# scope of navigation

## general

This section briefly describes the spacecraft navigation process, and defines terms relevant to this process.

## NAVIGATION

### DEFINITION

The word ‘navigate’ is derived from the Latin words *navis*, meaning ship, and *agere*, meaning to move or direct. The common definition of navigation establishes that it is the science of getting a craft or person from one place to another. In this document, ‘navigation’ means the determination and prediction of spacecraft trajectories and attitudes.

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## SPACECRAFT NAVIGATION PROCESS

### definitions of spacecraft navigation terms

In order to establish a solid standard for the exchange of spacecraft navigation data among agencies, it is important to clearly define terms relevant to this process. These terms are as follows:

**Navigation** is the process used to find the present and imminent future position, orbit and orientation of a spacecraft using a series of measurements.

**Guidance** is the process of defining a path to move a spacecraft from one point to another or from one orientation to another.

**Control** is the process to maintain a spacecraft within the prescribed path and attitude.

**Orbit** is the translational motion of a spacecraft around a large central body, resulting from the gravitational forces of the larger mass acting on the spacecraft. The orbit can be represented bas position and velocity in a state vector, or as orbital elements.

**Attitude** is the orientation and/or pointing of a spacecraft and it is defined by its rotation relative to a defined reference coordinate system.

The responsibilities for guidance and control are outside of the scope of this

In its simplest form, navigation is the determination of the position and/or orientation of an object. The position problem is generally called orbit determination and the orientation problem is called attitude determination. Orbit and attitude determination, although related, affect each other only weakly, so they can generally be performed separately. For example, a nominal attitude can generally be used in drag models that affect orbit determination, and a predetermined ephemeris can generally be used in attitude determination.

## STRUCTURE OF THIS DOCUMENT

1. Section 2 provides foundational information regarding the components of a message exchange architecture (definitions, paradigms, etc.).
2. Section 3 provides details about coordinate frames, time systems, astrodynamic constants, environmental models, and other ancillary concepts important in spacecraft navigation.
3. Section 4 discusses properties of the entities that participate in a navigation data exchange.
4. Section 5 discusses the types of measurements that may be made during a navigation session.
5. Annexes A and B constitute a Glossary of Terms and a listing of Acronyms, respectively.