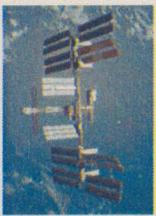


payload ASI su ISS - sommario



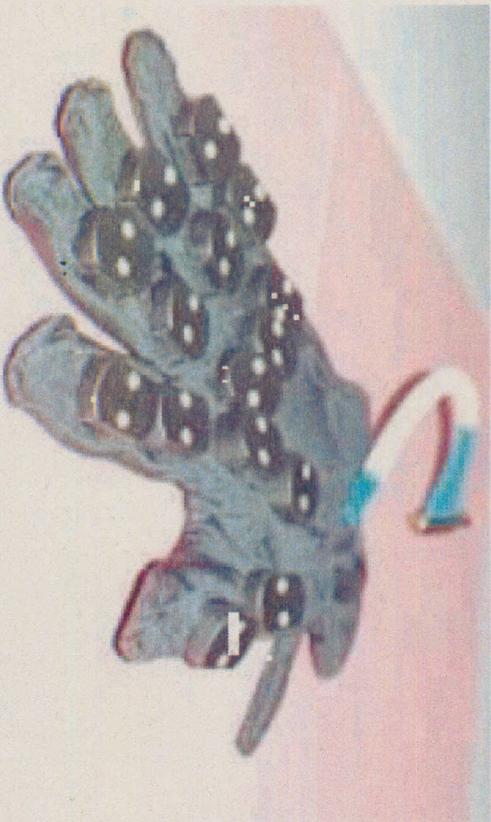
- **i payload in orbita**
- **l'hardware ready-to-fly**
- **altre facility utilizzabili**



HPA – Hand Posture Analyser




agenzia spaziale
italiana



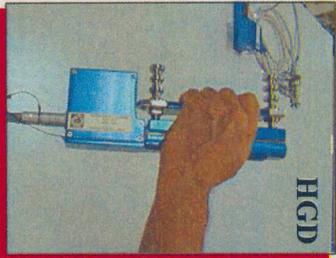
- HPA è uno strumento per misurare le prestazioni del braccio e della mano in condizione di microgravità
- A bordo da settembre 2003
- Ha effettuato 18 ore di esperimenti con 4 soggetti diversi



HPA – Hand Posture Analyser



Hand Grip Dynamometer (HGD) measures isometric force exerted by the hand



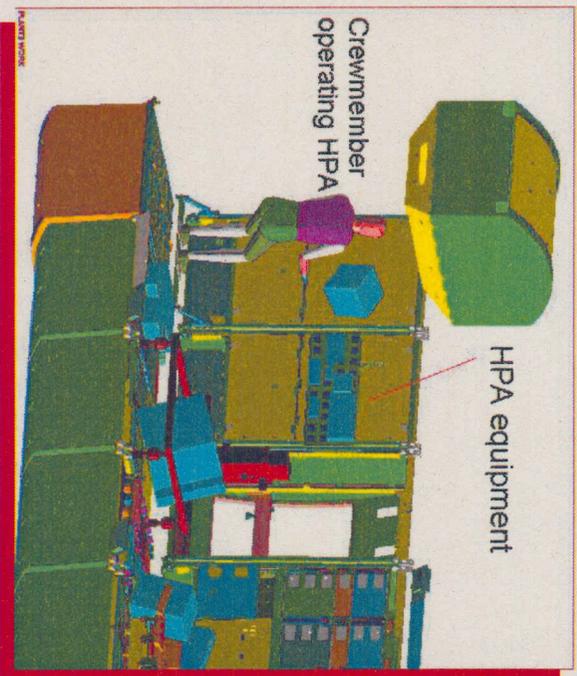
Pinch Force Dynamometer (PFD) measures isometric force exerted between two opposing fingers



Posture Acquisition Glove (PAG) with 15 Hall-effect angular sensors (three/finger)



Wrist Electronics Box (WEB) contains the inertial tracking system, made up of a triad of accelerometers and a second triad of gyroscopes to measure three directional acceleration and angular velocity



HPA in the ISS for experiment execution

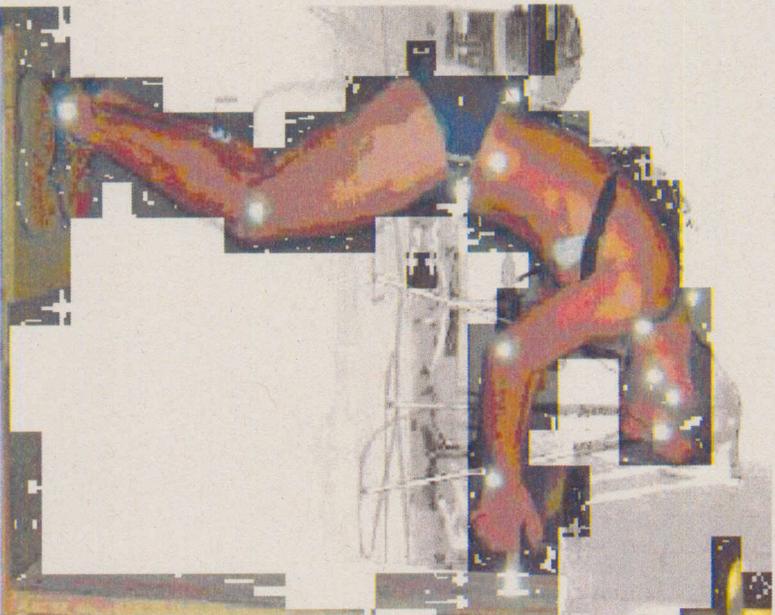
HPA instrument set on ground



Target objects support (TOS) and target objects (TO1, TO2, TO3) to be grasped during HPA protocol



ELITE S2



- ELITE-S2 prevede l'analisi tridimensionale del movimento degli astronauti nello spazio
- lanciato nel 2007, la prima fase sperimentale è stata completata a maggio 2008
- sarà riattivato nel 2010 (incr. 23-24)



ELITE S2



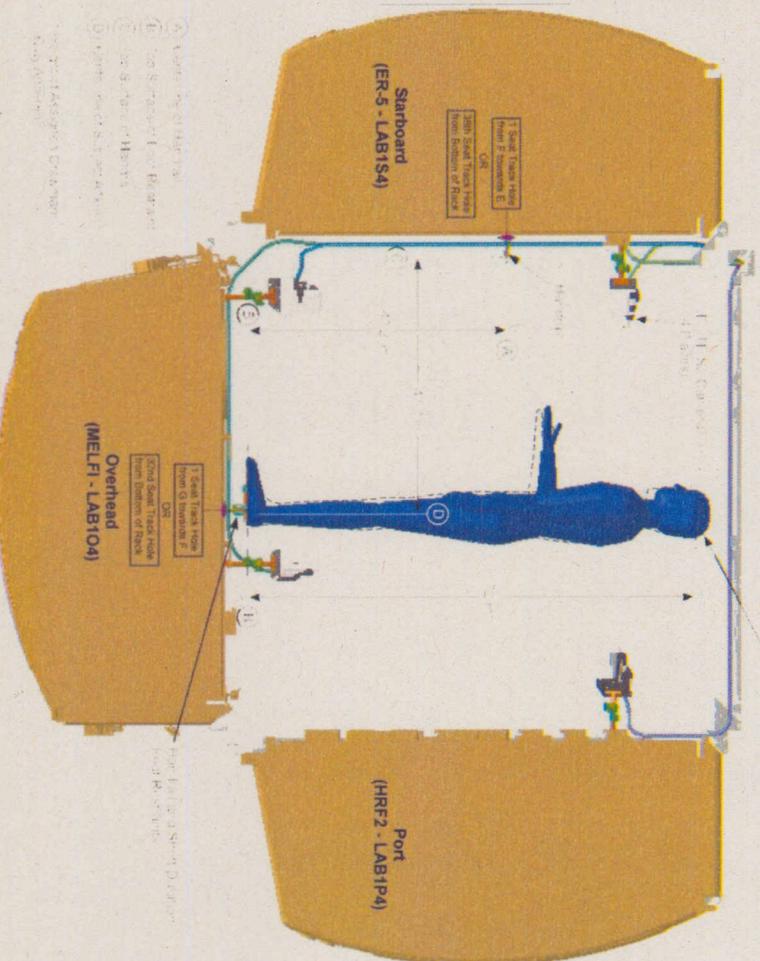
agenzia spaziale
italiana



Deck
(CHACS - LAB1D4)



JSC Astronaut Al Drew during usability test on ELITE S2 at KSC



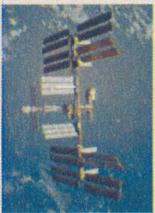
ELITE S2 in the US lab for experiment execution



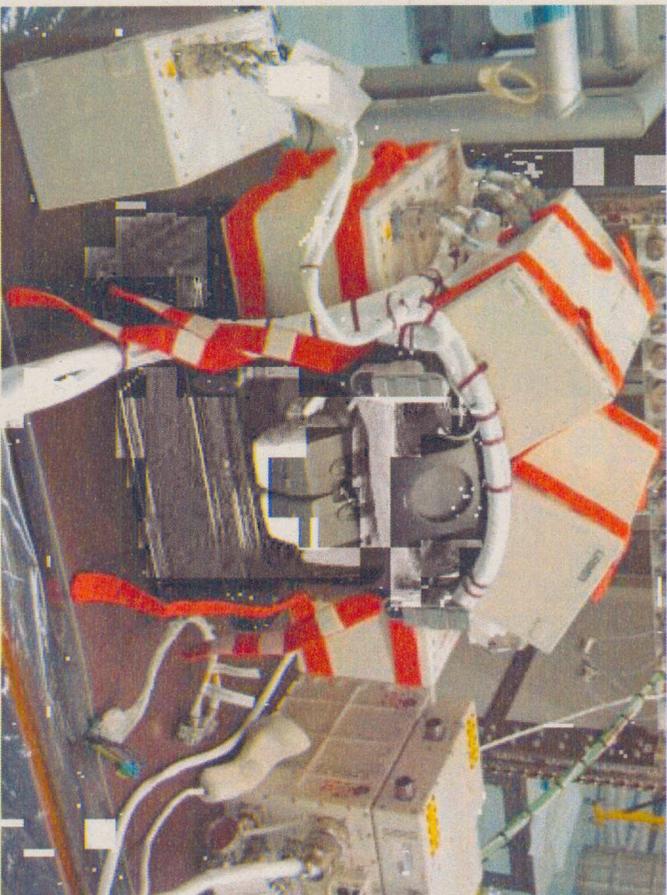
ELITE S2 integrated in EXPRESS rack at KSC



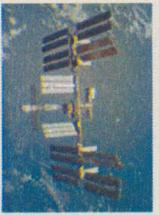
ELITE S2 cameras at KSC



ALTEA



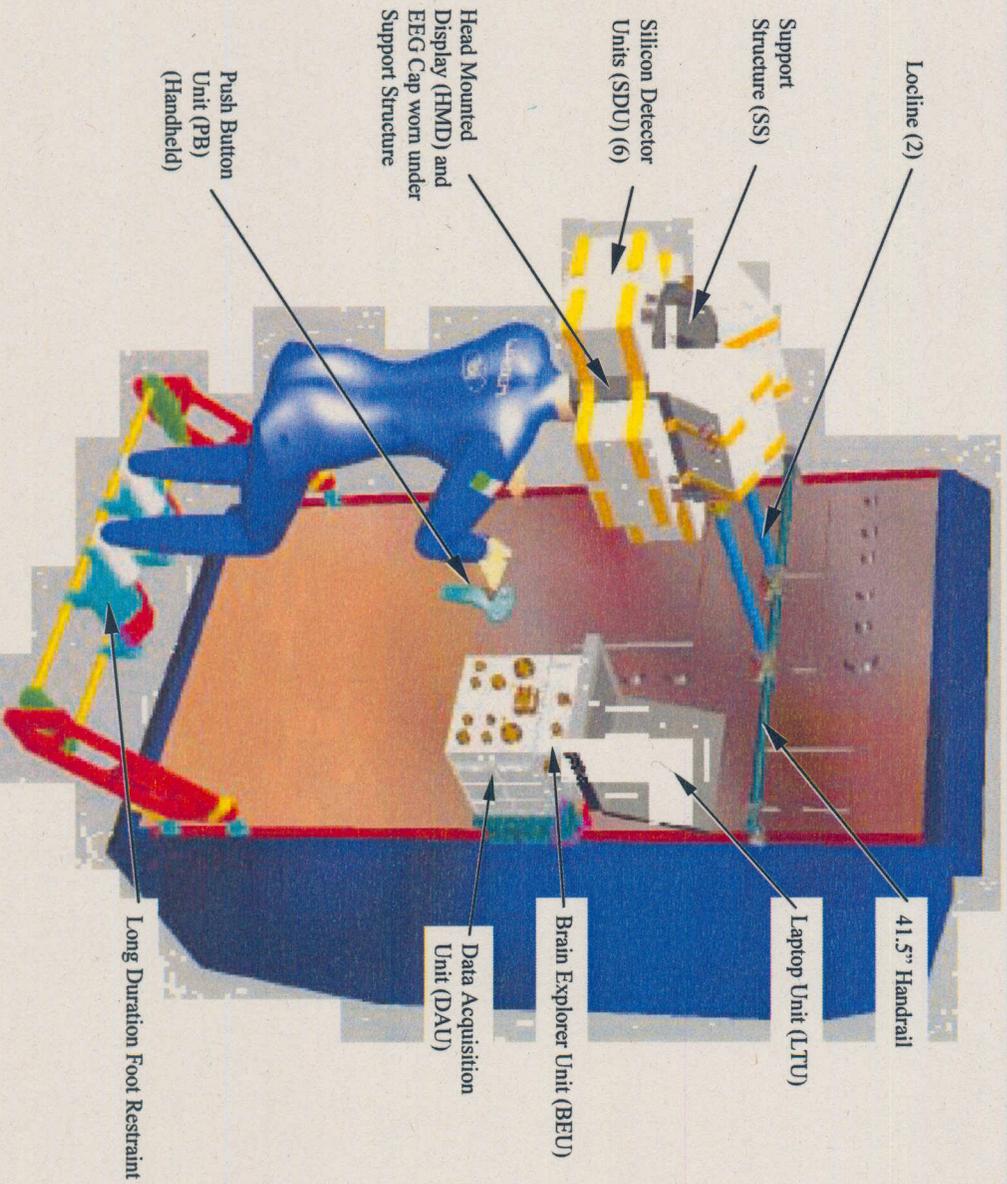
- ALTEA è un esperimento per lo studio degli effetti delle radiazioni cosmiche sul sistema nervoso centrale
- Lanciato a luglio 2006, ha completato la prima fase di sperimentazione a luglio 2007



ALTEA



agenzia spaziale
italiana





ALTEA - funzionamento

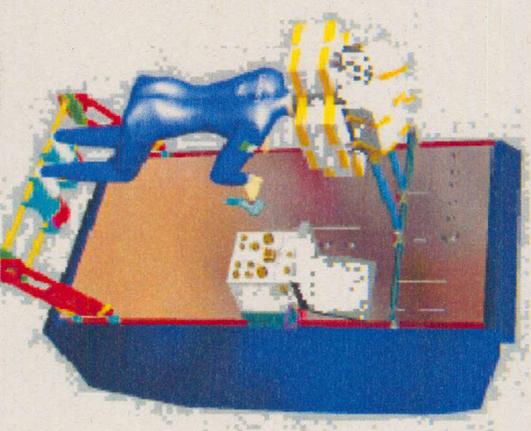


DOSI:

- misura dell'energia depositata in ciascun rivelatore
- calcolo della traiettoria, tipo di particella, energia

CNSM:

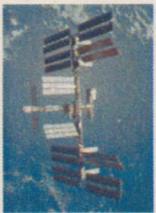
- calcolo dell'energia ceduta da ciascuna particella nelle differenti aree cerebrali
- misura delle dinamiche elettrofisiologiche
- correlazione delle dinamiche elettrofisiologiche con il passaggio di ioni (energia depositata nei tessuti cerebrali)



CNSM



DOSI



payload ASI su ISS - sommario



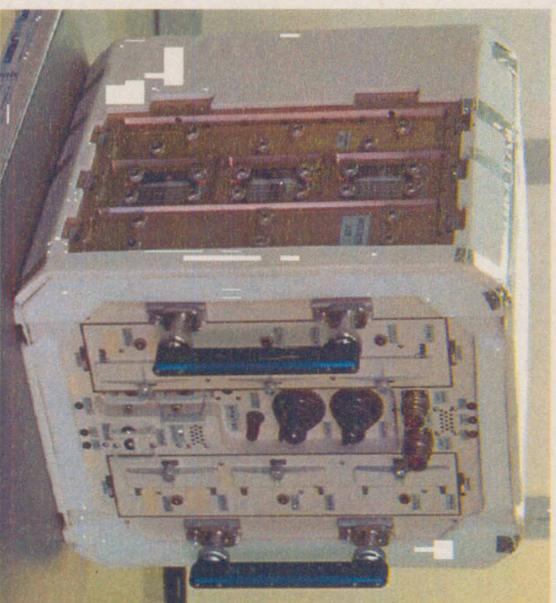
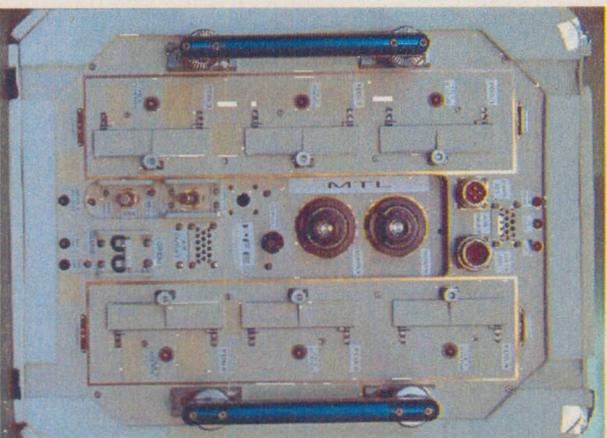
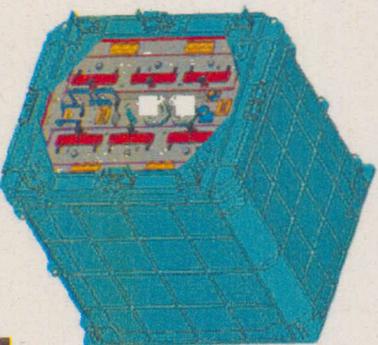
- i payload in orbita
- **l'hardware ready-to-fly**
- altre facility utilizzabili



MDS

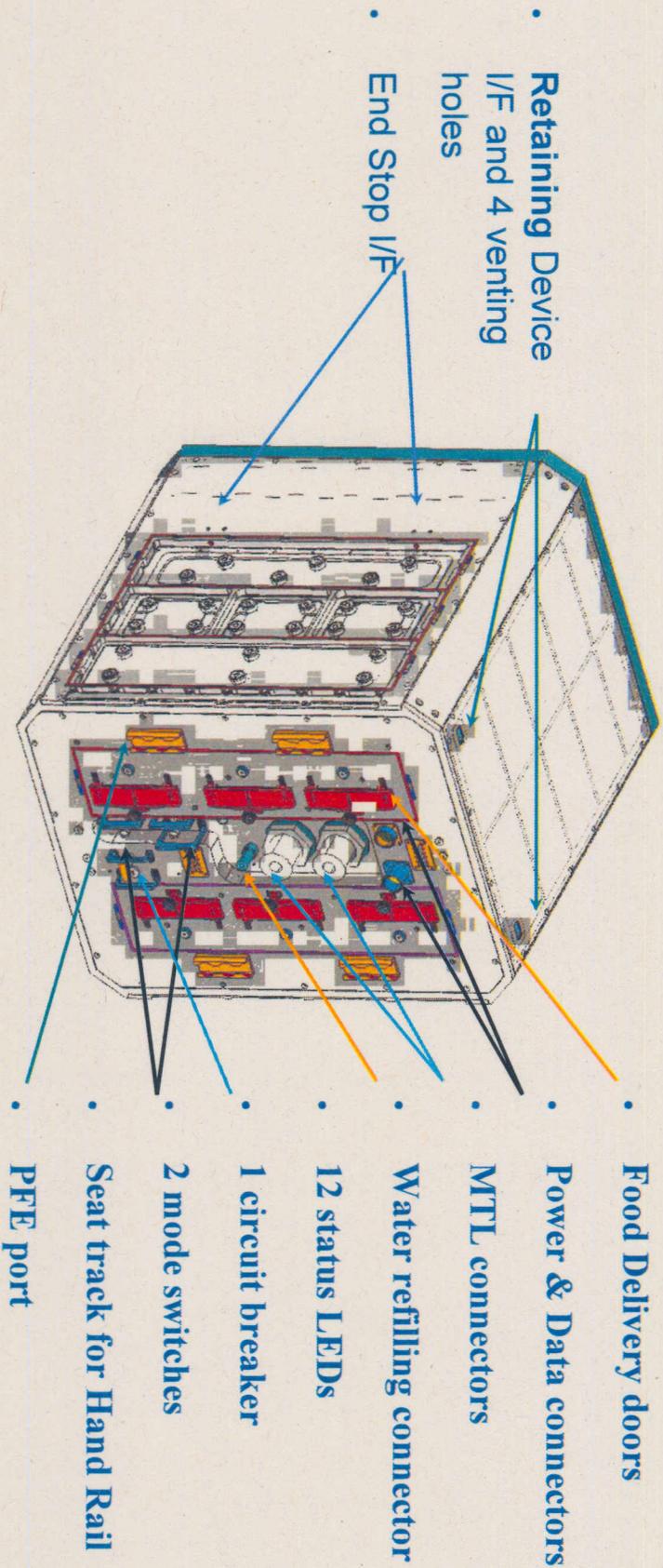


- MDS, primo esperimento con animali a bordo della ISS
- Lancio previsto ad agosto 2009
- in negoziazione reflight 2010





MDS

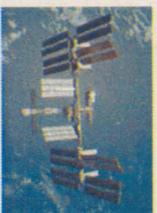




MDS



- MDS studia gli effetti della microgravità su ossa di roditori allo scopo di identificare i meccanismi genetici alla base della riduzione di massa ossea osservata su soggetti umani in conseguenza di una lunga esposizione (più di 100 giorni) alla microgravità.
- MDS è una facility relativamente autonoma.
- Un astronauta controllerà su base quotidiana lo stato dei roditori da una finestra di ispezione.
- I livelli di acqua saranno controllati quotidianamente e ripristinati come necessario.
- Ogni 20 giorni la crew sostituirà i waste filters e le barre di nutriente.



accessori HPA



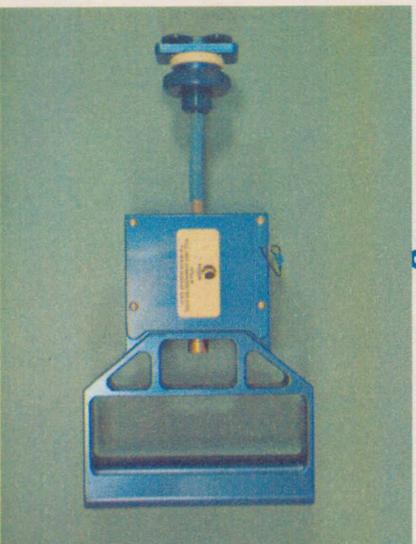
PULL GRIP DYNAMOMETER (PGD)

Principal Investigator: C. Reggiani

Science goal: experimental studies on alteration of proximal upper limb muscles

PGD & Seat Track coupling:

- Size: 60 x 140 x 300 mm
- Mass: 0.943 kg



- PGD Power & Data Cable:**
- Stowed envelope: 170 (diameter) x 30 mm
 - Mass: 0.242 kg

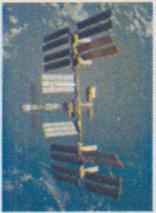
PGD Hand Support:

- Size: 135 x 125 x 110 mm
- Mass: 0.557 kg



Total upload:

- Net volume: 6.9 l
- Net mass: 2.3 kg



accessori HPA



agenzia spaziale
italiana

FIXED GRIP DYNAMOMETER (FGD)

Principal Investigator: V. Zolesi, co-PI: P. Pastacaldi

Science goal: study of force applied by astronaut to maintain its body in steady floating position

FGD Support & Seat Track coupling:

- Size: 75 x 120 x 165 mm
- Mass: 0.370 kg



Total upload:
- Net volume: 1.5 l
- Net mass: 0.37 kg

Pinch Force Dynamometer (PFD) measures isometric force exerted between two opposing fingers





accessori HPA



HEART RATE MONITOR (HRM)

Science goal: assessment of correlation between force protocols and heart rate / O2 content in blood . Use of the device in combination with HGD, PFD, PGD and FGD with associated protocols (CHIRO, MAAT, NB).

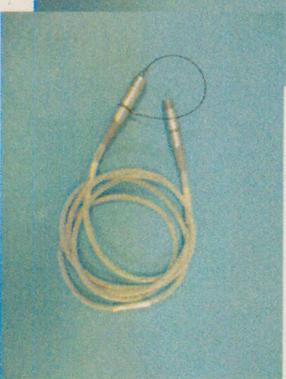
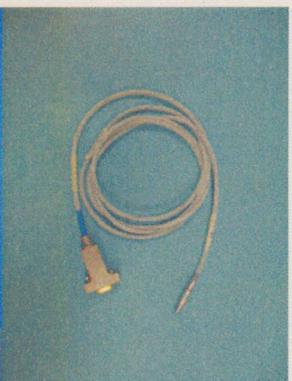
HRM :

- Size: 100 x 140 x 76 mm
- Mass: 0.436 kg



HRM Cables:

- Stowed envelope: 170 (diameter) x 40 mm
- Mass: 0.907 kg



Total upload:
- Net volume: 2 l
- Net mass: 0.7 kg



accessori HPA



TARGET OBJECTS AND TARGET SUPPORTS (TO & TOS)

Principal Investigator: F. Posteraro

Science goal: *study of motor control of the upper limb (grasping and reaching)*

Start Support:

- Size: 155 x 235 x 10 mm
- Mass: 1.05 kg



Target Support:

- Size: 330 (diameter) x 10 mm
- Mass: 0.448 kg



Big Cylinder:

- Size: 100 (diameter) x 30 mm
- Mass: 0.165 kg



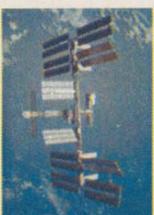
Small Cylinder:

- Size: 30 (diameter) x 30 mm
- Mass: 0.025 kg



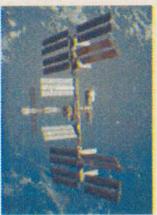
Total upload:

- Net volume: 1.5 l
- Net mass: 1.7 kg



*flight hardware utilizzato su precedenti missioni,
disponibile per sperimentazione su ISS*



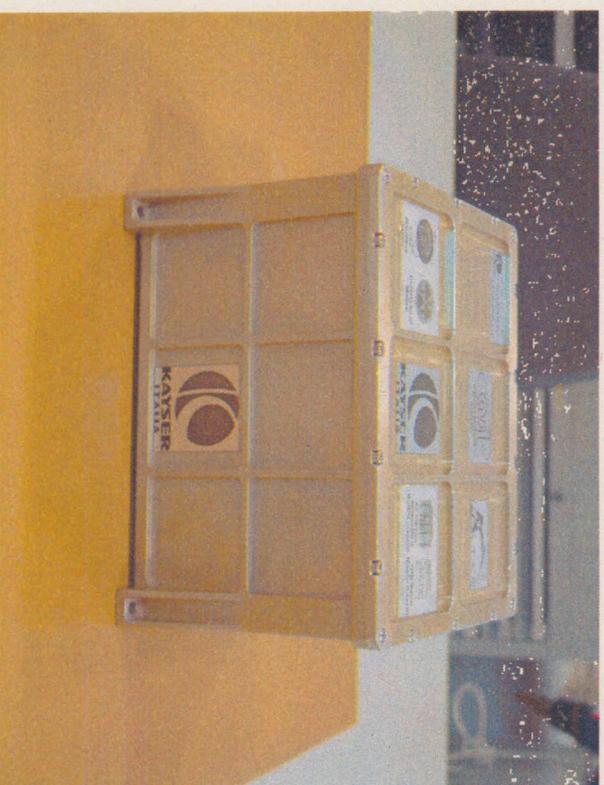
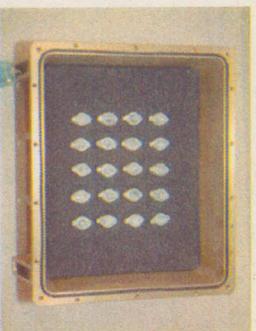


missione ESPERIA

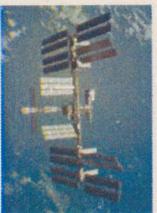


BIOKON – Biokon container available for accommodation of passive or active experiments
Internal volume available for experiments: 163x128x95 mm, about 2 liters (reference only)

**Example:
BIOKON containing
SPORE experiment**



BIOKON upload:
- Net volume: 3.1 l
- Net mass: 0.95 kg

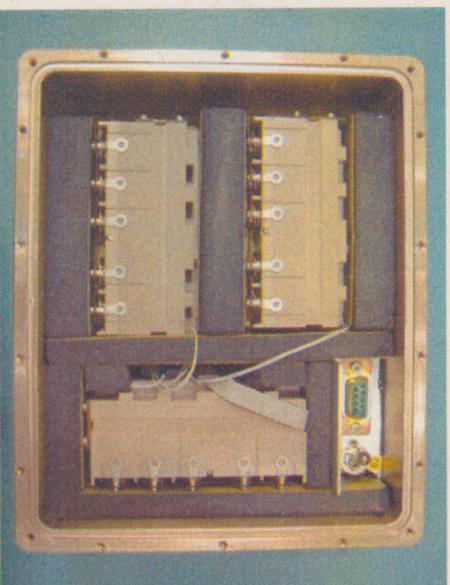


missione LIFE



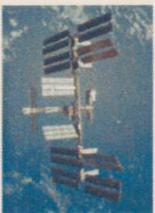
BIOKON 4 – Biokon container with electronics for Experiment Units activation and housekeeping / data storage. Internal volume available for experiments: about 163x100x50 mm

**Example:
BIOKON 4 containing MYO
experiment**



BIOKON 4

BIOKON upload:
- Net volume: 3.1 l
- Net mass: 1.5 kg

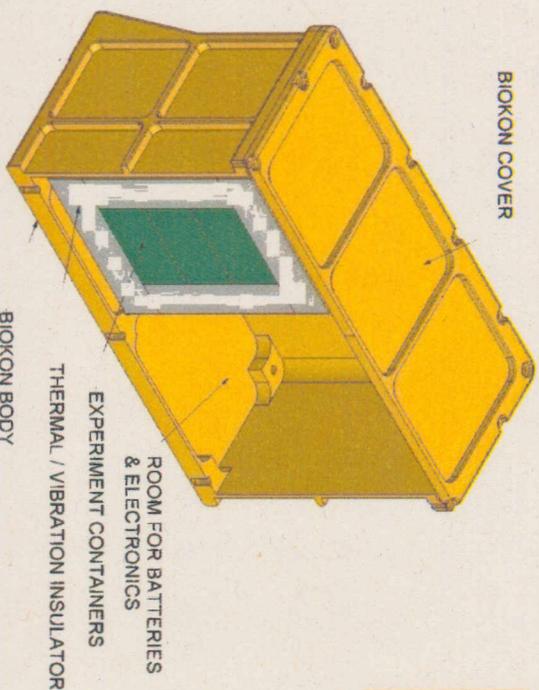


missione LIFE

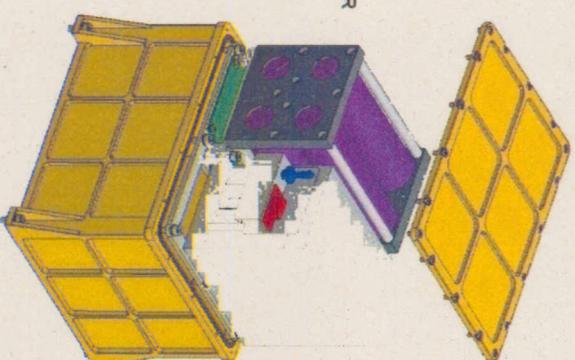


BIOKON 5 – Biokon container with electronics for Experiment Units activation housekeeping and data storage and heating system: Internal volume available for experiment: about 80x100x90 mm

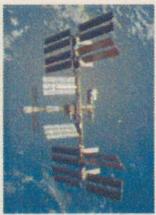
**Example:
BIOKON 5 with PITS
experiment, temperature
controlled at 37°C**



BIOKON upload:
- Net volume: 3.1 l
- Net mass: 2.2 kg



BIOKON 5

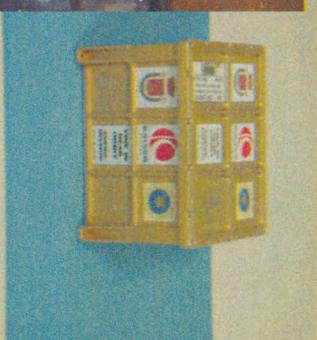
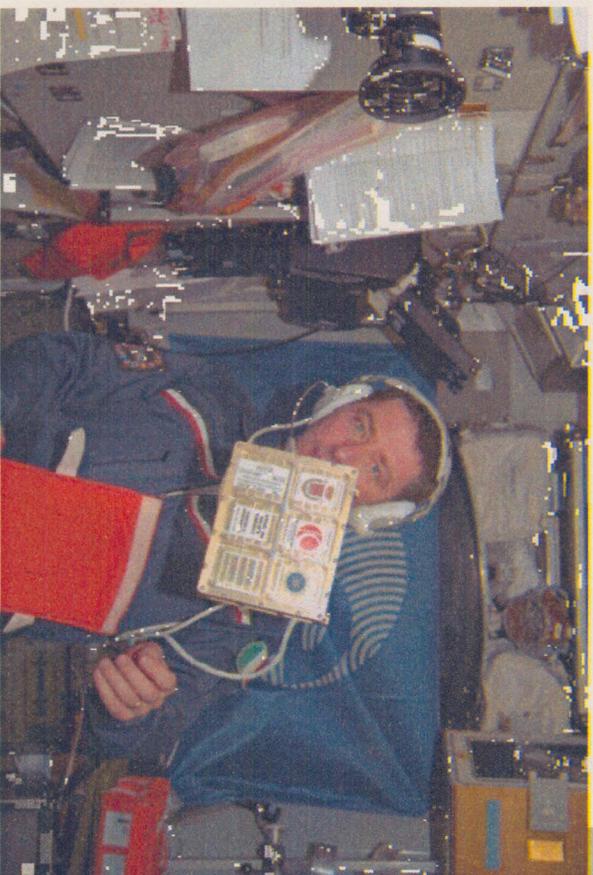


missione ENEIDE

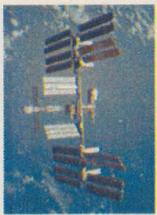


BIOKON – Biokon container available for accommodation of passive or active experiments
Internal volume available for experiments: 163x128x95 mm, about 2 liters
(reference only)

**Example:
BIOKON containing
VINO experiment**



BIOKON upload:
- Net volume: 3.1 l
- Net mass: 0.95 kg



payload ASI su ISS - sommario



- i payload in orbita
- l'hardware ready-to-fly
- altre facility utilizzabili



Il Columbus



- Il laboratorio europeo *Columbus* è stato messo in orbita a gennaio 2008
- Contiene 16 “racks” di cui 10 destinati agli esperimenti
- 3 “racks” del *Columbus* sono *specializzati* per disciplina
 - biologia (Biolab), fisiologia umana (EPM), scienza dei fluidi (FSL)
- 2 EPF (Exposed Payload Facility) alloggiavano fino a 4 payload esterni



ESA science & resources



ESA Human Spaceflight Users

<http://spaceflight.esa.int/users/index.htm>



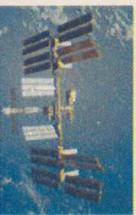
le facility NASA



Tra le attrezzature sperimentali di proprietà della NASA, in orbita o nei piani di completamento della Stazione, sulle quali l'ASI gode di diritto di utilizzo:

- CIR, Combustion Integrated Rack
- HRF, Human Research Facility
- FIR, Fluids Integrated Rack
- MARES, Muscle Atrophy Research Exercise System
- MSRR, Materials Science Research Rack
- Space DRUMS, Space Dynamically Responding Ultrasonic Matrix System
- WORF, Window Observational Research Facility

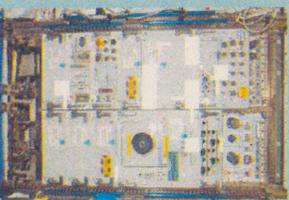
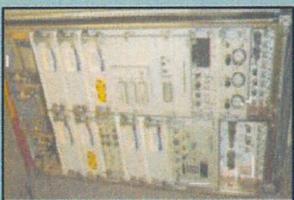
Le modalità dell'accesso e la quantità delle risorse disponibile sono in via di definizione da parte di ASI e NASA.



le facility NASA



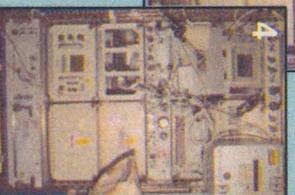
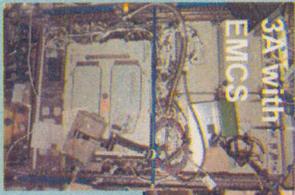
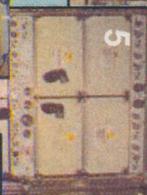
2 Human Research Facility Racks



Microgravity Science Glovebox



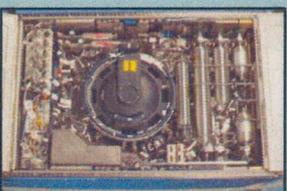
5 EXPRESS Racks



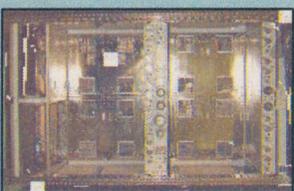
Minus Eighty-Degree Laboratory Freezer for ISS



Combustion Integrated Rack



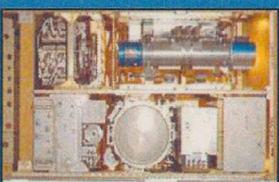
EXPRESS-6 (Galley and Research)



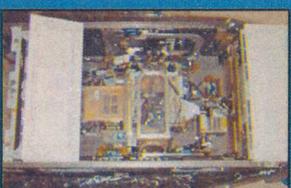
MELFI-2



Materials Science Research Rack



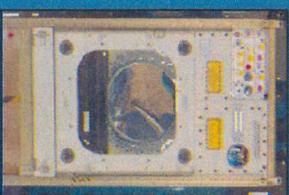
Fluids Integrated Rack



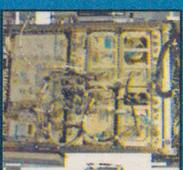
EXPRESS-7 and 8



Window Observational Research Facility



SpaceDRUMS in EXPRESS 5



Muscle Atrophy Research Exercise System (MARES)

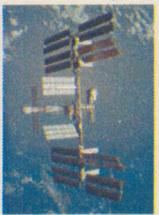


MELFI-3



on-orbit

2009-2010



NASA science & resources



NASA Research and Utilization Plan for the ISS
(Appendix E: ISS Research Facilities and Hardware)

- [http://exploration.nasa.gov/documents/reports/
NASA_Research_and_Utilization_Plan_for_the_ISS.pdf](http://exploration.nasa.gov/documents/reports/NASA_Research_and_Utilization_Plan_for_the_ISS.pdf)

Space Station Science

- http://www.nasa.gov/mission_pages/station/science/index.html