From Apollo to the ISS: The Televisual Image in Human Spaceflight

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Abstract
The televisual image has played a key role in the first fifty years of human spaceflight and lunar exploration by the National Aeronautics and Space Administration (NASA). As multiple national space agencies and private entities prepare to return humans once again to the surface of the moon as a precursor to eventual planned missions to Mars, television will continue to deeply shape the perception and politics of human spaceflight. This paper presents a history of the televisual image in human spaceflight through analysis of contemporaneous documentary evidence such as spaceflight transcripts and space agency press kits, with a focus also on the technical developments underpinning the broadcasts. The analysis commences with NASA’s Apollo missions of the 1960s through to the International Space Station (ISS) era. These televisual images have deep cultural currency but are also fragile and present moments of risk for the agencies involved.

Keywords
television, spaceflight, NASA, lunar exploration

“That’s one small step for man, one giant leap for mankind.” - Neil Armstrong from the surface of the moon, 1969.

The line uttered by United States (US) astronaut Neil Armstrong as he first stepped onto the lunar surface in 1969 is one of the most well-known phrases in human history. It was broadcast live worldwide on terrestrial television and radio networks and quoted...
in global contemporaneous media coverage to an audience estimated at around 600 to 650 million people (600 million see walk 1969; Hsu 2019; Sarkissian 2001). The landing and subsequent first words from the surface of the moon continue to serve as a climactic moment in popular retellings of the lunar landing and there has even been extensive quasi-academic debate over whether Armstrong said the words as quoted above or a slightly different phrase.\(^1\)

The prominence of Armstrong’s phrase in global cultural memory demonstrates the complexity and investment in public communication by organizations such as the National Aeronautics and Space Administration (NASA). Armstrong’s utterance could not have been heard by millions around the world without the development of a global communication system consisting of spacesuit-based devices, components of Apollo spacecraft, ground-based receivers on multiple continents, and global terrestrial transmission industries and equipment. These communication systems in turn were part of one of the world’s most complex and expensive public undertakings: an ambitious human spaceflight program sparked in part by the Cold War with the goal to land for the first time on the surface of Earth’s only natural satellite. Armstrong’s phrase, and the endeavor which made it possible, therefore serves as a useful launching point for consideration of the role of televisual broadcasts in crewed spaceflight. This study contributes to the understanding of global media histories by presenting an industry-centric case told over time with a focus on a particular mode of media (television broadcasting). Responding to Lotz (2019, 924), the paper seeks to “acknowledge the multiplicity of factors that have produced contemporary industrial dynamics” in television through the specific case study which entangles the human spaceflight endeavor with the ongoing development of the medium of television. It also establishes the groundwork for a larger project examining overall communication and engagement strategies within the space industry, including the role of the televisual now with the advent of internet streaming, high-definition in-flight cameras, and the emergence of private spaceflight activities.

Numerous global entities, including space agencies, militaries, and corporations, have in recent decades built or contributed to multiple electronic communication networks that now span across not only Earth but beyond our atmosphere and even throughout portions of our solar system. This paper engages with these systems from the media infrastructure studies perspective of the media studies tradition, noting the ways in which they “originate as sociotechnical systems that are centrally designed and controlled, typically in the invention and development phases of new technologies” (Plantin et al. 2018, 295). At the time of the Apollo program, NASA’s spaceflight tracking and data network already “spanned just about every corner of the globe, from desolate volcanic atolls like Ascension Island to metropolitan, capital cities like Madrid and Canberra” (Tsiao 2008, xxxii) but has since grown extensively. Acknowledging this network and drawing on the media infrastructure perspective, the paper conceptually argues for the expansion of our understanding of communication systems and technology to encompass this ever-widening scope of reach beyond Earth. While these are primarily scientific technologies, that science is achieved by the two-way communication of messages between ground controllers and spacecraft, and by sensory extensions
enabled by telescopes and the like. Moreover, they allow us to “see” and even “hear” events, sites, and phenomena which we cannot otherwise access.

The various space communication networks provide clear and pertinent examples of the human-technology interface characterized by McLuhan as “the global village” (2013 [1964]), although they might now more closely resemble a “stellar village” given the decades-long expansion out into the solar system. McLuhan was aware of the implications of communication networks and technologies that reach beyond Earth. In Understanding Media (2013 [1964]), he described reactions to the launch of the first artificial Earth satellite Sputnik by the Soviet Union and other scientific achievements as “a movement of faculties that include and transcend them.” These events, according to McLuhan, were yet one more example of media as “extensions of man” (sic). These induce structural changes to our collective “faculties,” or ways of understanding, and therefore extend McLuhan’s signature claim that the “medium is the message” (2013 [1964]). The media infrastructural claim here is that the solar system itself is now able to be rightfully considered the domain of media theory given the breadth of our sensing technologies. We have now an established stellar media infrastructure, defined following Plantin et al. (2018, 294) as having the “key features of infrastructure such as ubiquity, reliability, invisibility, gateways, and breakdown.” Television’s historical role in the US human spaceflight program is a foundational element of the system which now allows that claim to be made.

The remainder of this paper presents a chronological account of the unfolding role of television in US human spaceflight programs from the Mercury era of the 1950s to the International Space Station (late 1990s to now). The carefully delimited focus on US human spaceflight activities helps to establish a common cultural context to the historical and technological developments discussed here, though this is not intended to diminish the emergence and achievements of other prominent actors in crewed and uncrewed spaceflight, including notably the national space agencies of Russia, China, Japan, the transnational European Space Agency, and others. Notably, Russia (as the USSR) achieved the first human spaceflight, piloted by Yuri Gagarin in 1961, as well as the first artificial satellites (Sputnik in 1957) and the first lunar mission (Luna 1, 1959) (Stone and Andres 2019). Private corporations such as Blue Origin and Virgin Galactic are also actively developing crewed spaceflight plans which are not covered here. The paper relies extensively on contemporaneous documentary sources from NASA such as spaceflight transcripts, technical papers, press releases, and press kits as its evidence base. These materials are available online via the sources cited in this article.

NASA’s founding document, the National Aeronautics and Space Act, obligates the organization to “provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof” (National Aeronautics and Space Act, Pub. L. No. 426 1958, sec. 203a). Television has been a significant component of the public communication mechanisms which NASA has adopted, as evidenced by the cases examined in this paper. However, a panel convened by NASA’s Space Sciences Laboratory found that even in the 1990s and 2000s, “communication
often remains an afterthought, a by-product of scientific endeavor somehow removed from the scientific process itself” (Borchelt 2001, 200). In the early, heady days of crewed spaceflight missions, television network ABC “feuded” with NASA over access to missions and information (Cressman 2007). But as the value of television for developing and strengthening public support was realized, and as television technology developed in parallel to the complexifying space program, cameras, and broadcast equipment were embedded ever deeper into missions.

**Mercury-Gemini-Apollo (1958–1972)**

Cressman (2007) and Starr (2008) both describe the 1959 unveiling of NASA’s first astronauts for the Mercury program as a significant moment in the relationship between the space agency and the media. Cressman suggests the men were “transformed from unknown test pilots into celebrities” (2007, 135) while Starr notes they were presented as “pioneering, almost superhuman” (2008, 204). At that time, NASA maintained an exclusivity deal with *Time* magazine that meant the astronauts did few television interviews outside of press conferences. Yet, as Cressman (2007) shows, the television networks continued live coverage of many spaceflight activities throughout the 1960s, although the broadcasts were limited to footage of launches with some audio of later stages for much of the Mercury and Gemini programs. This was both a technological limitation and the result of decisions made at NASA about which aspects of the flights would be shared with television networks. But the television industry was interested in spaceflight, and pressed NASA to allow ever greater access.

For the first crewed Gemini launch, piloted by Alan Shepard, “important details about the mission remained shrouded from journalists covering the flight” until the White House intervened in NASA policy to encourage a live broadcast (Stone and Andres 2019, 92). The American television networks ABC, CBS, and NBC subsequently all carried live coverage of the Freedom 7 launch from Cape Canaveral anchored by their own personnel using pooled footage and voiceover announcements from NASA’s public affairs staffer John Powers (Stone and Andres 2019). Within a week of that flight, President John F. Kennedy had addressed a gathering of America’s broadcasters in Washington, Shepard by his side, to “enlist the broadcasters’ partnership” for the remainder of his space program (Stone and Andres 2019, 99). This appeal to television was part of Kennedy’s standard operating procedure following its role in his election and his “custom of live, televised news conferences” (Hoover 1988, 41). Alongside Kennedy’s politics, the televisual was beginning to embed itself deep into the fabric of crewed spaceflight initiatives.

The Apollo program, which commenced on the back of the successes of Gemini, made moves toward a greater openness to television, with “brackets for a television camera” installed in Apollo capsules (Cressman 2007, 142). NASA commissioned a television camera that could transmit via the single channel Apollo data downlink
without requiring significant astronaut control and Apollo 7 was designated the first American spaceflight mission from which a live broadcast would occur (Wood 2005). The Apollo 7 press kit promised that despite the technological challenges of receiving live television from an orbiting spacecraft, “the home viewer should still be able to see the picture with reasonable clarity” (NASA 1968b, 54).

However, the astronauts themselves remained wary of television (Cressman 2007). Stone and Andres (2019, 205) observe that “neither the spacecraft engineers nor the majority of the astronauts wanted the camera on board.” The Apollo 7 flight transcript shows Houston transmitting a flight plan update nineteen hours and seventeen minutes into the flight to request that the first broadcast be conducted four hours later (NASA 1968a). At twenty-two hours and thirty minutes, Commander Walter Schirra indicated his view that the crew would “be unable to support anything but the normally scheduled flight plan activities” (NASA 1968a, 110). Discussion between Houston and the crew continued over the following hour, but Schirra did not conduct the broadcast (Wood 2005). Complicating the matter further was the limited number of ground stations capable of receiving the broadcast, which restricted potential broadcast time to only those moments when the spacecraft was over one of the two ground stations in either Florida or Texas (NASA 1968b; Wood 2005). Nonetheless, Schirra and crew eventually conducted the first live broadcast from an American spacecraft “about seventy-two hours into the Apollo 7 mission” (NASA 2018). At two days, twenty-three hours, and forty-four minutes, Houston’s capsule communicator (CAPCOMM) narrated for the crew what could be seen on the television broadcast:

I can see Wally [Schirra] handle it now, and Donn [Eisele] has a smile on his face, and there’s Walt. The definition is pretty good down here; I can see the center hatch. Actually I am amazed; it looks real good. (NASA 1968a, p. 321)

The astronauts of Apollo 7 then broadcast to Americans a view of their own country live from space, panning over the south-eastern states from Florida to Louisiana.

Later in 1968, Apollo 8 featured one of the more controversial space-based television broadcasts. On Christmas Eve, the three astronauts read passages from the Book of Genesis as part of a broadcast (Oliver 2013). That event and others during the Apollo 11 mission provoked a lawsuit that sought to prohibit NASA from “either directing or permitting further religious activities in space” (Oliver 2013, 117).

By the time of the Apollo 11 mission and moon landing in 1969, key moments in NASA’s spaceflight efforts were regularly broadcast globally via terrestrial radio and television networks. The broadcast infrastructure supporting the Apollo 11 landing included three major tracking and relay satellite dish facilities, each approximately 120 degrees of latitude apart on the surface of the Earth. These were located at Goldstone in California, Canberra, Australia, and Madrid, Spain. Two 64 m satellite dishes at Goldstone and Parkes, Australia, were used to receive the television signals sent by the lunar lander (Sarkissian 2001; Wood 2005).
Around one hundred nine hours and forty-two minutes after launch, Armstrong stepped onto the moon’s surface and delivered his famous line (NASA 2018). Accounts of this moment from around the world have informed analyses of the social dimensions of spaceflight ever since. Linking two archeological traditions together, Gorman (2019) compares her televised viewing of the moon landing from a small Australian town with that of terrestrial archeologist Erich Wendt listening on radio from the Apollo 11 cave in Namibia in a demonstration of the ways in which communication technology can evince connections across time and space. Itakura (in Japanese Aerospace Exploration Agency [JAXA] 2015, 29) says the broadcast was “an historical media event. . . long remembered by the Japanese.” Mailer (1969, 377) described the entirety of that first lunar walk as “a set of television activities.”

Katz and Dayan (1985, 310) famously described the moon landing as a “media event,” which is a simultaneous global broadcast of an event which originates outside of the media and is given “sanctity and significance” by broadcasters. Such activities rely upon a vast array of communication infrastructure simply by their nature as globally-broadcast events. In the case of the Apollo program, that infrastructure extended beyond Earth to the lunar lander and the orbiting command service module (CSM), both of which had important technical functions in capturing and relaying information to Earth-based facilities. CBS news anchor Walter Cronkite “could hardly contain his excitement” (Stone and Andres 2019, p. 255) following Apollo 11’s launch. For the landing several days later, all three American commercial television networks “commenced live coverage of what promised to be a broadcast lasting more than twenty-four hours” (Stone and Andres 2019, p. 259). Cronkite again anchored for CBS.

Apollo 11 itself carried two television cameras aboard, as shown in the details provided in the mission’s press kit (NASA 1969a). The first was capable of recording and broadcasting in color and was used in much the same manner as broadcasts during previous flights with general commentary and televised broadcast from space by the astronauts. The second was a black and white camera made by Westinghouse specifically for capturing Armstrong’s descent to the moon’s surface and the crew’s activity thereafter (NASA 1969a). It would be “powered up before Armstrong starts down the LM [Lunar Module] ladder. . . and relay a TV picture of his initial steps on the Moon” (NASA 1969a, 77). Wood (2005, 21) observes that “Neil’s climb down the ladder and first steps on the surface were transmitted to Earth through the steerable high-gain antenna on the LM.”

The Apollo 11 transcripts show that the crew were well aware of the global media interest in their flight, with a report from CAPCOM three days into the flight citing Pope Paul VI as having arranged a color television for the event, the BBC considering an alarm system to tell people when the moon walk would commence, and the German city of Frankfurt installing public televisions (NASA 1969b, 205). These aspects of the historical record demonstrate that television had by now deeply penetrated the focus of NASA and its astronauts. The televised had come to be a dominant concern for the mission, perhaps third only to the twin goals of arriving on the moon and then returning to Earth.
The television broadcast remained a prominent goal for the mission as the moment of Armstrong’s first step on the moon neared. As Neil Armstrong descended from the lunar lander, Buzz Aldrin reminded him to deploy the Modular Equipment Stowage Assembly (MESA) which held the lunar surface camera:

**Aldrin:** Did you get the MESA out?

**Armstrong:** I’m going to pull it out now. Houston, the MESA came down all right.

**CAPCOMM:** This is Houston. Roger. We copy. And we’re standing by for your TV.

(NASA 1969b, 367).

Twenty seconds later, CAPCOMM confirmed they were receiving images, to which Aldrin replied: “You’re getting a good picture, huh?” (NASA 1969b, 376). The footage then shows Armstrong pausing on the ladder just above the lunar surface and describing what he saw before stepping down and saying the famous line: “That’s one small step for man, one giant leap for mankind.” In the transcript, it alone is rendered in capital letters. Here, the televisual image not only represented spaceflight but actually was spaceflight for the vast majority of Earth’s population. Here the televisual achieved true extension of human faculty beyond Earth.

Armstrong’s first steps commenced an approximately two and a half hour extra vehicular activity (EVA) which was broadcast live around the world. After both astronauts had exited their lander, they repositioned the camera to show a wider view of the location. The whole EVA and broadcast included a phone call with US President Richard Nixon, the collection of samples from the Moon’s surface, and capturing of multiple still photographs of the landscape, equipment, and astronauts. Televisual activities do predominate throughout this broadcast, which is now available to view in full on NASA’s YouTube channel (NASA 2014).

Despite the enthusiasm for the initial moon landing accomplished by Apollo 11, interest in further missions waned quickly. Kauffman (2001, 437) notes that “The television networks, sensing little public interest, did not even telecast a live interview with the Apollo 13 crew from outer space” prior to that mission’s crisis, discussed below. Having achieved its zenith with the first moonwalk on Apollo 11, the televisual lost interest in crewed spaceflight. Launius observes that “Apollo never enjoyed the strong public support that many have romantically projected into the project” (2003, 174). However, a camera was placed for the first time on the launch pad to capture the Saturn V’s initial ascent for the Apollo 13 mission (Westinghouse 1970; Wood 2005). This indicates that even as television abandoned NASA, NASA did not abandon television.

Apollo 13’s planned moon landing was canceled following a malfunction in the vehicle’s oxygen tanks which imperiled the crew. The danger once again piqued public and media interest in the flight and television once again tuned itself into the space program. NASA’s public and stakeholder communication during the Apollo 13 crisis was open and honest (Kauffman 2001). This approach “bolstered the agency’s image and maintained sufficient confidence and trust with Congress and the public to gain continued support for manned space exploration” (Kauffman 2001, 445). Launius,
however, suggests that public support for spaceflight was only later redeemed in the 1980s by films such as *Apollo 13* (based on the events of the mission), and “near-term science fiction films” (2003, 170).

Even as interest in the broadcasting of spaceflight waned – notwithstanding the way that the Apollo 13 emergency attracted attention – NASA continued to invest in television equipment and broadcasting capabilities. By now, the Agency was deeply invested in the televisual to inform mission design and help attain public support. As such, Apollo missions 14 through 17 all successfully landed on the moon and returned safely to Earth, recording broadcast-quality television footage along the way. Apollo 15 used a Ground Commanded Television Assembly system, which allowed the crew to set up a camera that filmed their ascent from the surface of the moon (Wood 2005). Other image processing improvements and additional ground infrastructure greatly improved the quality of broadcast footage obtained during these missions compared with Apollo 11 (Russell n.d; Wood 2005).

Following the conclusion of the Apollo lunar missions with Apollo 17, NASA conducted the Skylab program, which was the world’s first orbital space station and was occupied by three missions between 1972 and 1974 (Newkirk et al. 1977). As with Apollo, Skylab included live and recorded telecasts from space, including seventy during the Skylab 4 mission (Newkirk et al. 1977). As early as 1970, NASA’s Education Programs Office was planning to use live television broadcasts from Skylab for educational purposes and one of the first broadcasts included the Skylab 2’s crew observing damage that the station had sustained during launch (Newkirk et al. 1977).

NASA then undertook a joint program with the USSR known as the Apollo-Soyuz Test Project (ASTP), which culminated in 1975 with a broadcast handshake in space. Skylab program director William Schneider directed a memo to his ASTP counterpart in 1973 in which he “ascribe[d] at least two of my many ulcers to television” (cited in Newkirk et al. 1977, 333). Ezell and Ezell (1978, 235) observe that “the public exposure of the project – especially television– was a major objective of ASTP, accorded as high a priority as everything else in the project except flight safety.” This mission objective was one of the more contentious points in negotiations and planning between NASA and their Soviet counterparts, as NASA’s “requirements for live television broadcasts from Apollo and Soyuz were to be often in conflict with the Soviet desire to make motion pictures of the same events” (Ezell and Ezell 1978, 236). Delegations from the two nations eventually visited each of the respective space flight centers to test whether television equipment would interfere with flight equipment and vice versa (Ezell and Ezell 1978). ASTP received approval to use geostationary satellites to relay live images to the ground stations, which expanded the available broadcast windows, and agreement was made with the European Broadcasting Union and the West German Government to exchange signals on the continent and ensure sufficient broadcasting capacity for ASTP (Ezell and Ezell 1978). While American media were excluded from attending the Soviet launch complex at the Baikonur Cosmodrome, ATSP nonetheless marked the first live-to-air global television broadcast of a Soviet launch, and Apollo
followed it up hours later with the “first live launch pad color television pictures of
the interior of the CSM [Command Service Module]” (Ezell and Ezell 1978, 319). The most consequential television broadcast of ASTP came shortly after docking, as Apollo Commander Thomas Stafford and Soyuz Commander Alexei Leonov exchanged greetings and shook hands upon opening their adjoined hatches (Ezell and Ezell 1978).

Throughout the Mercury and Apollo missions, Skylab, and ASTP, the global communication infrastructure required to capture and relay video from sites as diverse as launch pads, the vehicles themselves, the surface of the moon, and the splashdown locations steadily grew, even as the interest of television broadcasters and their audiences waxed and waned. This system has since come to be the basis of a vast communication infrastructure which supports probes both within and beyond the solar system, ranging from the Juno mission to Jupiter, to the Parker Solar Probe and multiple Mars missions, to missions such as the Voyager probes, which are now in the interstellar medium that exists between stars (Richardson et al. 2019; Strauss 2019). Photographic images continue to be returned from many of these missions, and many examples of in-motion scenic shots of far-flung planets now circulate in the world’s media systems, though few of them are truly captured by traditional video technologies, instead being stitched together from many hundreds or thousands of still photographs.

**Space Shuttle (1981–2011)**

The development of the Space Shuttle (formally the Space Transportation System, or STS) continued the expansion of broadcasting activities and events associated with US crewed spaceflight. The total orbital Shuttle fleet eventually included five reusable vehicles which, unlike the ocean splashdowns of Apollo capsules, landed on dry-land runways in a manner like aeroplanes. Like Apollo, the Shuttle launched atop huge booster rockets which were jettisoned during the mission. The five orbital vehicles—Columbia, Challenger, Discovery, Atlantis, and Endeavor—were flown for 135 missions between 1981 and 2011 and were pivotal to construction of the International Space Station. The era also offered some moments wherein the relationship between NASA and the media was substantially strained or challenged, most notably following the Challenger and Columbia disasters in 1986 and 2003 respectively. Indeed, these two disasters are the most prominent moments of spaceflight broadcast in the Shuttle era and the available sources concentrate on them almost to the exclusion of all other broadcast activities. The Shuttle era both relied upon and contributed to the growth and change of global television broadcasting technologies and systems: the vehicle was used to deploy new satellites while televisual broadcasts were used for operational, educational, and engagement purposes.

Launius demonstrates that public support for the Space Shuttle program was higher than for Apollo but suggests that this popularity in large part relies upon popular media other than spaceflight broadcasts (2003). However, Launius also documents two actual
events which correlate to high points in public opinion of the program: the 1995 docking of the Shuttle with the Russian space station Mir, which “may have sparked recognition of the importance of human exploration in opening the high frontier of space” (Launius 2003, 170); and President Ronald Reagan’s 1984 direction to NASA to build what would become the International Space Station (Launius 2003).

Building on the previous spaceflight broadcast successes, the broadcasting service NASA TV was established in the 1980s to “provide the agency’s Space Shuttle Program managers and engineers with realtime video of space shuttle operations and liftoff-to-landing coverage of missions” (McAuliffe 2007). The service has also provided public free-to-air television channels since its founding. In 2005, NASA signed an agreement with Yahoo! and Akamai to stream the return-to-flight Shuttle mission which followed the 2003 loss of Columbia (Dunbar and Mirelson 2005). The contemporaneous press release quoted NASA Administrator Charles Bolden heralding the agreement as “another significant milestone for the Internet” (quoted in Dunbar and Mirelson 2005). This indicates NASA’s interest in further extending broadcasts of human spaceflight activities beyond the traditional terrestrial broadcasting networks.

The Press Kit for the first orbital shuttle flight, STS-1, in April 1981, notes that “real-time orbital television” would be received upon overflight of the transmission stations in Florida, Madrid, Canberra, and Goldstone (NASA 1981, 40). It also promises a schedule of nine on-flight television transmissions of activities ranging from payload door tests, flight status reports by the astronauts, and flight control tests. The transmissions would go live from “two closed-circuit color television cameras in the spacecraft cabin” which were remotely managed by Mission Control (NASA 1981, 42). They were to be transmitted from the Shuttle via the tracking stations to Goddard Space Flight Center in Washington, DC, and then on to Mission Control at the Johnson Space Center in Houston. The Press Kit also notes that the television signals would now be transmitted via satellite within the US whereas “during previous manned program support, use of communications satellites was limited to those connecting the United States with foreign locations” (NASA 1981). This demonstrates the continued development of the global television broadcasting network at that time and its integration into spaceflight mission planning by NASA.

Among other developments, Space Shuttle broadcasts were used to expand access to space to those who could not physically be there. Block and Okrand (1983) note that the first live-captioned unscripted television broadcast was a 1982 launch of Columbia while Weitekamp (2008, 218) documents a program as early as 1984 “that actively sought civilians who might eventually fly on Shuttle missions.” Among the suggestions put forward for those who might fly were CBS television news presenter Walter Cronkite (Weitekamp 2008). This is especially notable given Cronkite’s prominence in broadcasts of launch and landing of the Apollo 11 mission. He was widely regarded to be the televisual face of spaceflight. The introduction of payload specialists on Shuttle flights (the first on STS-5 in 1982) did facilitate non-astronaut spaceflight participants including US politicians and Saudi royalty, but not Cronkite or other television presenters (Weitekamp 2008).
The 1986 Space Shuttle Challenger disaster stands out in the broadcast history of crewed spaceflight because it was observed by an unusually large number of school children live on television. NASA had devised a program, “Teacher in Space,” which attracted some 11,000 applicants from across the US (NASA 1986). The selected spaceflight participant was Christa McAuliffe who was scheduled to conduct two school lessons broadcast live from the Shuttle. The program was explicitly designed to recapture interest in the space program, and McAuliffe had been afforded numerous media appearances prior to the launch. As a result of the widespread interest in the program, Weitekamp (2008, 233) observes that “many schools had arranged to view the launch in order to allow students to follow the culmination of the Teacher in Space program live.” Challenger broke apart seventy-three seconds after launch, killing all seven crew on board. The incident was made even more shocking for the number of school children watching, and their investment in the mission because of McAuliffe’s role in it. Whereas in the 1960s and 70s television had shown spaceflight as an enterprising and daring accomplishment of humankind, it now brought images of Challenger’s breakup live into hundreds of American schools, not to mention those viewing at home and elsewhere around the world.

The 2003 loss of Columbia during STS–107 occurred as the Shuttle re-entered the Earth’s atmosphere after a successful mission. Like most Shuttle missions, STS–107 conducted live spaceflight from orbit broadcasts for NASA TV (NASA 2002). That service was by now widely serving as the televisual offering for human spaceflight. The orbiter’s wing had been damaged during launch by a known fault and the heat of re-entry caused the wing to fail, leading to the breakup of the vehicle and the death of all seven crew members. Following the disaster, a Contingency Shuttle Crew Support plan was developed for any future missions that might be unable to return safely from space (NASA 2005). While the Shuttle, and especially its destruction, was visible from the ground across multiple regions of the US, it was not under the same kind of close and live televisual observation as Challenger as the accident occurred. Nonetheless, images of the sky streaked with smoke from the lander were broadcast nationally, as were images of recovered debris.

NASA public communication following Columbia was more well-received than that following Challenger (Kauffman 2005; Martin and Boynton 2005). Both “were crises of epic proportions. . . seen live on television or captured on video” (Martin and Boynton 2005, 260). Hall (2003) and Mason (2004) found that NASA displayed continued organizational failure that persisted between the two disasters.

The remainder of the Shuttle program focused on building the International Space Station while satellite deployments and supply deliveries to the ISS were largely taken over by uncrewed flights, missions undertaken by the Russian Soyuz spacecraft, and resupply missions by the uncrewed European Ariane 5. Launius (2003, 170) notes that until 1995, even the American public “favored robotic missions over the Shuttle flights,” perhaps due to the widely televised Challenger and Columbia disasters.
The Space Shuttle era concluded in 2011 with STS–135 flown by Atlantis. Like Apollo, it saw an ever-greater role for televisual broadcasts of spaceflight activities, including launches and landings. Television played a particularly vivid role in exposing the public to the risks of spaceflight in this era, particularly during the Challenger disaster. The era is also defined by NASA’s introduction of the NASA TV service, initially via terrestrial and then satellite broadcast before the 2005 introduction of web streaming. The role of web streaming in spaceflight broadcasts continued to grow in prominence well into the 2000s.

International Space Station (1998–Ongoing)

Following decommissioning of the Space Shuttles, NASA relied solely upon Russian launch capacities to ferry crew to the International Space Station until the Demo–2 mission conducted by private US corporation SpaceX in 2020. While media and television access to launches from the Russian Baikonur Cosmodrome in Kazakhstan is less common than that for NASA’s Kennedy Space Center, it is by no means rare in the modern era. NASA TV’s schedule includes regular coverage of launches from Baikonur, and documentaries such as *A Year In Space* (Grob et al. 2015) have been filmed there.

Construction of the International Space Station (ISS) was first directed by US President Ronald Reagan in 1984, though it was initially to be a sole US enterprise (Logsdon 1998). It became a collaborative program involving the US, Canada, Russia, Japan, the European Space Agency, and others. The first phase of station development was the Shuttle-Mir program, in which the Space Shuttle regularly docked with the Russian space station Mir and astronauts from the two nations flew on each other’s space vehicles (Morgan 2001). The ISS was initially constructed largely from payloads delivered to space by the Space Shuttle and Soyuz/Proton between 1998 and 2000 (Morgan 2001) though additional modules have since been added, including the Russian module Nauka in 2021 (NASA 2021a; 2021b).

Television broadcasting from the ISS has followed many of the same trends observed for Apollo and the Space Shuttle. It has been the backdrop of many television broadcasts of science experiments, meetings between new crew members, interviews, spacewalks, and other material. Much of this continues to be broadcast on NASA TV (NASA n.d. for example on YouTube, see: NASA 2021a). In late 2021, the ISS also became the filming location for a Russian feature film after an actress and director were sent there aboard a Soyuz spacecraft from Baikonur, footage, and coverage of which was posted by the Russian space agency on Twitter (Roscosmos 2021). The use of the ISS for this purpose perhaps recalls the cultural differences in media modes preferred by the USSR and NASA at the time of the ASTP:

Traditionally, the Soviets had released information about their missions only after the fact. And they had not engaged in extensive use of television, preferring instead to tell the space story through newspapers and motion pictures (Ezell and Ezell 1978, p. 236)
Nonetheless, media speculation abounds that US actor Tom Cruise is also planning to visit the station to film scenes (e.g., Shoard 2021). The expansion of filmic activity aboard the ISS to non-astronauts indicates a further change in the role of the televisial in spaceflight and in the communication of spaceflight activity with the public, even as it bears the hallmarks of significant continuity with the Apollo and Space Shuttle eras.

**Conclusion and Future Directions**

The phrase delivered by Armstrong, those first words spoken by a human being standing on the surface of another cosmological body, is emblematic of NASA’s public communication during Apollo and since. It cannot be divorced from the wider cultural and political economies within which it was uttered and nor can more recent moments of spaceflight broadcast. The Apollo 11 moon landing was a “media event” (Katz and Dayan 1985), ceremonial and sacred to the networks which carried it and seemingly to the global media audience. A *New York Times* retrospective called it “one of the first global news media spectaculars” (Hsu 2019). Apollo 11 Flight Director Clifford Charlesworth called it “the greatest television spectacular of all time” (quoted in Sarkissian 2001, 307). Nonetheless, coverage standards were not identical around the world. The moon landing “received vastly different media coverage in the US and the Soviet Union” (Sonnevend 2018, 124). And, “the BBC covered the event with less reverence than its American counterparts” (Hsu 2019). The landing’s media presentation was intimately linked with the political environment in which it originated and occurred. Though widely seen as an achievement of all of humanity, it was marked indelibly as an American activity, topped off with the planting of an American flag in the lunar regolith. Gorman recognized that action as “a well-known metaphor (and cliche) of colonization” (2019, 8). Stone and Andres (2019, x) describe the mission as “a demonstration of national will framed as a world media event.”

From that base, the television technologies and the televisial image became increasingly prominent in NASA’s human spaceflight program, even when television networks themselves lost interest. However, as Apollo 17 showed, NASA’s use of the technology meant that when an audience was willing, the images could be produced. The geopolitical detente evidenced by the symbolic televised handshake between Thomas Stafford and Alexei Leoniv during the Apollo-Soyuz Test Project was continued through cooperation on the International Space Station and the various broadcasts that have occurred since. The focus of ISS broadcasts in 2023 remain on NASA TV–streamed school meet and greets and science demonstrations.

This paper is the first stage in a broader project examining the role of media, communication, and engagement strategies in the modern space industry. There are two lines of inquiry in this broader project: (1) examination of industry engagement strategies as they underpin career aspirations and develop a future workforce; and (2) ongoing analysis of the role of media (including television) in coverage of the new era of spaceflight including Artemis. As such, this paper has presented primarily an historical narrative, with an expectation that future questions and implications will be explored in the larger project.
The paper, and the broader project, is timely considering current efforts, from both corporations and governments, toward once again placing human beings on the surface of the moon as a gateway to eventual crewed missions to Mars and renewed missions to other stellar entities. Five decades after Apollo, NASA’s Artemis program intends to achieve “the goal of an initial human landing [on the moon] by 2024. . . while simultaneously working toward sustainable lunar expiration in the mid- to late 2020s” (NASA 2020, 9). The campaign commenced with the launch of Artemis 1 in November 2022. Speaking to a NASA podcast (Artemis Imagery 2022), Gary Cox from the Orion capsule development team indicated there would be cameras inside the crew cabin, on the outside of the spacecraft, and on the spacecraft’s solar array. Additionally, the Space Launch System rocket which will propel Orion into space will have its own camera system (Artemis Imagery 2022). These are expected to produce images of Earth and the moon in addition to the crew. The project also comes in the early phases of NASA’s commercial crew program wherein private corporations take up much of the spaceflight activity previously only available to governments and significant recent instances of broadcast of spaceflight activities by private corporations and governments around the world.

For the vast majority of human observers on Earth, the increasing depth of televisial coverage of crewed spaceflight across the decades from Apollo to the ISS have allowed ever greater involvement and access to environments which they will never see, smell, touch, or hear in person. There is now an extensive media infrastructure beyond Earth that is realizing McLuhan’s notion of the extension of humanity, this time well beyond the surface of our planet.

Despite difficult moments in the relationship between NASA and the media, televison gradually became more deeply integrated into crewed spaceflight activities from the time of the Gemini and Apollo programs, through to the Space Shuttle era, and then the International Space Station. Undoubtedly, this success is inspired in no small part due to the iconic televisual images of Armstrong stepping onto, and then speaking from, the surface of the moon. Ever greater layers of media infrastructure are building upon television’s example in images returned from other planets, the outer solar system, and soon once again from the moon.

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Note

1. Jones (1995), in the *Apollo Lunar Surface Journal*, notes that while the audio of that moment clearly misses the a, Armstrong himself believes he said it. Shann-Ford (2006) conducted a “voice signal analysis,” the results of which were widely reported, that found Armstrong did “say the sentence completely and correctly.” However, that conclusion was disputed by linguists on the *Language Log* blog (Beaver 2006). Olsson and Riley (2009) suggest that Armstrong did omit the word, but that his meaning nonetheless remains clear. Finally, Baese-Berk et al. (2016) note that “substantial ambiguity exists in the original quote from Armstrong.”

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Roscosmos. 2021. *Attention! We are beginning our broadcast from the Baikonur, where the #SoyuzMS19 spacecraft is about to launch with the ‘Challenge’ project participants! Lots of interesting guests and comments to come, join in! The launch is scheduled for 08:55 UTC*.


**Author Biography**

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