikipedia.org/wiki/Space_Shuttle_Missions [accessed 14 June 2010].

21. "Vehicle Assembly Building," web page, <http://science.ksc.nasa.gov/facilities/vab.html> [22 June 2010]; "KSC's Vehicle Assembly Building Gets New Paint Job," KSC Release No. 93-98, web page, <http://www-pao.ksc.nasa.gov/release/1998/93-98.htm> [accessed 3 June 2002]; Caption for KSC photo KSC-98PC-903. NASA sources issued at the time of the repainting consistently listed the flag's dimensions as 209' x 110' [63.7 x 33.5 m]. The area was always listed at 23,432 square feet. An earlier source indicated that the stripes were 8½' [2.59 m] wide, with the flag dimensions being 209' x 100' [63.7 x 33.5 m]. Adding the width of 13 stripes at 8½' results in a total width of 110½' [33.68 m], while 13 stripes at 9' [2.74 m] results in a total width of 117' [35.66 m]. Calculating the area from the length and width for any combination of measurements indicated does not result in the area given. The flag is painted on a corrugated surface, which could account for some variation. In addition, it is likely that all measurements have been rounded up to the next whole number. Caption for KSC photo KSC-76PC-0127; NASA Photos KSC-76P-0124 (original flag on VAB), KSC-98PC-0989 (repainting of flag on VAB), and KSC-98PC-1237 (VAB after repainting).

22. Frank Kuznik, "Personal Effects," *Air & Space/Smithsonian* (December 1994/January 1995), available online at <http://www.airspacemag.com/ASM/Mag/Index/1995/DJ/prfx.html> [accessed 4 June 2002, URL no longer valid]; "Student Reading: Personal Preference Kit," web page, <http://quest.nasa.gov/space/frontiers/activities/collins/box.html> [accessed 4 June 2002]; "Mementos Aboard Space Shuttle Flights," *Code of Federal Regulations*, Title 14 Chapter 5, part 1214.6, available online at http://www.access.gpo.gov/nara/cfr/waisidx_02/14cfr1214_02.html [accessed 7 June 2002]; William David Compton, *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions* (Washington, D.C.: 1989), p. 307-308, available online at <http://www.hq.nasa.gov/office/pao/History/SP-4214/ch13-4.html> [accessed 22 June 2010]; Ivan D. Ertel and Roland W. Newkirk, *Apollo Spacecraft: A Chronology*, vol. 4, p. 352, available online as vol. 4 pt. 3 (1972-1974), <http://www.hq.nasa.gov/office/pao/History/SP-4009/v4p3i.htm> [accessed 18 July 2002]. Dale D. Myers, Associate Administrator for Manned Space Flight, "Astronaut Preference Kits - Apollo Missions," memorandum to the Apollo Program Director (with attached policy), 19 January 1972; Donald K. Slayton, Director of Flight Crew Operations, "Astronaut PPK's (Personal Preference Kits)," memorandum to Julian Scheer, NASA Headquarters, 22 October 1968; Donald K. Slayton, Director of Flight Crew Operations, "Apollo 7

Personal Preference Kits (PPK's)," memorandum to William C. Schneider, NASA Headquarters, 14 October 1968; all on file in the JSC History Collection.

23. Eugene M. Emme, comp., *Aeronautics and Astronautics: An American Chronology of Science and Technology in the Exploration of Space, 1915-1960* (Washington, DC: NASA, 1961), pp. 118-35, web page, <http://www.hq.nasa.gov/office/pao/History/Timeline/1960.html> [accessed 6 June 2002]; Bob Fritz, "Al Shepard Was True Friend to School Kids," *Florida Today Space Online* (8 September 1988), web page, <http://www.floridatoday.com/space/explore/stories/1998b/090898a.htm> [accessed 23 June 2002, URL no longer valid]; "NASA Administrator Launches 'Flags for Heroes and Families' Campaign," NASA News Release 01-195, web page, <http://www.nasa.gov/releases/2001/01-195.html> [accessed 29 May 2002, URL no longer valid]; "History of the Astronaut Hall of Fame and Space Camp Florida," web page, http://www.astronauthalloffame.com/newsroom/ahof_history.htm [accessed 23 June 2002, URL no longer valid]. The author confirmed that the flag that flew on Alan Shepard's Mercury flight and on STS-71 is still on exhibit at the Astronaut Hall of Fame. Brian Sherman, personal communication, 29 June 2010.

24. James M. Grimwood, "February 20, 1963," in *Project Mercury: A Chronology* NASA SP-4001 (Washington, DC: NASA, 1963), p.184, also available on the web as Part 3 (B): Operational Phase of Project Mercury, June 1962 through June 12, 1963, <http://history.nasa.gov/SP-4001/p3b.htm> [accessed 22 June 2010]; Mark Jenkins, "Geographic Tracked Glenn's Historic Flight into Space," *National Geographic News* (20 February 2002), web page, http://news.nationalgeographic.com/news/2002/02/0220_0220_johnglenn.html [accessed 23 June 2002, URL no longer valid]; Robert F. Allnutt, NASA Assistant Administrator for Legislative Affairs, letter to Senator J.W. Fulbright, 11 February 1969, on file at the NASA Headquarters (HQ) History Office; photograph of astronaut Neil Armstrong presenting a NASA flag flown aboard Gemini 8 to Paul Bikle, Director of NASA's Flight Research Center, <http://www.dfrc.nasa.gov/Gallery/photo/Directors/Large/E66-16107.jpg> [accessed 23 June 2002].

25. The NASA press kits for the Apollo 7-10 missions did not even mention flags. For Apollo 11, NASA issued a special press release devoted just to this subject. Most of the releases for the remainder of the Apollo flights either included a section on the flags that would be carried on the mission, or included this information in the general release. The only exception was Apollo 17.

George M. Low, Manager of Apollo Spacecraft Program, "Flag for Lunar Landing Mission," memo to Director of JSC, 23 January 1969; T. O.

Paine, NASA Acting Administrator, "Symbolic Articles to be Carried on First Manned Lunar Landing," memo to Associate and Assistant Administrators and Center Directors, 25 February 1969; Leonard Jaffe, Director for Space Science and Applications Programs "Symbolic Articles to be Carried on First Manned Lunar Landing," memo to Associate Administrator for Space Science and Applications, 13 March 1969; Willis H. Shapley, NASA Associate Deputy Administrator and Chairman of the Committee on Symbolic Activities, "Symbolic Items for the First Lunar Landing," memo to Dr. Mueller of the Apollo Program Office, 19 April 1969; Willis H. Shapley, "Report of Committee on Symbolic Activities for First Lunar Landing," memo to Dr. Mueller, 15 May 1969; Willis H. Shapley, "Symbolic Activities for Apollo 11," memo to Dr. Mueller of the Apollo Program Office, 2 July 1969; all on file at the NASA HQ History Office. Jack Kinzler, Manned Spacecraft Center, Chief of Technical Services (retired), interview with the author, 30 August 1992; personal files and collection of Jack Kinzler.

For more information on the political issues related to placing a flag on the Moon, see Anne M. Platoff's "Where No Flag Has Gone Before: Political and Technical Aspects of Placing a Flag on the Moon," published by NASA as NASA-CR-188251 (August 1993) and in *Raven: A Journal of Vexillology*, vol. 1 (1994), p. 3-10; available online at <http://www.jsc.nasa.gov/history/flag/flag.htm>.

26. Robert F. Allnutt, letter to Senator J.W. Fulbright, 11 February 1969; letter to Representative Robert H. Michel, 8 April 1969; letter to Representative Richard L. Roudebush, 8 April 1969; letter to Representative William Scott, 13 May 1969; letter to Senator Wallace F. Bennett, 1 July 1969; letter to Representative Richard L. Ottinger, 2 July 1969; letter to Senator Margaret Chase Smith, 22 July 1969; letter to Representative Clark MacGregor, date unreadable; all on file at the NASA Headquarters (HQ) History Office. T. O. Paine, letter to Presidential Science Advisor Lee A. DuBridge, 30 January 1969; letter to Senator Birch Bayh, April 1969; on file at the NASA Headquarters (HQ) History Office. "Plans' for Apollo to Land U.N. Flag Questioned," *Space Daily* (31 March 1969), p. 145; "Rarick Calls for Placing U.S. Flag on the Moon," *Space Daily* (29 May 1969), p. 132; "'Put an American Flag on the Moon' - Bennett," *Space Daily* (3 June 1969), p. 148; all on file at the NASA Headquarters (HQ) History Office. "Mathias Asks Flags for Next Apollo," *Washington Star* (28 May 1969); "2 U.S. Flags to be Hoisted," *Washington Star* (11 June 1969); William Hines, "Big Congressional Flap Over Flag," *Washington Star* (29 June 1969); Fanny Ventadour, "U.S. Flag on Moon Improper: Reader," letter to the editor, *Orlando Sentinel* (17 July 1969); clippings on file at the NASA Headquarters (HQ) History Office. Mr. Symington, "The Implantation of a Flag on the Moon," *Congressional Record*, House (16 June 1969), p. H4828; Joe E.

Evins, "American Flag to be Placed on Moon by Apollo 11 Astronauts," *Congressional Record*, Extensions of Remarks (16 June 1969), p. E4908. "Putting Space in Rule of Law," *Business Week* (19 July 1969), p. 104-105; "Let's All Cheer," *Huntsville News* (July 1969), clipping on file in the JSC History Collection. One of the more interesting options proposed by members of the public was that from a Mrs. Rothbaum who had written to her Senator that she would like to make a U.S. flag for the astronauts to place on the moon. Other citizens suggested "a banner with miniature flags of all nations," "the Flag of all Mankind," and the Christian flag.

Section 8 of Public Law 91-119, the National Aeronautics and Space Administration Authorization Act, 1970 amended the National Aeronautics and Space Act of 1958 to add "The flag of the United States, and no other flag, shall be implanted or otherwise placed on the surface of the moon, or on the surface of any planet, by the members of the crew of any spacecraft making a lunar or planetary landing as a part of a mission under the Apollo program or as a part of a mission under any subsequent program, the funds for which are provided entirely by the Government of the United States. This act is intended as a symbolic gesture of national pride in achievement and is not to be construed as a declaration of national appropriation by claim of sovereignty." (P.L. 91-119, Nov. 18, 1969, Section 8 (83 Stat. 202)); Spencer M. Bereaford, NASA General Counsel, memorandum to the Associate Deputy Administrator, 5 December 1969, on file at the NASA HQ History Office; "Conferees Agree on Space Budget and Flag Rule," *Evening Bulletin (Philadelphia)* (5 November 1969), clipping on file at the NASA HQ History Office.

For more discussions on the implications of planting the flag in terms of international law, see: Eugene Brooks, "Legal Aspects of the Lunar Landing," in *International Astronautical Federation, Colloquium on the Law of Outer Space, 12th (5-10 October 1969) Proceedings* (Davis, Cal.: University of California, 1970), p. 160-175; and Adrian Bueckling, "Flaggen Auf Dem Mond," *Zeitschrift für Luftrecht und Weltraumrechtsfragen*, vol. 19 (1 January 1970), p. 19-24.

27. Jack Kinzler, Manned Spacecraft Center, Chief of Technical Services (retired), interview with the author, 30 August 1992. "Apollo 11 Flags," NASA Press Release No. 69-83E, 3 July 1969; *Press Kit: Apollo 11*, Release No. 69-83K (6 July 1969), p. 5, on file in the JSC History Collection, reproduction available at http://history.nasa.gov/alsj/a11/A11_PressKit.pdf [accessed 22 June 2010]; "United States Apollo Team Gears for Historic Landing on the Moon," *NASA Space Sheet*, vol. 7 no. 10 (for release after 11 July 1969), on file in the JSC History Collection; "Apollo 11 Crew Pre-Mission Press Conference," 5 July 1969, transcript on file in the JSC History Collection.

Press Kit: Apollo 12, Release No. 69-148 (5 November 1969), reproduction available at http://history.nasa.gov/alsj/a12/A12_PressKit.pdf [accessed 20 June 2010], p. 5; *Press Kit: Apollo 13*, Release No. 70-50K (2 April 1970), reproduction available at http://history.nasa.gov/alsj/a13/A13_PressKit.pdf [accessed 22 June 2010], p. 5, 20, 73; *Press Kit: Apollo 14*, Release No. 71-3K (21 January 1971), reproduction available at http://history.nasa.gov/alsj/a14/A14_PressKit.pdf [accessed 22 June 2010], p. 5, 13, 86; *Press Kit: Apollo 15*, Release No. 71-119K (15 July 1971), reproduction available at http://history.nasa.gov/alsj/a15/A15_PressKit.pdf [accessed 22 June 2010], p. 6, 25, 129; *Press Kit: Apollo 16*, Release No. 72-64K (6 April 1972), reproduction available at http://history.nasa.gov/alsj/a16/A16_PressKit.pdf [accessed 22 June 2010], p. 5, 29, 137; *Press Kit: Apollo 17*, Release No. 72-220K (26 November 1972), reproduction available at http://history.nasa.gov/alsj/a17/A17_PressKit.pdf [accessed 22 June 2010], p. 29.

For more information on the technical aspects of placing a flag on the moon, see "Where No Flag Has Gone Before: Political and Technical Aspects of Placing a Flag on the Moon," previously cited. Several oral histories relevant to this topic are on file in the JSC History Collection at the University of Houston – Clear Lake. Jack A. Kinzler, interview by Roy Neal, "Oral History 3 Transcript", 27 April 1999, p. 14-28 – 14-33, 14-59; Jack A. Kinzler, interview by Paul Rollins, "Oral History 2 Transcript", 16 January 1998, p. 13-1 – 13-18. See also, Owen E. Maynard, interview by Carol Butler, "Oral History Transcript," 21 April 1999, p. 12-55 – 12-66. Maynard recounted that he argued against inclusion of a large flag on the Apollo 11 mission because he was concerned about the extra weight that it would add to the lunar module.

At one point mission planners had decided not to plant flags on the moon during the missions that followed Apollo 11. This decision did not stand, so flags were left on the surface by all of the crews that landed successfully. George M. Low, Apollo Spacecraft Program Manager, "Plaque and Flag for Apollo 12," memorandum to R. R. Gilruth, PA-9-9-16, 6 September 1969, on file in the JSC History Collection.

The flag left on the surface by the Apollo 17 crew was one that had been displayed in the Mission Operations Control Center during the Apollo 11 through Apollo 16 flights. Following the flight, the crew presented a new flag to Mission Control that had been carried in their command module as a replacement. "Apollo 17 Flag to Fly in MOCR," *Space News Roundup*, vol. 13 no. 2 (21 December 1973), p. 1.

Did we actually go to the moon? This question was the focus of a television program titled "Conspiracy Theory: Did We Land on the Moon?" that aired on the Fox network on 15 February 2001. Among the conspiracy

theorists who purported that NASA faked the moon landings was Bill Kaysing, the author of a book called *We Never Went to the Moon*. When this author examined this book in the early 1990s, she was not surprised that the publication exhibited all of the classic characteristics of a “vanity press” publication. The layout and design was grossly amateurish and the sources cited were impossible to trace. In addition, Kaysing used NASA training photos of astronauts in space suites practicing EVA techniques on a simulated lunar surface as part of his evidence. He stated that since you could see the roof of the facility in the “untouched” photos this demonstrated that NASA had faked the moon landing photos. NASA has included these photos in the collection of training photos available through the JSC Public Affairs photo collection – something that would not have been done if NASA was trying to cover up a conspiracy.

The conspiracy theorists frequently cite the “fluttering” flags on the moon as evidence that photos of the missions were frauds. There are several reasons why the flags appear to be fluttering. One is the horizontal crossbar in the lunar flag assembly that makes the flags “fly” without wind. In addition, the tight packing of the flags created wrinkles in the nylon that contributed to the appearance of “fluttering” flags. Further evidence that the “motion” is due to wrinkling and not due to a blowing breeze is the consistent look of the flags in photos taken at different times. If the flags were indeed blowing in a breeze they would look different in each photograph.

For more analysis that discounts the moon hoax theory, see “Moon Base Clavius,” a web site devoted to debunking the conspiracy (“Moon Base Clavius,” web site, <http://www.clavius.org/index.html>). Of particular interest to the role of the flags as evidence are the following pages: “Environment: Fluttering Flags,” web page, <http://www.clavius.org/envflutter.html> [accessed 2 July 2002]; “Photo Analysis: Jump Salute,” web page, <http://www.clavius.org/jumpsal.html> [accessed 2 July 2002]; “Photo Analysis: Pride Run Amok,” web page, <http://www.clavius.org/decal.html> [accessed 2 July 2002]; “Photo Analysis: Indirect Light,” web page, <http://www.clavius.org/indlight.html> [accessed 2 July 2002]; and “Photo Analysis: Different Shadow Lengths,” web page, <http://www.clavius.org/shadlen.html> [accessed 2 July 2002]. Another good site that provides links to pages on both sides of the debate is “Did We Land on the Moon? A Debunking of the Moon Hoax Theory,” <http://www.braeunig.us/space/hoax.htm> [accessed 20 June 2010]; NASA Photo AS16-113-18339. The television show “Mythbusters” also debunked the moonlanding hoax, including claims about the flag [Mythbusters, “NASA Moon Landing episode,” originally aired 27 August 2008].

28. “Apollo 11 Technical Crew Debriefing,” 31 July 1969, vol. 1, p. 10-43 – 10-45, on file in the JSC History Collection; “Apollo 11 Postflight-Crew

Press Conference," 12 August 1969, p. 40C/1, transcript on file in the JSC History Collection; Edgar M. Cortright, *Apollo Expeditions to the Moon*, NASA SP-350 (Washington, DC: NASA, 1975), p. 216; Edwin E. Aldrin, Jr., "Lunar Dust Smelled Just Like Gunpowder," *Life*, v. 67 no. 8 (22 August 1969), p. 26; Charles R. Pellegrino and Joshua Stoff, *Chariots for Apollo: the Making of the Lunar Module* (New York: Atheneum, 1985), p. 179; Buzz Aldrin, *Men From Earth* (New York: Bantam Books, 1989), p. 242; David S.F. Portree, "Flag on the Moon," radio script and background information, *Earth and Sky*, aired 11 December 2001, <http://www.earthsky.org/2001/es011211.html> [accessed 21 June 2002, URL no longer valid]; Andrew Chaikin, *A Man on the Moon* (New York: Penguin, 1994), p. 224. Video footage from Apollo 14 (JSC-563, reference master 118476) and from Apollo 16 (AK-113) showed that the flags from those missions remained standing after liftoff. Footage from other missions did not show enough to conclude anything about the condition of the flag after the ascent module left the surface. NASA Photo S71-19500. See also Platoff, "Where No Flag Has Gone Before," fn. 15.

29. David S.F. Portree, "Flag on the Moon," radio script and background information; "Apollo 12 Surveyor III Analysis," web page, http://cass.jsc.nasa.gov/expmoon/Apollo12/A12_Experiments_III.html [accessed 26 June 2002, URL no longer valid]; *Analysis of Surveyor 3 Material and Photographs Returned by Apollo 12* (Washington, DC: NASA, 1972), p. iii, 1-13, 17, 23-29, 60, 94-96; Grant H. Heiken, David T. Vaniman, and Bevan M. French, *Lunar Sourcebook: a User's Guide to the Moon* (Cambridge: Cambridge University Press, 1991), p. 34, 40-42, 45-48, 310; "Of 195 Flags Going to Moon, One Stays," *Business Week* (19 July 1969), p. 105. The moon actually has a slight atmosphere but, because it is 14 orders of magnitude less than that of Earth, it is said to have no atmosphere from a terrestrial perspective. *Lunar Sourcebook: a User's Guide to the Moon*, p. 40-42.

The issue of sun rot is of great interest to the manufacturers of flags. Nylon is a polyamide and, like other plastics, deteriorates when exposed to ultraviolet radiation such as that in sunlight. Tests conducted by DuPont, the manufacturer of SolarMax® nylon, compared the weathering of flags flown at test locations in Florida, Arizona, and California for a 12-month period. The sample flags in Florida and California showed severe fading after 7-9 months and experienced mechanical failure at 10 months. In Arizona, the test flags failed mechanically at 4 months before severe fading was noticed at 7 months. In all cases, flags made of this "sun resistant" fabric did not survive for an entire year. What does this study tell us about the outlook for the flags on the moon? On one hand, the lunar flags are not exposed to wind and moisture – elements that certainly contributed to the deterioration of the flags in the DuPont study. However, the

levels of UV on the lunar surface are significantly higher than those at the terrestrial sites. The key element that is present on Earth and not on the moon is oxygen, but since no one has studied the role of oxygen in the effects of sun rot it is impossible to speculate whether oxygen is a factor. Since there is no commercial value to a study of sun rot in a vacuum, we will only learn how the flags fared by revisiting the landing sites. "Polyamides, Plastics: Environmental Effects - Ultraviolet Radiation," in Herman Mark, et. al., *Encyclopedia of Polymer Science and Engineering* (New York: John Wiley and Sons, 1988), vol. 11, p. 467; DuPont, "Sunlight Photodegradation of Textile Fibers and Fabrics," web page, <http://www.dupont.com/solarmax/html/photodeg.html> [accessed 16 July 2002, URL no longer valid]; DuPont, "Outdoor Weathering Flag Test Program," web pages, <http://www.dupont.com/solarmax/html/flagtest.html> [accessed 16 July 2002, URL no longer valid], entry page and links to flag test results.

30. David S.F. Portree, "Flag on the Moon," radio script and background information; "Apollo 12 Surveyor III Analysis," web page, http://cass.jsc.nasa.gov/expmoon/Apollo12/A12_Experiments_III.html [accessed 26 June 2002, URL no longer valid]; *Analysis of Surveyor 3 Material and Photographs Returned by Apollo 12* (Washington, DC: NASA, 1972), p. iii, 1-13, 17, 23-29, 60, 94-96; Grant H. Heiken, David T. Vaniman, and Bevan M. French, *Lunar Sourcebook: a User's Guide to the Moon* (Cambridge: Cambridge University Press, 1991), p. 34, 40-42, 45-48, 310; "Of 195 Flags Going to Moon, One Stays," *Business Week* (19 July 1969), p. 105. Data on bbs and air guns was found at the web site for Daisy Outdoor Products, <http://daisy.ifware.com> [accessed 29 June 2002, URL no longer valid].

To understand the emotional response that Americans had to the raising of the U.S. flag on the moon, read some of the news accounts from the time. The *Seattle Times* put it this way: "The flag that stands on the moon is not a flag of conquest. It does not symbolize exclusive possession. It warns no others to keep off. But it belongs there because this nation put it there. A triumph for all mankind, yes. But also a day of new glory for Old Glory." "...So Proudly We Hailed," *Seattle Times* (21 July 1969), clipping on file in the JSC History Collection. International observers also hailed the significance of the moment, understanding that the flag raising was not a claim of sovereignty. An Australian journalist quoted by *US News and World Report* explained "This is not only an hour of triumph for America, it is an achievement for all mankind." "A U.S. Flag on the Moon," *US News and World Report* vol. 67 (21 July 1969), p. 29-33. Other reporters from around the world made similar comments. "Flag on Moon Offers An Example for Man," *Philadelphia Inquirer* (10 August 1969), clipping on file at the NASA HQ History Office.

31. "Apollo 11 Flags," NASA Press Release No. 69-83E, 3 July 1969; *Press Kit: Apollo 11*, Release No. 69-83K (6 July 1969), p. 5, on file in the JSC History Collection, reproduction available at http://history.nasa.gov/alsj/a11/A11_PressKit.pdf [accessed 22 June 2010]; James G. Fulton, "Apollo 11 Flags," *Congressional Record – Extensions of Remarks* (15 July 1969), p. E5931-E5932; Ivan D. Ertel and Roland W. Newkirk, *Apollo Spacecraft: A Chronology* (Washington, D.C.: NASA, 1978), vol. 4, p. 314, available online as vol. 4 pt. 3 (1969 3rd quarter), <http://www.hq.nasa.gov/office/pao/History/SP-4009/v4p3e.htm> [accessed 18 July 2002]; "Apollo 11 Facts," web page hosted by the National Air and Space Museum, <http://www.nasm.si.edu/collections/imagery/apollo/AS11/a11facts.htm> [accessed 20 June 2010]. The Apollo 11 presentation flag belonging to the state of Arizona is on exhibit at the Arizona Mining and Mineral Museum. National flags flown in Apollo 11 "Flag Kit" were listed in the *Congressional Record* and included: Afghanistan, Albania, Algeria, Andorra, Argentina, Australia, Austria, Barbados, Belgium, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burma, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Ceylon, Chad, Chile, China [Republic of], Colombia, Congo (Brazzaville), Congo (Kinshasa), Costa Rica, Cuba, Cyprus, Czechoslovakia, Dahomy, Denmark, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Ethiopia, Finland, France, Gabon, Gambia, [West] Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kenya, [South] Korea, Kuwait, Laos, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives Islands, Mali, Malta, Mauritania, Mauritius, Mexico, Monaco, Mongolia, Morocco, Muscat and Oman, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Rwanda, San Marino, Saudi Arabia, Senegal, Sierra Leone, Singapore, Somali, South Africa, Southern Yemen, Soviet Union, Spain, Sudan, Swaziland, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Republic, United Kingdom, Upper Volta, Uruguay, Vatican City, Venezuela, Viet Nam, Western Samoa, Yemen, Yugoslavia, and Zambia. Fulton, "Apollo 11 Flags," *Congressional Record – Extensions of Remarks*, p. E5932.

32. Apollo 12: The "Flag Kit" for Apollo 12 included all of the national flags flown on the first lunar mission. *The New York Times* noted that the "list of nations ... includes 'Vietnam' and 'China'". Inquiries at the National Aeronautics and Space Administration elicited the information that these were South Vietnam and Nationalist China." James A. McDivitt, Manager of the Apollo Spacecraft Program, "Stowage of Flag Kit on Apollo 12," memo to R.A. Petrone, 6 November 1969, on file in the JSC History

Collection; "Apollo 12: Apollo Stowage List, Mission AS-507 CM 108/LM-6," 18 November 1969, on file in the JSC History Collection; *Press Kit: Apollo 12*, Release No. 69-148 (5 November 1969), reproduction available at http://history.nasa.gov/alsj/a12/A12_PressKit.pdf [accessed 22 June 2010], p. 5; "Astronauts Will Plant 2d U.S. Flag on Moon," *New York Times* (10 November 1969), clipping on file at the NASA HQ History Office; "Debris and Mementos are Left on Lunar Surface by Astronauts," *New York Times* (22 November 1969), clipping from the files of the Flag Research Center; "Apollo 12 Facts," web page hosted by the National Air and Space Museum, <http://www.nasm.si.edu/collections/imagery/apollo/AS12/a12facts.htm> [accessed 20 June 2010].

Apollo 13: *Press Kit: Apollo 13*, Release No. 70-50K (2 April 1970), reproduction available at http://history.nasa.gov/alsj/a13/A13_PressKit.pdf [accessed 22 June 2010], p. 73. The author was surprised to find a Canadian flag flown on Apollo 13 had been sold at an auction. All NASA sources indicate that only U.S. flags and the flags of the 50 states were flown on this mission. It is possible that other flags were flown but were not listed because a complete set of international flags was not carried on the flight.

Apollo 14: *Press Kit: Apollo 14*, Release No. 71-3K (21 January 1971), reproduction available at http://history.nasa.gov/alsj/a14/A14_PressKit.pdf [accessed 22 June 2010], p. 86; "Apollo 14 Facts," web page hosted by the National Air and Space Museum, <http://www.nasm.si.edu/collections/imagery/apollo/AS14/a14facts.htm> [accessed 20 June 2010].

Apollo 15: *Press Kit: Apollo 15*, Release No. 71-119K (15 July 1971), reproduction available at http://history.nasa.gov/alsj/a15/A15_PressKit.pdf [accessed 22 June 2010], p.129; "Apollo 15 Facts," web page hosted by the National Air and Space Museum, <http://www.nasm.si.edu/collections/imagery/apollo/AS15/a15facts.htm> [accessed 20 June 2010].

Apollo 16: The national flags which the State Department recommended to be flown on Apollo 16 included: Afghanistan, Albania, Algeria, Andorra, Argentina, Australia, Austria, **Bahrain**, Barbados, Belgium, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burma, Burundi, **Byelorussia (Byelorussian Soviet Socialist Republic)**, Cambodia, Cameroon, Canada, Central African Republic, Ceylon, Chad, Chile, **China (People's Republic of)**, China (Republic of), Colombia, Congo (People's Republic of), Costa Rica, Cuba, Cyprus, Czechoslovakia, Dahomy, Denmark, Dominican Republic, Ecuador, **Egypt**, El Salvador, Equatorial Guinea, **Estonia (Republic of)**, Ethiopia, **Fiji**, Finland, France, Gabon, Gambia, Germany (Federal Republic of), Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras,

ras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kenya, Korea (Republic of), Kuwait, Laos, **Latvia (Republic of)**, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, **Lithuania (Republic of)**, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Monaco, Mongolia, Morocco, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, **Qatar**, Romania, Rwanda, San Marino, Saudi Arabia, Senegal, Sierra Leone, Singapore, Somalia, South Africa, Spain, Sudan, Swaziland, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, **Tonga**, Trinidad and Tobago, Tunisia, Turkey, Uganda, **Ukraine (Ukrainian Soviet Socialist Republic)**, Soviet Union (Union of Soviet Socialist Republics), **United Arab Emirates**, United Kingdom, Upper Volta, Uruguay, Vatican City, Venezuela, Viet Nam (Republic of), Western Samoa, Yemen (Yemen Arab Republic), Yemen (People's Democratic Republic of), Yugoslavia, Zaire, and Zambia. Flags in bold had been added to the list of countries flown on Apollo 11 and Apollo 12 (countries whose names had changed are not bolded, except for Egypt and Syria which had been listed together as the United Arab Republic on previous lists). Richard H. Campbell, U.S. State Department, "Foreign Flags for Apollo 16," memo to Richard Friedman, NASA, 5 January 1972, on file in the JSC History Collection; Rocco A. Petrone, Apollo Program Director, "Flags to be Carried on Apollo 16," memo to the NASA Associate Administrator, 8 March 1972, on file in the JSC History Collection; *Press Kit: Apollo 16*, Release No. 72-64K (6 April 1972), reproduction available at http://history.nasa.gov/alsj/a16/A16_PressKit.pdf [accessed 22 June 2010], p.137; Ivan D. Ertel and Roland W. Newkirk, *Apollo Spacecraft: A Chronology*, vol. 4, p. 352, available online as vol. 4 pt. 3 (1972-1974), <http://www.hq.nasa.gov/office/pao/History/SP-4009/v4p3i.htm> [accessed 18 July 2002].

Apollo 17: The author could not find a list of flags carried on the Apollo 17 mission. Unlike the press kits for earlier missions, the one for Apollo 17 did not discuss small flags carried on the flight. However, several national flags flown on the mission were found indicated that there was a flag kit on the flight. "Towards the Moon Exhibition," web page, http://www.ninfinger.org/models/mot_manen/mot09.html [accessed 22 June 2010] shows a Swedish flag flown on Apollo 17 mounted on a plaque with a lunar sample from the same mission. The flag is on display at Sweden's Observatory Museum in Stockholm. According to the text on the plaque, the flag was carried aboard "America", the Apollo 17 Command Module. It is possible that on this flight the flags were not taken to the lunar surface as was the case on previous missions. A photograph of another national flag carried on Apollo 17 was found on the website for CNN. This one was the flag for Honduras and was mounted on a similar

plaque. The story recounted how the U.S. government seized the lunar sample after a man tried to sell it to undercover agents (he was cited for not declaring the item at customs). Apparently, he had bought the rock from a Honduran official. Other stories on the incident indicated that customs agents found the plaque in the man's car, but that "the inscription had been changed to identify the specimen as merely a worthless sample from a Honduran mine." There was no mention of what had become of the flag. "Customs Agents Seize 4-Billion-Year-Old Moon Rock," CNN web site, <http://cnn.com/US/9812/07/moon.rock/index.html> [accessed 8 December 1998]; "U.S. Customs Seizes Smuggled Moon Rock," *New York Times* (8 December 1998) p. A20; "Customs Officials Net Floridian Who Tried to Peddle Moon Rock," *Houston Chronicle* (8 December 1998), p. A3.

Following the presentation of 4x6 inch flags to several heads of state, it was discovered that some of the national flags flown were obsolete. Dr. Whitney Smith of the Flag Research Center was contacted by NASA and asked to check the remaining flags for accuracy. Whitney Smith, personal communication, 29 April 1992. One example of such a flag was carried on the Apollo 14 mission and then presented to ambassador H.E.M. Nicolas Mondjo of the People's Republic of the Congo. The flag flown on the mission was that of the previous regime, so the government refused the gift. Eventually the flag ended up for sale by the George Glazer Gallery. "Congo Flag From Apollo 14," web page, <http://www.georgeglazer.com/prints/aviation/moonflag.html> [accessed 8 July 2002].

33. "Items That Were Carried on the First International Flight," document posted on the web, http://www.collectspace.com/resources/ flown_astp_objectsexchanged.html [accessed 22 June 2010]; caption and photo of Apollo-Soyuz "gift bag," NASA Photo S75-27952, <http://science.ksc.nasa.gov/mirrors/images/images/pao/ASTP/10076504.jpg> [accessed 22 June 2010]; "Apollo Soyuz Test project," web page hosted by the National Air and Space Museum, <http://www.nasm.si.edu/galleries/attm/pa.3.html> [accessed 20 June 2002], page includes links to photos of small American and Soviet flags from the mission that are in the museum's collections.

34. "Discovery's On-Board Souvenir Shop," web page hosted by collectSpace, <http://www.collectspace.com/news/news-080901a.html> [accessed 18 June 2002]; "STS-108 Official Flight Kit," web page hosted by collectSpace, <http://www.collectspace.com/news/news-112801a.html> [accessed 18 June 2002]; "STS-109 Official Flight Kit," web page hosted by collectSpace, <http://www.collectspace.com/news/news-030202a.html> [accessed 18 June 2002]; "STS-110 Official Flight Kit," web page hosted by collectSpace, <http://www.collectspace.com/news/news-040402a.html> [accessed 18 June 2002]; "STS-111 Official Flight Kit," web page hosted by

collectSpace, <http://www.collectspace.com/> news/news-053002a.html [accessed 18 June 2002].

35. "McAuliffe Flag Returned," *Washington Post* (16 July 1987) and photocopy of memorial certificate with the Flag of Learning and Liberty, both on file in the JSC History Collection.

36. "NASA Administrator Launches 'Flags for Heroes and Families' Campaign," NASA News Release 01-195 (11 October 2001), <http://spaceflight.nasa.gov/spacenews/releases/2001/01-195.html> [accessed 22 June 2010]; Todd Halvorson, "Next Shuttle to Carry Flags for Victims, Survivors of Sept. 11 Terrorist Attacks," *Space.com* (11 October 2001), http://www.space.com/missionlaunches/sts108_flags_011011.html [accessed 21 May 2002]; "6,000 Flags Aboard Shuttle Endeavour Honor Those Lost September 11, 2001," *Space Today Online*, <http://www.spacetoday.org/SpcShtls/Endeavour6000flags.html> [accessed 4 June 2002]; "NASA Administrator, Astronauts Honor Flag Day With Special Presentation of Old Glory," NASA News Release 02-112, <http://spaceflight.nasa.gov/spacenews/releases/2002/02-112.html> [accessed 18 June 2002]; "Students Lend a Hand for NASA's 'Flags for Heroes and Families,'" NASA News Release J02-66, <http://www.nasa.gov/centers/johnson/news/releases/2002/j02-66.html> [accessed 22 June 2010]; "STS-108, Mission Control Center Status Report #09," 9 December 2001, web page, <http://spaceflight.nasa.gov/spacenews/reports/sts108/STS-108-09.html> [accessed 10 July 2002]; "News: Flags for Heroes and Families," web page, <http://www.jsc.nasa.gov/news/flags/> [accessed 10 July 2002]; "STS-108 Official Flight Kit," web page hosted by collectSpace, <http://www.collectspace.com/news/news-112801a.html> [accessed 18 June 2002]; "Flag Day: NASA Returns *Old Glory* to NY," web page hosted by collectSpace, <http://www.collectspace.com/news/news-061402a.html> [accessed 18 June 2002].

37. "Flag Carried on Gemini-3 Mission to be Flown During Future Flights," *Space News Roundup* (Manned Spacecraft Center), vol. 4 #13 (16 April 1965), p. 1; "Last Flight for Gemini Flags," *Space News Roundup* (Manned Spacecraft Center), vol. 6 #4 (9 December 1966), p. 1; Barton C. Hacker and James M. Grimwood, *On the Shoulders of Titans*, NASA SP-4203 (Washington, D.C.: NASA, 1977), p. 381, available online at <http://www.hq.nasa.gov/office/pao/History/SP-4203/ch15-5.htm> [accessed 29 May 2002]; NASA photographs S66-64324 and S66-64328 (of the flags being lowered after the last Gemini flight) and NASA photograph S77-23416 (of the Gemini flag on exhibit in the Building 2 museum); observations of this flag by the author during a visit to the Building 2 Museum, March 1989; Louis A. Parker, JSC Exhibits Manager, personal communication, 30 May 2002; Robert T. Luke, JSC Public Affairs Office, personal communication, 30 May 2002; NASA JSC photograph S77-23416. The author contacted

the Kennedy Space Center asking about the existence of a program flag for Project Mercury. KSC was unable to confirm the existence of such a flag. The author contacted the Johnson Space Center asking about the existence of a program flag for the Apollo Program. JSC was unable to confirm the existence of such a flag. Louis A. Parker, JSC Exhibits Manager, personal communication, 27 June 2002; Robert T. Luke, JSC Public Affairs Office, personal communication, 2 July 2002.

38. During her employment at NASA Johnson Space Center the author observed these flags flying on the main flagpoles in front of Building 1. They were also exhibited in the lobby of Building 30 near the entrance to the Mission Control Center and at official visitor centers. She also has seen them when watching launch footage from the Kennedy Space Center. There is usually one of these flags on display near the large countdown clock often shown before a launch. The website at KSC also includes photographs that show the shuttle flags on poles near the launch pads with the space transportation system (the NASA name for the combined orbiter, external tank, and solid rocket boosters) in the background. "Space Flight Awareness Awards - History," web page, <http://www.hq.nasa.gov/osf/sfa/history.html> [accessed 29 May 2002]; "Space Flight Awareness Awards - AWARENESS," web page, <http://www.hq.nasa.gov/osf/awareness.html> [accessed 29 May 2002, URL no longer valid]; photo of Endeavour flag, NASA photo KSC-02PD-0592 and caption, 29 April 2002, <http://images.ksc.nasa.gov/photos/2002/captions/KSC-02PD-0592.html> [accessed 23 June 2010]; photo of Discovery flag, NASA photo KSC-00PP-1415 and caption, 14 September 2000, <http://images.ksc.nasa.gov/photos/2000/captions/KSC-00PP-1415.html> [accessed 23 June 2010]; photo of Endeavour flag, NASA photo KSC-98PC-1359 and caption, 21 October 1998, <http://mediaarchive.ksc.nasa.gov/detail.cfm?mediaid=1807> [accessed 23 June 2010]; photo of flag near countdown clock, NASA photo KSC-01PADIG-265 and caption, 10 August 2001, <http://mediaarchive.ksc.nasa.gov/detail.cfm?mediaid=7789> [accessed 23 June 2010]; 4x6 inch flags for "Columbia", "Discovery", "Atlantis" and "Endeavour" in the collection of the author.

39. Author's observations of the Phase 1 (Shuttle-Mir) flag at the Johnson Space Center; Alida Andrews, contractor employee at JSC, personal communications, 7 June 2002; Phase 1 Shuttle-Mir flag offered for sale, http://www.lovaura.com/sts_mir.htm [accessed 13 July 2002, URL no longer valid] and detail photograph showing the flag on a certificate, http://www.lovaura.com/images/sts_91_flownflag_full.jpg [accessed 13 July 2002, URL no longer valid]. On 31 October 1997, Johnson Space Center put out a combined synopsis/solicitation for commercial items concerning the Phase 1 flags. The solicitation was for 70,000 4x6 inch

polyester flags. <http://www.reston.com/nasa/iss/10.31.97.iss.flags.html> [accessed 28 June 2002, URL no longer valid].

40. The author's inquiries in 2002 about the International Space Station flag flying at the Johnson Space Center solicited the following response: "There is not [an] 'official' ISS flag. What is flown outside Building 1 is an internal flag that is used only at JSC. An official ISS program emblem is soon to be released by NASA HQ. Members of NASA and foreign ISS partners have met over this subject, and I've heard that an emblem is forthcoming. JSC has not been too eager to release images of this emblem because of certain sensitivities about it; therefore, it's [sic] use has been relegated to internal-JSC use only." Louis A. Parker, JSC Exhibits Manager, personal communication, 17 July 2002. Follow-up contact with Mr. Parker in 2007 revealed that there was still not an official ISS flag, but that the first unofficial JSC flag was still being used at that center. A second follow-up in 2010 revealed a new emblem and flag, still unofficial, were in use at JSC. Louis A. Parker, personal communications, 27 September 2007 and 28 June 2010. The flag used at the Glenn Research Center was shown in a photograph on the *USA Today* web site. Joe Milicia, "Aviation takes back seat to space flight at NASA," *USA Today* (18 June 2006), http://www.usatoday.com/tech/science/space/2006-06-18-nasa-aviation_x.htm [accessed 27 September 2007]. Mr. Parker confirmed that, like the flag used at JSC, this flag was also "unofficial".

41. Space Shuttle Mission Flags, eBay Item number: 140158787702, Purchased 23 September 2007; "Popular Pennant," collectSPACE, <http://www.collectspace.com/archive/archive-0706.html> [accessed 15 November 2007].

42. USML-1 flag flown aboard STS-50 mission (June 1992), mounted on certificate presented to Rich Drake; USMP-1 flag flown aboard STS-52 mission (October 1992), mounted on certificate presented to Michael S. Platoff; 4x6 inch payload flags for TSS and USMP-1 in the collection of the author. The USMP-2 flag was found in an auction at eBay. "Nasa Space Shuttle Columbia STS 62 Mission Flown Flag," eBay Item number: 130158783780, Ended: Oct-01-07 [accessed 1 October 2007].

43. <http://www.lunarlegacies.com/apollo-crews.htm> [accessed 28 June 2002, URL no longer valid]; "ISS Phase 1: Shuttle-Mir Docking Missions," web page hosted by Lovaura.com Space Memorabilia, http://www.lovaura.com/sts_mir.htm [accessed 18 June 2002, URL no longer valid].

44. "Large U.S. Flag Flown in Space Aboard Gemini 7," eBay Item Number: 170144924904, Closed at: US \$8,000.00, Auction Date: 20 September 2007; "U.S. Flag Flown in Space Aboard Apollo 7," eBay Item Number: 170144925180, Closed at: US \$1,700.00, Auction Date: 20 Sep-

tember 2007; "Large U.S. Flag Flown in Space Aboard Gemini 9," eBay Item Number: 170144925016, Closed at: US \$8,500.00, Auction Date: 20 September 2007; "Large U.S. Flag Flown in Space Aboard Gemini 9," eBay Item Number: 170144925025, Closed at: US \$8,000.00, Auction Date: 20 September 2007; "U.S. Flag Flown in Space Aboard Apollo 9," eBay Item Number: 170144925367, Closed at: US \$5,000.00, Auction Date: 20 September 2007; "U.S. Flag Flown in Space Aboard Apollo 7," eBay Item Number: 170144925184, Closed at: US \$6,000.00, Auction Date: 20 September 2007; "Apollo 15, 1971, Flown Illinois State Motto Flag," eBay Item Number: 320165975231, Closed at: US \$2,000.00, Auction Date: 20 October 2007; "Apollo 15 - Flown United States Flag," eBay Item Number: 320165975209, Closed at: US \$3,600.00; Auction Date: 20 October 2007; "Apollo 11, 1969, Flown New Jersey State Flag," eBay Item Number: 320165975147, Closed at: US \$2,500.00, Auction Date: 20 October 2007; "Apollo 11, 1969, Flown United States Flag," eBay Item Number: 320165975143, Closed at: US \$5,250.00, Auction Date: 20 October 2007; "Gemini Titan 5, 1965, Flown Religious Flag," eBay Item Number: 320165975088, Closed at: US \$1,450.00, Auction Date: 20 October 2007; "Mercury Atlas - 9, 1963, Flown United States Flag," eBay Item Number: 320165975044, Closed at: US \$4,750.00, Auction Date: 20 October 2007; "Nasa Space Shuttle Columbia STS 52 Mission Flown Flag" eBay Item Number: 130163226909, Winning bid: US \$151.35, Ended: 18 October 2007; "STS-065 Flown Silk Apollo 11 25th Anniv. Flag," eBay Item Number: 150162617256, Closed at: US \$110.00, Auction Date: 11 October 2007; "1988 STS-026 Flown Silk NASA Flag," eBay Item Number: 150162617325, Closed at: US \$160.00, Auction Date: 11 October 2007; "1988 STS-026 Flown NASA Silk Flag," eBay Item Number: 150162617319, Closed at: US \$190.00, Auction Date: 11 October 2007; "1975 Flown Unites [sic] States Flag," eBay Item Number: 150162616905, Closed at: US \$700.00, Auction Date: 11 October 2007; "1973-74 Flown American Silk Flag," eBay Item Number: 150162616877, Closed at: US \$525.00, Auction Date: 11 October 2007; "1969 Flown U.S. Flag," eBay Item Number: 150162616599, Closed at: US \$8,000.00, Auction Date: 11 October 2007; "1969 Flown United States Flag," eBay Item Number: 150162616279, Closed at: US \$1,000.00, Auction Date: 11 October 2007; "1965 Flown Illinois State Flag," eBay Item Number: 150162616124, Closed at: US \$1,200.00, Auction Date: 11 October 2007; "Nasa Space Shuttle Columbia STS 62 Mission Flown Flag," eBay Item Number: 130161159854, Winning bid: US \$177.50, Ended: 10 October 2007; "Nasa Space Shuttle Discovery STS-91 Mission Flag 1998," eBay Item Number: 130157328770, Winning bid: US \$87.00, Ended: 2 October 2007.

45. "Christie's Auction Results: Space Exploration," web page, http://www.christies.com/auction/results/results_lotlist.asp?saleno=NYC8209 [accessed 8 July 2002, URL no longer valid]; "Results of the Christie's Space Exploration Auction,"

web page hosted by collectSPACE, <http://www.collectspace.com/news/news-091899b.html> [accessed 20 June 2002]; "Aurora Auction Catalog Ready for Print," web page hosted by collectSPACE, <http://www.collectspace.com/news/news-040302a.html> [accessed 8 July 2002]; Aurora auction catalogs, posted online at <http://www1.icollector.com> [accessed 14 July 2002, URL no longer valid]. In addition to the flags flown as part of the U.S. manned space program, the Aurora auction also included two flags flown to the Soviet Salyut space station: one for Vietnam (\$200) and one for Cuba (\$225).

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Front cover: The primary symbol on the flag of the National Aeronautics and Space Administration is the NASA Seal. Because the seal is used only in official contexts, other agency symbols are better known by the general public.

Back cover: (*top*) The Atlantis orbiter flag flies near its namesake vehicle as the space shuttle sits on the launch pad at Kennedy Space Center prior to the STS-86 mission in 1997.

(*bottom*) Apollo 14 commander Alan B. Shepard, Jr. places the deployed lunar flag assembly on the moon during the first extravehicular activity of the mission (5 February 1971).

POSTAL NOTICE

Title of publication: *THE FLAG BULLETIN*. Publication number: 153370. Date of filing: 30 September 2010. Frequency of issue: bimonthly, six issues a year. Annual subscription price: \$68. Mailing address of known office of publication and headquarters of general business office: 3 Edgehill Road, Winchester, Mass. 01890 USA. Publisher/editor/managing editor/owner: Whitney Smith (same address). Known bond holders, mortgagees, and other security holders: none. Circulation (average number of copies during preceding twelve months/actual number of copies of issue nearest filing date): total 466/466. Counter sales: 0/0. Mail subscription: 402/402. Total paid circulation: 402/402. Leftover copies: 64/64. Returns from news agents: 0/0. Total: 466/466. I certify that the above statements are correct and complete: Whitney Smith, Editor.

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THE ATLANTIS ORBITER FLAG FLIES IN THE FOREGROUND AS THE SPACE SHUTTLE SITS READY FOR LIFTOFF



APOLLO 14 ASTRONAUT STANDS BY THE LUNAR FLAG ASSEMBLY ON THE SURFACE OF THE MOON