

Muscle Atrophy Research and Exercise System (MARES)

The Muscle Atrophy Research and Exercise System (MARES) is a European Space Agency (ESA) facility for research into the effects caused by weightlessness on human muscles. This system is integrated in the Columbus module of the International Space Station (ISS) and is part of the NASA Human Research Facility.

The main objectives of MARES are:

- To carry out research on muscle-skeletal, bio-mechanical, neuromuscular and neurological physiology
- To study the effect of micro-gravity on the Human Being
- To evaluate the effect of the countermeasures to the space environment induced physiological effects
- To assess the effectiveness of exercise test protocols

The system allows the investigation of atrophy induced both in isolated muscle groups of the trunk and extremity joints, and in complete limbs. To this end, it applies a programmable speed and force/torque stimulus to eleven different body muscular groups, and then it measures the torque/force and speed response of the subject.

MARES is composed of several subsystems:

- Torque motor (between 1 and 900 Nm) and its servo drive electronics
- Mechanical sub-system consisting of the main structure, the subject restraining chair with its pantograph and a set of restraints and human interface adapters
- Controller
- Supervision electronics
- Power and battery
- User interface software

NTE-SENER, as prime contractor of MARES, has been responsible for the project management, the overall system design, all control, power and supervision electronics and the whole mechanical and structural parts, as well as the software.



Client: European Space Agency (ESA)

Country: Netherlands

Start date: 2009