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Cosmic Explorers: Mission Control

The People Behind the Missions

Aira Astralis

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Conclusion

This free sample contains the Introduction and Chapter 1. The complete book contains the full contents above.

Introduction

A mission control center (MCC, sometimes called a flight control center or operations center) is a facility that manages space flights, usually from the point of launch until landing or the end of the mission. It is part of the ground segment of spacecraft operations. A staff of flight controllers and other support personnel monitor all aspects of the mission using telemetry, and send commands to the vehicle using ground stations.

Personnel supporting the mission from an MCC can include representatives of the attitude control system, power, propulsion, thermal, attitude dynamics, orbital operations and other subsystem disciplines. The training for these missions usually falls under the responsibility of the flight controllers, typically including extensive rehearsals in the MCC. America NASA Launch Control Center controls NASA launch missions prior to liftoff from facilities located at NASA's Kennedy Space Center on Merritt Island, Florida.

Responsibility for the booster and spacecraft remains with the Launch Control Center until the booster has cleared the launch tower. Houston's Kraft-named control center - formally the Christopher C. Kraft Jr. facility, abbreviated MCC-H - takes over every crewed mission after liftoff. It sits in Houston, Texas at the Lyndon B. Johnson Space Center. NASA's Mission Control Center in Houston also manages the U.S.

Mercury Control Center was located on the Cape Canaveral Air Force Station and was used during Project Mercury. One of its still standing buildings now serves as a makeshift bunker for the media if a rocket explodes near the ground.

Multi-Mission Operations Center at the Ames Research Center The Space Flight Operations Facility is operated by the Jet Propulsion Laboratory (JPL) in Pasadena, California and manages all of NASA's uncrewed spacecraft outside Earth's orbit and several research probes within along with the Deep Space Network.

Space Telescope Operations Control Center (STOCC) is located at Goddard Space Flight Center in Greenbelt, Maryland and provides mission control for the Hubble Space Telescope. Payload Operations and Integration Center at the Marshall Spaceflight Center in Huntsville, Alabama where science activities aboard the International Space Station are monitored around the clock. The Multimission Operations Center at the Applied Physics Laboratory near Baltimore, Maryland controls spacecraft including the MESSENGER and New Horizons missions.

The ISS FCR 1, the White FCR, the Blue FCR, the SCA, and the MPSRs all had their consoles removed and replaced with modern hardware, in part to support the new operational concept of commercial companies having a presence in Mission Control.

In addition to the controllers in the Cape MCC, each of the crewed tracking stations and the Rose Knot Victor and Coastal Sentry Quebec tracking ships, had three controllers, a CAPCOM, SURGEON, and an engineer. Unlike the Cape CAPCOM, which was always staffed by an astronaut, the tracking station/ tracking ship CAPCOMs were either a NASA engineer, or an astronaut, with the latter located at stations deemed "critical" by the flight director and operations director.

Chapter 01: The Discovery of Mission Control

NOAA operates its constellation of satellites from the Satellite Operations Control Center (SOCC) at Suitland, Maryland and Command and Data Acquisition (CDA) facilities at Wallops, Virginia and Fairbanks, Alaska. Satellites controlled include JPSS and GOES. The Canadian Space Agency Robotics Mission Control Centre in Longueuil, Quebec plans and conducts Canadarm and Dextre operations at the International Space Station. The Centro de Operacoes Espaciais (COPE) is operated by the Brazilian Armed Forces to support government satellites in orbit.

Two Space Operations Centers (COPEs) are part of its structure: the main center (COPE-P) in Brasilia and the secondary center (COPE-S) in Rio de Janeiro. Asia Beijing Aerospace Command and Control Center is a command center for the Chinese space program which includes the Shenzhou missions. The building is inside a complex nicknamed Aerospace City. The city is located in a suburb northwest of Beijing.

The Master Control Facility of the Indian Space Research Organisation is located at Satish Dhawan Space Centre, Sriharikota, India.

JEM Control Center and the HTV Control Center at the Tsukuba Space Center (TKSC) in Tsukuba, Japan manages operations aboard JAXA's Kibo ISS research laboratory and the resupply flights of the H-II Transfer

Vehicle. JAXAs satellite operations are also based here. Europe European Space Operations Centre (ESOC) is responsible for ESA's satellites and space probes. It is located in Darmstadt, Germany. German Space Operations Center (GSOC) is responsible for DLR's satellites and other customers' missions.

It is located in Oberpfaffenhofen near Munich, Germany.

The Columbus Control Centre (Col-CC) at the German Aerospace Center (DLR) in Oberpfaffenhofen, Germany. It is the mission control center for the European

Columbus research laboratory at the International Space Station. Europe's Galileo global navigation satellite system (GNSS) is operated by two Galileo Control Centres (GCC) situated in Oberpfaffenhofen, Germany and Fucino, Italy. The French National Centre for Space Studies (CNES) ATV Control Centre (ATV-CC) is located at the Toulouse Space Centre (CST) in Toulouse, France.

It was the mission control center for the European Automated Transfer Vehicles, that regularly resupplied ISS. Currently it controls the civilian Surface Water and Ocean Topography mission and the military CERES (satellite) constellation. The Rover Operations Control Centre (ROCC) is located in Turin,

Italy. It will be the mission control center for the ExoMars rover Rosalind Franklin.

Russia The Mission Control Center of the Russian Federal Space Agency, known by its acronym TsUP, is located in Korolyov, near the RKK Energia plant. It contains an active control room for the ISS. It also houses a memorial control room for the Mir where the last few orbits of Mir before it burned up in the atmosphere are shown on the display screens.

Titov Main Test and Space Systems Control Centre, mission control center in Krasnoznamensk, Russia.

Axiom Space Mission Control Center (MCC-A) in Houston, Texas. Boeing Satellite Development Center (SDC) Mission Control Center in El Segundo, California, US. In charge of several military satellites. The Kongsberg Satellite Services (KSAT) space operations center in Tromso, Norway performs command and control for 13 satellites. Lockheed Martin A2100 Space Operations Center (ASOC) in Newtown, Pennsylvania, US.

Parsons Corporation operates the Parsons Space Operations Center (PSOC) in Colorado Springs, Colorado to support command and control for the NOAA POES and DARPA Blackjack satellite programs.

Satellite operator SES controls its fleet of more than 50 satellites from operations centers in both Princeton, New Jersey and Luxembourg. Space Systems/Loral Mission Control Center in Palo Alto, California, US. SpaceX Mission Control Center (MCC-X) in Hawthorne, California is the primary launch control facility for the company's Falcon rockets.

The NASA control center named for Christopher C. Kraft Jr. - MCC-H, first christened the Integrated Mission Control Center (IMCC), and known to every crew simply by its callsign, Houston, is the facility at the Lyndon B. Johnson Space Center in Houston, Texas, that manages flight control for the United States human space program, currently involving astronauts aboard the International Space Station (ISS) and the Artemis missions to the moon.

The center is in Building 30 at the Johnson Space Center and is named after Christopher C.

Kraft Jr., a NASA engineer and manager who was instrumental in establishing the agency's Mission Control operation, and was the first Flight Director. The MCC currently houses one operational control room in Building 30 from which flight controllers command, monitor, and plan operations for the ISS. This room has many computer and data-processing resources to monitor, command and communicate with the station. The ISS control room operates continuously.

A second control room in the same building, which formerly hosted the Shuttle flight control team, can be set up for ISS operations should the need arise

(e.g., during repairs or hardware upgrades in the main room), and also hosts training simulations. All Mercury-Redstone, Mercury-Atlas, the uncrewed Gemini 1 and Gemini 2, and crewed Gemini 3 missions were controlled by the Mission Control Center (called the Mercury Control Center through 1963) at Cape Canaveral Missile Test Annex, Florida.

This facility was in the Engineering Support Building at the east end of Mission Control Road, about 0.5 mile (0.8 km) east of Phillips Parkway. Mercury and Gemini launches were conducted from separate blockhouses at the Cape. The building, which was on the National Register of Historic Places, was demolished in May 2010 due to concerns about asbestos and the estimated $5 million cost of repairs after 40 years of exposure to salt air.

The front row (the "trench") had FDO (pronounced "fido"), responsible for orbital guidance and orbital changes, depending on the phase of flight; either Guidance, a specialist in the procedures of those two high-energy, fast-paced phases of flight or rendezvous, a specialist in orbital rendezvous procedures; and GC, the controller responsible for the computers and systems in MCC itself.

The back row had PAO (Public Affairs Officer), the "voice" of MCC; MOD, a management representative, depending on the phase of flight; either RIO for MIR flights, a Russian-speaker who spoke with the Russian MCC, known as TsUP; BOOSTER responsible for the SRBs and the SSMEs during ascent, or EVA responsible for space suit systems and EVA tasks; and finally, SURGEON.

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ABOUT THE AUTHOR

Aira Astralis is a science writer specializing in astronomy and space exploration. Her work spans the full breadth of humanity's relationship with the cosmos -- from the earliest naked-eye observations to the engineering marvels of modern space missions.

Her books are built on a foundation of primary sources: peer-reviewed research, mission archives, and direct engagement with the scientific community. She writes for readers who want to understand not just what we know about the universe, but how we came to know it.

She believes that the most important frontier is not out there but in the gap between what scientists discover and what the public understands. Her books exist to close that gap.