Flight and Scheduling Management by NASA

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Various organizations are involved in flight and scheduling management worldwide. Many companies and agencies from different countries operate in the aerospace industry, and each has its own unique management strategies, practices, procedures, and capabilities, which enable it to plan and perform its functions effectively. The *National Aeronautics and Space Administration* (NASA) is a major Aerospace Agency in America that is involved in aerospace research using different types of methodologies like space flights and satellites to collect, assess, evaluate, and analyze relevant aeronautic information. It is among the largest space agencies in the world, with operations serving people in the US and throughout the world in various ways, such as by distributing data and imparting essential knowledge gained from space research. The Agency has been involved in a series of successful space flights since it was established in 1958 based on the ideas of the National Advisory Committee for Aeronautics (NACA). Additionally, NASA is known for other major operations that fall within its mandate, like the control of space shuttles, among other responsibilities, through strong and efficient management principles.

Description Of The Agency

NASA is an American aerospace agency founded in 1958 and developed according to the directions and ideologies of the National Advisory Committee for Aeronautics (NACA), which was formed in 1915. Its headquarters is based at Two Independence Square in Washington, DC. Initially, the agency was established as a competitive response to the space achievements of the Soviet Union with the launch of Sputnik in 1957. NASA's objectives are to develop unique scientific and technological outcomes and has four major departments that direct its operations and missions. They include aeronautical research associated with the creation of improved aviation technologies and science that involves the development of programs to assist in understanding the origins of the solar system and the evolution of the universe and the earth. Another department involves human exploration and operations that involve management of the various tasks that are either manned or operated remotely, like shuttle and other launching services, space communication, and transportation. Space technology is mainly concerned with the development of exploration technologies and space science. Upon its establishment, NASA embarked on achieving its set goals, with its first major project being sending a man to the moon under the J.F. Kennedy administration. In 1969, NASA sent Neil Armstrong to the moon. Other successes include launching several satellites using Earth applications that are designed to collect diverse information on natural resources, communication, and the weather. In addition, NASA has created a space shuttle that can be used to conduct various missions that are not possible with ordinary spacecraft.

Operation Description

The Space Operations Mission Directorate (SOMD) provides services concerning space exploration to NASA customers and other partners within the US and the whole world. SOMD controls the Space Shuttle Program (SSP) to ensure that there is a safe fly-out. It manages the system's operations and payloads at the International Space Station (ISS), and through the Launch Services Program (LSP), it guarantees safe and reliable access to space. Additionally, through the Rocket Propulsion Test (RPT) Program, NASA manages access to excellent rocket testing capabilities. The Space Communication and Navigation (SCaN) program ensures that there are secure and reliable communications on the ground stations and the channels across the solar system. The health and safety training and support of the American astronauts are ensured by the Human Space Flight Operations (HSFO) program. Furthermore, the Flight Space Theme (FST) consists of various high-profile programs that ensure that all the agency's potential capabilities are exploited to ensure the successful accomplishment of NASA's goals and missions. The SCaN manages various networks, including terrestrial and orbiting communication nodes and other elements required to transfer data efficiently to manned vehicles and robot spacecraft (Foster, 2002). RPT controls several test facilities that are utilized by the Agency, its partners, and customers. The HSFO also guarantees astronauts preparedness for current and future missions. Likewise, plans are underway to introduce the 21st Century Space Launch Complex Program at KSC to enhance NASA's capabilities in conducting successful missions now and in the future.

Equipment Or Aircraft

NASA has various types of air- and spacecraft that it uses for specific purposes and missions. The NASA DC-8 is akin to a passenger airplane, although it is designed with limited seats to accommodate fewer passengers, which would include scientists and investigators, whilst creating more space for carrying scientific instruments. It functions as an airborne laboratory and is equipped with various instruments to support the staff required in flight. The aircraft can fly progressively for up to 10 hours at altitudes from layer up to the boundary to about 40,000 feet. Considering its purpose of observing and measuring earth systems phenomena, it can effectively penetrate the hurricane eye-wall, enhancing its capabilities to collect in-situ cloud microphysics data.

The NASA ER-2 performs functions similar to those of the DC-8. However, it flies to higher altitudes of up to 65,000 ft., with only one pilot and no onboard crew since the instruments are designed to operate on their own. It can fly for the duration of 8 to 10 hours. The instruments are so advanced that they can obtain optimal measurements of the atmosphere's satellite-like view while on top of the clouds. Other aircraft that serve similar purposes, although under different conditions, include the WB 57 high-altitude aircraft that can fly up to 60,000-65,000 ft and the General Hawk that was recently deployed and flies at heights of55 000 to 65,000 ft.

Additionally, NASA's Super Guppy is the largest and most precious aircraft at the agency. It serves the

purpose of transporting equipment, including spaceship parts to different places in the world and can carry a load of up to 26 tons.

Maintenance Requirements

The NASA Aircraft Maintenance Information System (NAMIS) conducts the agency's maintenance services. NAMIS provides the management capabilities required for maintaining, supporting, and operating the aircraft safely whilst observing compliance regulations and is well prepared for any given mission. Three levels are involved in the maintenance of aircraft: operational, intermediate, and depot. Operational includes rapid inspections, repairs or servicing of aircraft, and discrepancies noted during or in between flights. The intermediate level involves more extensive repairs or inspections. The depot level is when there is a requirement for major modification or overhauling of aircraft parts. NAMIS maintenance controls various tasks associated with maintaining NASA's aircraft, and it is responsible for assigning diverse functions to different personnel. In addition, it has to ensure that the aircraft does not experience downtime during or between flights to avoid mission failures. To this end, maintenance inputs have to be documented to give dependable assurances to the personnel and managers, and this division is equipped with appropriate skills and information to track the airworthiness, status, and mission capabilities of an aircraft. Furthermore, it is important for the maintenance of management to distinguish between public and certified aircraft and to ensure that the proper personnel are selected with the required qualifications. Significantly, aircraft maintenance requires taking appropriate precautions and ensuring the best-qualified personnel to reduce casualties and/or physical harm to the pilots and crew and prevent mission failures.

Manager's Roles And Responsibilities

The organizational structure of NASA consists of two primary management levels: Agency management, which is situated at the headquarters, and Enterprise management, which controls various centers and programs (*NASA Strategic Management Handbook*, 2018). Agency management is involved in the responsibilities of administration and Congress, and it is the primary interface of the Agency and its stakeholders. It is tasked with managing budgets, policies, standards, functional leadership, and creating long-term strategies to maintain the investment relationship between NASA and its stakeholders. Additionally, it is the center point of accountability, liaison, and communication. It includes various officials, including the NASA administrator, who is the key decision-maker at the organization. It is the responsibility of the administrator and his/her immediate senior council to develop policies and strategies for the organization to ensure that its priorities and goals are efficiently achieved. The Program Management Council is mandated to review new programs that have been proposed by the Enterprise Associate Administrator. The Capital Investment Council's role is to address capital investments and policy concerns, and it is the primary advisor to the administrator on issues regarding prioritizing and balancing resources. Science-associated policies and the chief scientist at NASA address activities with the assistance of three Associate

Administrators: Space Science, Mission to Earth, and Life and Microgravity Science and Application. The Technology Council's role includes advising the administrator on all aspects that are technologically related, including flight and ground programs. The Engineering Management Council creates a framework to assess and improve the practices, capabilities, standards, policies, and procedures concerning engineering. Further, the Space Management Council's role is to assess the various ways that the practices, policies, procedures, and capabilities of space operations can be improved. Other personnel attached to agency management include the Chief Information Officer and the Chief Financial Officer. Likewise, there is the internal senior management team, including several boards such as the HRM, EEO, Flight Assignment, Facilities Review, Environmental Management, Agency Performance Review, and Medical Policy.

Enterprise Management is involved with stewardship and developing strategies and cross-program objectives for the agency. This is NASA's main customer interface. Enterprise associate administrators are responsible for various tasks such as the provision of external advocacy, formulating programs, defining objectives and requirements, assessing performance, being the agency's internal customers, providing scientific leadership, and other roles related to the various centers and programs. Each center has a program officer tasked with planning long-term institutional strategies and providing budget allocation strategies and guidance to the centers. The functional officials provide strategies and policies to improve processes and provide consistency throughout the strategic enterprises. Additionally, this management level in NASA includes directors and other officials who are charged with creating strategic customer interfaces and ensuring that the agency's mission and goals are achieved.

Staff Qualifications, Certifications, And Responsibilities

Various occupational groups require numerous qualifications and at different levels of responsibility. The NASA employees included in the civil services are involved with tasks like aerospace research, management of resources and operation of facilities and aircrafts.

Professional, Engineering, and Scientific: The requirements are knowledge in specific fields such as mathematics, science, law, accounting, and engineering with a bachelor's or higher degree, depending on one's major. The job positions are accounting, biology, general engineering, computer science, and aerospace engineering.

Administrative and Management: The qualifications are knowledge of principles, practices, aspects, and concepts related to the organization's administration and management. No specific education is required except for contracting jobs, but abilities are important, including analytical, writing, research, and judgment skills. College level or experience gained through progressive responsibility is an essential requirement. The positions include specialists in administration, information technology, contracts, public affairs, and budget analysis.

Clerical and administrative support: These include responsibilities such as reviewing, preparing, receiving, and verifying documentation in a general office. In addition, there are positions for processing transactions, maintaining office records, and locating or compiling data. The positions include accounting technician, secretary, office automation clerk, clerk-typist, and procurement clerk.

Technical and Medical Support: The requirements in this field are experience and practical knowledge on techniques and equipment gained through training less than college level's graduation or responsibility experience. The jobs include electronics, engineering and meteorological technicians. Other staff positions at NASA include federal opportunities for students and recent graduates. The responsibilities involved are presidential management and internship positions in specified fields.

Human Factors

Some roles and responsibilities at NASA require experienced, committed, and healthy individuals. Human Factors and Behavioral Performance (HFBP) elements consolidate the Space Human Factors and Habitability (SHFH) and the Behavioral Health and Performance (BHP) research divisions. HFBP is aimed at mitigating various human health and performance risks. The risks are identified as follows:

- Incompatible vehicle or habitat design
- Performance errors due to inadequate training
- Inadequate human-computer interaction
- Inadequate mission, process, and task design
- Injury from diversified loads
- Performance decrements and adverse health results due to insufficient sleep, work overload, or Circadian Desynchronization
- Adverse cognitive and behavioral conditions
- Performance and behavioral health decrements due to lack of cooperation, coordination, communication, and psychosocial adaptation in a team
- Inadequate human design and automation or robotic integration

The habitats, tools, and systems interfaces must be well established and designed before a mission is conducted. Many challenges are likely to be encountered in the field, including radiation and prolonged stays away from home while confined in a small vehicle. To survive amidst these problems requires strong and resilient human factors and behaviors.

Quality Requirements

Quality is evaluated at each phase of the various operations conducted at NASA. The customers are assured of quality by the agency through the International Organization for Standardization 9001:2008 certified quality management systems. The quality assurance processes aim to monitor, assess, and improve workplace practices and principles to guarantee that customers or other

agencies are served as required. These practices involve the inclusion of safety oversights to aid in maintaining consistency and assist with identifying opportunities for improvement. The adoption of high levels of vigilance throughout the NASA workforce helps with the proactive development of customized solutions, the elimination of problems and other challenges to enhance operational performance, lower costs, and ensure the safety of the people working in unique habitats and highly dangerous operations. The stakeholders can have the quality they anticipate from NASA due to its commitment to serve and provide the best.

Regulations And Laws

NASA has various governing statutes, regulations, and laws, and it has promoted Agency-specific NEPA regulations that are included in its missions and are furthermore reflected in its support personnel complement:

- 14 CFR 1216.3 – Procedures for Implementing the National Environmental Policy Act (NEPA)

It controls the NEPA program according to Agency policy:

- NPR 8580.1A – Implementing the National Environmental Policy Act and Executive Order 12114

Additionally, NASA is required to comply with the legislation's environmental laws;

- Clean Air Act
- Clean Water Act
- National Historic Preservation Act
- Endangered Species Act

Furthermore, NASA is guided by government statutes concerning operating agencies in the US. They include;

- Bribery, Graft, and Conflicts of Interest – 18 U.S.C 201-209
- Procurement Integrity – 41 U.S.C 423
- E.O. 12674 (1989), as amended by E.O. 12731 (1990)

The regulations include;

- 5 CFR Part 2635

Standards For Ethical Conduct

Specifically covers non-criminals, prohibited products such as gifts from contractors and endorsements, and outside activities

Partial coverage of financial conflicts

- 5 CFR 6901

NASA Supplemental Standards of Ethical Conduct cover outside activities.

Safety

The Safety and Mission Assurance (SMA) at NASA offers independent oversight throughout the organization to ensure that the entire workforce is safe and that measures are put in place to design, evaluate, and track the performance of hazardous operations. It offers personal assistance to the workforce in categorizing, assessing, and managing existing or emerging threats. The NASA Safety Center (NSC) reports to the SMA and assists it in the actualization of its programs and portfolios. Its key focus is on improving the processes, personnel, and tools needed to achieve the Agency's safety goals. By verifying and complying with the SMA policies and working proactively, NASA can protect its workforce from various risks they may encounter while operations are being conducted. The mission statement of the NSC is to provide SMA expertise with information, verification, and analysis to aid collaboration and education while promoting the safety of workers and enhancing success in operations and projects.

Security

The information of the agency-wide Information Technology Security (ITS) program is managed by the NASA OCIO IT Security Division (ITSD) to mitigate vulnerabilities and adversaries and to reduce barriers to cross-collaboration among centers. The ITSD enhances the confidentiality, integrity, and availability of ITS across NASA to help improve disaster management, operations' progressiveness, and other processes related to its missions. ITSD creates consistency in security policy and evaluates and implements security controls based on risk. The IT Security Services Program Office (ITSPO) is mandated to deliver security services throughout the Agency. Additionally, it helps the NASA Centers and information system owners comply with federal laws and supports the Agency's IT Risk Management forum in improving security across the organization without any biases involved.

Environmental Responsibilities

The roles and responsibilities of all employees in NASA are clearly outlined across all centers, irrespective of where they are situated or the hierarchy within the organization. The operations of the Environmental Management System (EMS) are based on a certain number of people. The EMS representative reports to the senior management and the NASA HQ Environmental Management Division on EMS and is mandated to manage the EMS. The functional teams of EMS are involved with specific tasks at NASA and assist with actualizing the program's policies. The EMS functions to ensure

that all the employees are aware of their environmental responsibilities while working for the Agency. Compliance is ensured through training and conducting refresher programs for new and existing employees. Additionally, it involves tracking the compliance levels of the employees by using specific procedures involving documentation. The procedures are effective in consistency and assessment, demonstrating that EMS is active while the documents provide the necessary evidence.

Furthermore, through the periodic review of NASA's operational progress, the EMS can assess and point out the possible emergencies and consequences that may be related to a particular mission. The identification helps with the development of procedures and practices to counter the threats associated with those emergencies, hence reducing casualties such as injuries, asset losses, downtime, and the prevention or minimization of detrimental environmental effects.

Other Management Factors Considered

NASA's management, regardless of the level, agency, or enterprise, integrates their ideologies to strategically, fundamentally, and technically develop procedures, practices, policies, and capabilities that boost the organization's reputation among its customers, stakeholders, and other agencies. Positive recognition helps with the organization's endorsement, which increases its performance level because it results in sufficient capitalization to support current and future missions. NASA functions to guarantee the safety of the people of the US and the world by helping with risk management through the assessment and evaluation of possible threats posed by disasters such as hurricanes and tornadoes, among others. Furthermore, the primary goal of NASA is to conduct successful, cost-effective missions by minimizing damage to the environment, reducing injuries among the personnel involved in operations, and controlling the needless loss of valuable property. Furthermore, the Agency's operations prioritize environmental issues by considering the ecosystem and its surroundings.

References

Foster, I. (2002). The grid: A new infrastructure for 21st century science. *Phys. Today*, *55*(ANL/MCS/JA-42173).

NASA Strategic Management Handbook. (2018). *Hq.nasa.gov*. Retrieved 17 February 2018, from https://www.hq.nasa.gov/office/codez/strahand/roles.htm