

## **GSAW 2022 Tutorial D:**

### Mission Ops and Ground Systems 101: Why and How Your Ground System is Driven by Your Space Mission

#### **Overview:**

The purpose of this tutorial is to provide an introduction to various space mission types, link together the various mission systems engineering concepts which go into the design and development of a space mission with the ground system architecture. Attendees will learn about:

- Types of satellite missions and characteristics of them
- Types of satellite orbits and why a particular mission is in a particular orbit
- Characteristics of different satellite operators (commercial, DoD, civil)
- Mission drivers
- Mission operations concepts and how various challenges have been addressed
  - Space mission data standards
  - How to deliver data
- General ground system and Mission Operations Center design

#### **Instructor:**

Theresa Beech, NASA Goddard Space Flight Center

#### **Biography:**

##### **Theresa Beech**

Almost 25 years experience in satellite ground systems, space mission design, and space communications network design for space operators around the world. She has extensive experience in satellite ground system design and development, space-to-ground interfaces, satellite flight dynamics, precise orbit determination, software development, and technical team leadership.

Has worked on a wide variety of types of satellite missions including: communications, imagery, PNT, and scientific missions for US Government space agencies (NASA, NOAA, USGS, DoD), commercial telecommunications operators (Intelsat, Star One of Brazil, Measat of Malaysia, Azerspace of Azerbaijan), and joint agency missions. Specific mission experience includes: GOES-R, TDRSS, Landsat-8, the Lunar Reconnaissance Orbiter, the US Air Force Satellite Control Network (AFSCN), and multiple commercial telecommunications systems. Led technical teams responsible for developing new ground systems from a green field, as well as teams doing complex, multi-satellite, multi-site ground system migrations.

Before joining NASA Goddard Space Flight Center, founded and ran MetiSpace Technologies Inc., a small engineering business dedicated to satellite ground systems engineering. Currently the Goddard Mission Services Evolution Center (GMSEC) Product Development Lead and Deputy Project Manager, leading a technical team of 20+ engineers who design and develop ground systems SW for NASA and other US Government Space Agencies.

#### **Description of Intended Students and Prerequisites:**

Personnel responsible for the staffing, management, acquisition, development, and/or maintenance of ground systems. No specific ground system expertise is required. Material

contains references to commercial, civil, DoD space and a variety of different missions types (Earth observation, communications, science, weather, navigation). Good overall introduction to what drives ground system design from a satellite mission perspective, providing a broader perspective of how ground systems fit into the overall space mission.

**What can Attendees Expect to Learn:**

Attendees will gain an understanding of what types of Earth orbiting satellite missions there are, what orbits they are in, what drives the choice of these orbits, and what these orbits drive to in terms of mission operations concepts and, ultimately, ground system design. They will gain an understanding of the differences between certain mission types and what impact this has on ground systems from the perspective of a wide variety of satellite mission types (communications, navigation, earth observation, weather, science) in different customer spaces (commercial space, DoD space, civil space). Attendees will be exposed to a typical mission operations drivers, typical mitigation strategies, typical mission constraints and what this leads to in terms of a typical ground system and mission operations architecture. The purpose of this tutorial is to give attendees a broader picture of how mission operations and ground systems fit into the overall space mission enterprise.