

Glossary-V1.0

GEO:	Geosynchronous Orbit. Orbit with the same orbital time (24 h) as the rotation of earth around herself.
SMEs :	Small and Medium Enterprises.
S/C:	Spacecraft.
S/O:	Space Object.
Commercial S/C:	Meaning that the scientific and Military spacecrafts are not included in the analysis.
In-situ:	Lattin term meaning at the same place with respect to another object being mentioned.
Anomalies:	Technical term meaning any unforeseen behaviour of the spacecraft which can not be explained by the expected behaviour and is attributed to some kind of technical failure.
Desighed Life Time:	The satellites are desighed to live for certain number of years to fullfil certain operational needs. For implementing the designed lifetime, certain components and configurations of a particular, and well predictable lifetime, are selected. If there are not available components for extensively long durations then the solution of redundancy or back-up circuits / units is implemented. Current satellites are designed for 12-15 years. According the designed lifetme the satellites are filled-in with the respectively aproprate amount of fuel.
Commissioning:	The set of tests a spacecraft has to undergo to prove that it is operational on orbit after the schocking experience of the launch. Sometimes these tests are performed by the manufacturer.
Characterization:	Is the part of the tests that intend to measure the actual performance of various parameters of the satellite.
Callibration:	Adjustment of operational parameters of an instrument in an optimum way with respect to interpretation of its results.
Alive satellites:	Meaning most propably healthy. This term is used to contrast with the “sick/dead” that is used later. The term “healthy” is avoided because at the early life stages of a satellite on orbit its status is

undefined and every parameter has to be carefully and accurately analysed.

Re-orbit: According to ESA terminology this means the process of placing a spacecraft at a higher orbit to release its current position from occupation. This new orbit that a satellite obtains after the re-orbiting operation is also called grave-yard orbit.

CS: Client Spacecraft.

EOL: End-Of-Life

Orbit Injection: Or Orbit insertion, in the launcher literature meaning the point where the spacecraft is separated by the upper stage and it is left at an orbit (intermediate or final). Diagrammatically this orbit is naturally being intersected with the orbit of the composite body orbit (upper stage + spacecraft) and thus is described as being injected into the required orbit due to the zero angular difference (tangential) of the two orbits at intersection.

Apogee-Kick-motors: These are satellite engines that are used in the beginning of the life of the satellite in order to place it in the right operational orbit. They change the orbit, from the elliptical one that the launcher has injected them to, into a circular orbit. In order to do so they are ignited at the moment the satellite passes its apogee point of the elliptical orbit. These motors are separated by the satellite (ejected) after use in order to let the satellite lighter. This practice has been abandoned to avoid creating additional space debris. It has been replaced by the introduction of the so called UPS Unified Propulsion Subsystem, a propulsion subsystem of the satellite that is being used both for circularizing its orbit in the beginning of its life and also later on for the stationkeeping. We believe the concept of ejectable AKM can come back as preferable solution because the On-Orbit-Services will make available safe and tidily re-orbiting of the AKM.

Upper stages: Meaning the last stages of the launchers. Some launchers PROTON, Delta have an upper stage that reach the GEO ring to deliver the satellite it transports. It is usually been re-orbited after this

at the cost of using the remaining chemical propellants they carry for this purpose.

- Fairing:** The hollow part of the nose of the launcher that covers and protects the satellites during the ascent phase, when it passes through the atmosphere. It is being jettisoned soon after the launcher exits the atmosphere. Its shape is dictated by aerodynamic considerations.
- Utility Base:** This NEW TERM, is used to describe the fact that the spacecraft in question will have resources commonly required by all satellites "Utility" and also provide facilities and services. The "Base" is used to denote that it will be more or less stationary. Due to its large size it will not be economical to perform trips to visit the client satellites but vice versa.
- In addition it is foreseen to perform multiple operations, simultaneously in different directions, using multiple instances of Utility Agents. Most optimum therefore is that the UB is stationary, placed in an optimum position, to minimize the overall travel time/cost of visiting a community of client satellites.
- Utility Agent:** This NEW TERM, is used to denote that this spacecraft will mediate for the availability of "Utilities" between the Utility Base and the place where they might be needed.
- Escort Agent:** This NEW TERM, is used to denote that this spacecraft will escort a Utility Agent or a client spacecraft. Its main use will be to inspect and to retransmit signals.
- Engine Module:** This NEW TERM, is used to denote that this spacecraft will be as simple as an engine. It will not have its own navigation capabilities and it will be an add-on module to be attached externally on the main thruster nozzle of a client spacecraft.
- Up-link:** The telecommunication channel of a satellite that has the direction up-wards from the earth to the satellite. Otherwise we can call it the reception channel of the satellite.
- Station keeping:** The set of maneuvers and their application that are required in order to keep the satellite within its specified window (station) of operation with respect to the East-West drift or North-South drift.
- The satellite normally drifts out of this window in a few weeks due to gravitational forces of the

moon, venus, sun and due to solar radiation pressure on its surface and due to gravitational asymmetry of the earth. (its is being pulled by forces of different size by different points of the earth "surface".)

- Inclination:** The angle of the orbital plane of a satellite with respect to the orbital plane that is defined by the equator. Normally the satellite needs to operate within a fraction of degree of inclination but may drift several degrees by the end of its life.
- TBD:** To-Be-Defined by further analysis.
- Tug:** Term meaning originally the ship that is being used to assist larger ships to maneuver in close ports or to be carried in a port if uncontrolled due to a mechanical failure.
- Listening of telemetry:** Meaning that the telemetry is received and analysed.
- ECHO command:** Is a special telecommand that its use is just to be relayed back to earth to the controlling station in order that the control station can be assured that the satellite can receive telecommands and transmit telemetry and all processing in-between is functioning properly.
- Segregated:** Opposite of aggregated, meaning that the totality of functionality been required has been divided in multiple segments and distributed to different entities.
- A5-ECA:** Denotes the launcher Ariane-5 in such a configuration that is equipped with an upper stage which uses cryogenic propellants, in contrast to the previous version that were using less efficient storable propellants.
- ECA:** Etage Cryogenique Ariane. Attention ! this is not the name of the upper stage but it means the version of Ariane-5 that has a cryogenic upper stage.
- Attitude behaviour:** Orientation of the spacecraft with respect to the earth and the sun.
- Chaser spacecraft:** Terminology used in the On-Orbit-Servicing literature meaning a spacecraft that has the capability to chase after another spacecraft that is usually described as the target. The target may be co-operative or non-cooperative.

Target:	With respect to the On-Orbit-Servicing literature we describe as target (co-operative or non-cooperative) a spacecraft that a chaser spacecraft has as objective to seek and catch.
GTO:	GEO Transfer Orbit, It is specific to the launcher literature meaning the intermediate (transfer) orbit before we attempt to transfer to the GEO (Geosynchronous circular) orbit. It is an elliptical orbit and each launcher defines its own geometry of GTO orbit. The GTO of Ariane has a Perigee of 250 km Apogee 35.000 km or GEO and inclination of 7 deg.
FAQ:	Frequently asked questions.
Heaters:	On a satellite we mean electrically powered heating elements that are used to heat normally the propellants and the boxes with the electronics and other equipment to ambient temperature.
Pyros:	Stands for “pyrotechnically activated devices”, which are devices that can be activated only once using electrically ignited explosives, to perform release of booms, solar pannels ...
EMC:	ElectroMagnetic Compatibility. It is very important from the safety point of view that a spacecraft will not emit to the proximity electromagnetic radiation that would ignite fuel or pyros unintentionally or disrupt communication of the launcher or the data processing of the launcher. (It is similar to the issue of mobile phones in the aircrafts during flight, and the prohibition of mobiles close to the gas stations).
Catalyst:	Meaning in this case the metallic material that is used inside the thusters to ignite the fuel. In the case we use Hydrazine as fuel.
NOAA:	National Oceanic and Atmospheric Administration (the Meteorological organization of USA).
OOS:	On-Orbit-Servicing.
Unit-Level:	Engineering term meaning lower than Subsystem and higher than subassembly.
Momentum wheels:	Equipment used in configuration of 4 in a pyramid like redundant scheme in order to stabilize a satellite usually in a three axis. It has a wheel shape and is driven by an electrical motor generating momentum each time that is accelerated or decelerated. The momentum is transferred to the body of the satellite and moves the satellite in a different stable attitude.

Lagrange: Name of inventor of certain gravitationally balanced points between celestial bodies. Are considered ideal to establish there bases because there is no need for continuous orbit correction and missions originating from these points can serve two distinct points in two different celestial bodies (Earth-Moon, Earth-Sun) in the optimal propellant consumption way.

Propellant & fuel: In our case we consider only liquid propellants that can be transferred through pipes from one spacecraft to another. In this project and at this stage only the "storable" propellants are considered in contrast to the cryogenic which can not be stored for long time due to thermal penetration into the Propellant storage media (tanks), which temperature change alters the properties of the propellants. This term is also interchangeable with the term fuel in the case that the fuel can be ignited without the need of an oxidizer propellant. This is the case of decomposable fuels like Hydrazine. They require a catalyst to ignite or sustain fuel decomposition. In the later case we talk about monopropellant propulsion system in contrast with the case where an oxidizer is present where we talk about bi-propellant propulsion system.