Space Medicine studies the interaction of physiological processes with the space environment. Orbiting systems (spacecraft and space stations) are systems in "free fall" with respect to the gravitational field; inside these systems gravity is compensated and subjects experience weightlessness; this effect has various impacts on the body. The absence of gravity due to phenomena such as the early onset of diseases such as osteoporosis, muscle atrophy, impaired motor, cardiovascular, respiratory, psychological control. Another effect is the increased space cosmic background radiation and its impact on biological matter.

The study of this kind of phenomena on orbit - on human, animal and cell models - allows the identification of countermeasures in view of the long flights for human exploration; it also increases knowledge to be used in the current on earth clinical practice.

ALTEC participated in the major three-year programs promoted by the Italian Space Agency ASI:

- **OSMA** Osteoporosis and muscle atrophy
- **DCMC** Disorders of Motor and Cardio-respiratory Control
- **MoMA** Biotecnologie from Molecules to Man.

These programs involved various on ground and in orbit researches at cell, animal and human level, and involved participation of dozens of research institutes, hundreds of researchers and a variety of industries. Collected data are providing new knowledge on topics with immediate impact in terms of population wellbeing and are essential in the perspective of planetary colonization.

The three programs involved the use of on-orbit facilities developed by ASI (MDS, HPA, ELITE-S2, ALTEA);

In the frame of OSMA ALTEC also supplied important services to ASI experiment MDS (Mice Drawer System). MDS is a space stabularium that accommodated 6 mice for 90 days on the ISS, establishing a record of exposure to the microgravity for animal’s models and re-entering to earth the 28th, November 2009. Associated to program MDS, ASI promoted a complex international program of biological tissue sharing, which allowed team of scientists spread on three continents (Americans, Italians, Belgian, Germans, Canadians, and Japanese) to benefit of the data of this extraordinary mission.

ALTEC participated as leader of the industries on OSMA and as head of operations for DCMC and MOMA.

For DCMC and OSMA the audio and video of experiments HPA and ELITE S2 were received by ALTEC in real-time and made available to the science teams.

ALTEC supported the whole process of tissue sharing of biological samples of MDS, by studying and supporting the entire logistics scenario, which culminated in a series of shipments of highly perishable hundreds of samples in the U.S., Europe, Canada and Japan.

ALTEC is also promoting among scientists the use of the Neutral Buoyancy Test Facility **NBTF** - a unique pool completely out of the ground, equipped with four huge windows and a control room with audio/video connection to the subject under test - as a powerful tool to support neuroscience research in studies about e.g. orientation, equilibrium, locomotion, space perception, attitude, physiological parameters control, internal gravity models, and capability to forecast objects motion.
ALTEC has a recognized role as prime contractor for industrial activities to be undertaken in support of human spaceflight to the International Space Station. Up to today, under the responsibility of the Italian Space Agency (ASI), ALTEC has developed HSF program activities in the frame of the following missions:

- **STS-120 (2007)** in which the Italian Astronaut Paolo Nespoli acted as Mission Specialist
- **STS-134 (2011)** in which the Italian Astronaut Roberto Vittori acted as Mission Specialist

For the above mentioned missions, ALTEC performed and managed all the activities needed for the successful achievement of the programs milestones according to the standard payloads integration template in terms of reviews, agreements, engineering data provision, analyses, tests, flight and ground safety and required product delivery according to each phase outcomes as hereafter summarized.

ALTEC supports the Italian Space Agency during all standard phases of the payload integration:

- **Strategic Phase**
- **Tactical Phase**
- **Operations Phase (Real Time)**
- **Post-Operation Phase (Post Flight)**
  each of which is characterized by the execution of specific activities.

During the **Strategic Phase** the Inter Agency agreements are settled (also in terms of increment and flight assignment), the payload requirements are agreed together with the relevant verification process and methods, the payload configuration is defined and the Phase 0/I/II safety reviews take place.

During the **Tactical Phase** the requirements verification is finalized, the Safety Process is completed with the Phase III safety reviews, the crew procedures are developed, the crew training held and the pre-shipment reviews take place.

The **Operations Phase** defines the integration of the hardware into the spacecraft, the launch, the on-orbit operations and the return of the payload from the ISS.

The **Post-Operations** phase defines the vehicle de-integration requirements, the return of payload samples/hardware from the landing site to the Payload Developer (PD), the Lessons Learned, the Crew debrief and the required end of mission or increment reports.