The international space station history essay

In the late 19th century, as soon as scientists realized that traveling in space was a practical possibility, they began planning a permanent platform in orbit to use in observing the Earth, studying space, and as a construction site and refueling stop for spaceships bound for the moon and planets. In 1869, the Atlantic Monthly published the work by Edward Everett Hale, where he described the “ Brick Moon,” a satellite 60 meteres in diameter with the crew of 37, which helps to navigate ships at sea. 2 At the turn of the 20th century, Konstantin Tsiolkovsky in Russia envisioned many elements of future spaceflight, including space stations. 3 By 1923, Hermann Oberth wrote “ The Rocket to Planetary Space,” a theoretical work in which he discusses the roles and the design of the space station. 4 By 1929, the Honorable Noordung advances the idea of the station further in his work “ The Problems of Space Travel.” 5 Many early space station concepts were in the form of a giant wheel, which would rotate to provide simulated gravity through centrifugal force. These stations were to be hundreds of feet across and would house dozens of scientists and astronauts.

The first space stations to be built were in the form of the upper stage of the booster rocket which carried them into orbit. The earliest of these housed a crew of two or three, provided no artificial gravity, and were expected to fall out of orbit and burn up in Earth’s atmosphere when their usefulness was over.

As far back as 1959, the NASA Office of Program Planning and Evaluation’s Long Range Plan of the National Aeronautics and Space Administration set a target date of 1965-1967 for launching a program leading to a permanent near-Earth space station. The plan predicted that manned flight to the Moon would happen later. 2 These plans were changed as the United States began its race to the Moon in competition with the Soviet Union. After the success of Apollo, NASA reiterated its interest in a permanently manned space station.

In September 1969, the NASA Space Task Group noted that “ a space station module would be the basic element of future manned activities in Earth orbit, of continued manned exploration of the Moon, and of manned expeditions to the planets.” The base was to be used as a laboratory for a broad range of physical and biological experiments. 3 The Nixon administration approved the development of the reusable Space Shuttle as a main direction for the United States manned space program. The Space Shuttle was envisioned as a cheap and reliable transportation system between Earth and low orbit. For NASA it meant the Space Shuttle would launch and service a space station – the next “ logical step” in the human exploration of space. However these dreams were stalled for years by the difficult birth of the Space Shuttle. As the Space Shuttle sat on the drawing board, in 1973, the Skylab space station was launched to test some of the concepts and technologies for living in space. Over the course of a year, Skylab was used for three missions ranging from 28 days to 84 days in length. Further missions were prevented by unexpectedly high solar activity that would have posed a danger to the astronauts. Skylab later re-entered the Earth’s atmosphere and broke up over Australia and the Indian Ocean. 4 The funding provided to NASA did not allow the agency to implement the long-term vision put forth by the Space Task Group until the 1980s, when NASA again began to pursue the objective of developing a continuously manned station in low Earth orbit. Although the idea had been around for many years, and had long been a part of NASA's plans, the path to political approval was rocky. Many political actors, including members of Congress and those in the executive branch, did not support proposals to create a space station. The significant costs of space endeavors, while quite small in the landscape of the overall federal budget, are seldom easily approved. However, President Ronald Reagan was very supportive of the project, and it was likely his support that helped gain approval for the program. 5 To build and sustain broad interest in the project, NASA incorporated the interests and goals of many different potential users. Allowing form to follow function, NASA opted to put forth a list of missions that the space station would be designed to carry out. This helped NASA ensure that there was widespread interest in the project without it becoming prematurely " locked in" to a specific technical design. NASA proposed a modular design, allowing the desired capabilities, as well as others not yet imagined, to be added later. In his State of the Union address in 1984, President Reagan declared the space station to be one of the great national goals and directed NASA to develop a permanently manned space station by 1991, to be called Space Station Freedom. 6 However, in 1993, the Clinton Administration directed a complete reconsideration of the space station program, NASA was asked for another redesign of the space station Freedom. In response, NASA came up with three options known as A, B, and C, however none of them would meet the projected budget restrictions and all resulted in a further simplification of the space station's design.

///Segway needed///

With the loss of the moon race in 1969, the Soviet government adopted the space station as the major direction for the Soviet manned program. Since then several generations of the Salyut scientific stations, similar Almaz military stations and finally Mir space stations have flown. Mir-2 would follow as the main Soviet effort in the manned spaceflight. The project went through several reincarnations during the 1980s and the beginning of the 1990s, starting with the large space station launched by the Energia super heavy-lift booster and ending with a more modest design of the Proton-launched core and a single truss carrying solar arrays and helio-concentrators.

///Need more on Mir-2///

In 1993, due in part to a desire to promote post-Cold War cooperation between the United States and the former Soviet Union, Russia was invited to join the program, which would be renamed the " International Space Station," and would effectively merge the Russian Mir-2 and United States' Freedom projects. The inclusion of the Mir-2 core module into the Freedom design would allow early presence of the crew onboard, while the use of Progress cargo ships would provide much cheaper and reliable refueling and supply capabilities for the station, comparing to the use of the Space Shuttle. This invitation was accepted, and the details of Russia's participation were agreed in 1994. 9 Development of the space station continued, and the first module was launched in November 1998. 10 Since then, construction of the ISS has continued, although the loss of the Space Shuttle Columbia and subsequent grounding of the shuttle fleet caused significant delays.

In 2004, President George W. Bush unveiled the Vision for Space Exploration. Prominent in this vision was the commitment to complete the assembly of the ISS by the end of the decade. It called for research conducted aboard the ISS to focus on science related to exploration, including the need for research on how the space environment affects astronaut health and capabilities, and how to counter the effects of long-duration space flight. The " vision" also points out the importance of the United States living up to its agreements with, and obligations to, international partners. 11

In 2005, the ISS was designated by Congress as a National Laboratory to encourage full use of the space station's unique research capabilities. National Laboratory status means that commercial entities and government agencies other than NASA are now also able to design and carry out research aboard the ISS. 12

NASA has established partnerships with the Department of Energy, the Department of Defense, and the Department of Veterans Affairs. MOUs have been signed with the National Institutes of Health and the U. S. Department of Agriculture, and Space Act Agreements have been signed with three private firms and a university. NASA continues to evaluate and pursue additional partnerships.

NASA carried the biggest share of the station price tag. The US Space Shuttle served as a major carrier of the station's elements to orbit, including the US-built main truss of the station, four sets of solar arrays, and radiators, US-built laboratory and habitable modules, interconnected with the special node modules, the big airlock for spacewalks assembly and servicing platforms and eventually the reusable “ lifeboat” for the crew.

The Russian Aviation and Space Agency, pledged to contribute key elements, originally developed for the Mir-2 program, into the ISS project. Moscow-based Khrunichev enterprise has also built the first element of the station, the Zarya/FGB control module, under contract with Boeing. The Zvezda service module, a copy of the Mir’s core module, provided living quarters and propulsion capabilities. The docking compartment brings an airlock and additional docking port for the Russian segment. Science and power platform carried solar arrays and radiators, and a Universal Docking Module provided docking ports for at least three application modules.

The Western-European country-members of the European Space Agency provided the Columbus pressurized science lab and a free-flying platform, which could dock to the station. At the beginning of the 1990s, the length of the module had to be reduced and the free-flying platform was completely dropped from the project. In a separate contract with NASA, Italy built resupply modules that were carried in the Shuttle cargo bay. A special Ariane-5-launched space tug, the ATV, was built by the ESA with Russian help, and provides additional cargo supply capability for the station.

The National Space Agency of Japan, NASDA, contributed into the project a pressurized lab and unpressurized science platform. Although the original plans expected that Japanese launch vehicles and mini-shuttle could support the program, but neither was ready by the time the assembly of the station started in 1998.

Canadian engineers used their extensive experience gained in the course of developing the robotic arm for the US Space Shuttle, to design even more elaborate and sophisticated robotic systems, which would facilitate the assembly and servicing of the International Space Station.

Brazil promised

The United States' Skylab was converted from the upper-most stage of the Saturn V moon rocket. A total of nine American astronauts visited Skylab. Russia's multi-module Mir space station was operated for 15 years and was visited by Soyuz crew capsules as well as the American Space Shuttle.

The size of U. S., Japanese, and European elements was dictated by the capacity of the Shuttle's cargo bay. Russia joined the program in 1993, and their modules had been based on the Mir and Salyut stations. Building the station required more than 40 launches. The main Russian elements were lifted on Proton rockets. Other main components were carried by the Space Shuttle. Crews and cargo rode the Shuttle and on Soyuz craft.

The International Space Station (Figure 1) is the largest international scientific project in history. Led by the United States, the International Space Station draws upon the scientific and technological resources of 16 nations, including Canada, Japan, Russia, and nations of the European Space Agency, to create and operate the world's only continuously inhabited outpost and laboratory in space. The ISS will be completed over the next 4 years. The focus of the ISS National Laboratory effort is to ensure that the unique capabilities of this national investment are effectively utilized. More than four times as large as the Russian Mir space station, the completed International

Space Station will have a mass of about 420, 454 kilograms (925, 000 pounds). It will measure 110 meters (361 feet) across and 74 meters (243 feet) long, with almost an acre of solar panels to provide electrical power to six state-of-the-art laboratories.

The Station will be in an inclined orbit of 51. 6 degrees and at an altitude of 402 kilometers (250 miles). This orbit allows the Station to be reached by the launch vehicles of all the international partners to provide a robust capability for the delivery of crews and supplies. The orbit also provides excellent Earth observations, with coverage of 85 percent of the globe and 95 percent of populated areas. At the end of the year 2006, about 227, 273 kilograms (500, 000 pounds) of Station components were on orbit. Research requiring pressurized conditions will be conducted primarily in the U. S. Laboratory Destiny, the European Columbus Module, the Japanese Experiment Module (JEM), and the Russian Space Agency (RSA) research module (planned). Within these modules, refrigerator-sized racks are allocated for experimentation. These racks are called International Standard Payload Racks (ISPRs) and they provide a common set of interfaces, regardless of location.

Concept Development Report 1 Experiments that require exposure to the unpressurized environment may be mounted on the U. S. Truss and Express Logistics Carrier (ELC), the Japanese Exposed Facility (JEF), or the Columbus Exposed Facility (CEF). Hardware descriptions, designs, and photos for pressurized and unpressurized experimentation are found in Appendix A.