



# Life Science & Commercial Dept.



## Presentation to the NR Workshop, Internal PL Panel



Leiden (NL), 07 December 2015

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[luca.briganti@airbus.com](mailto:luca.briganti@airbus.com)





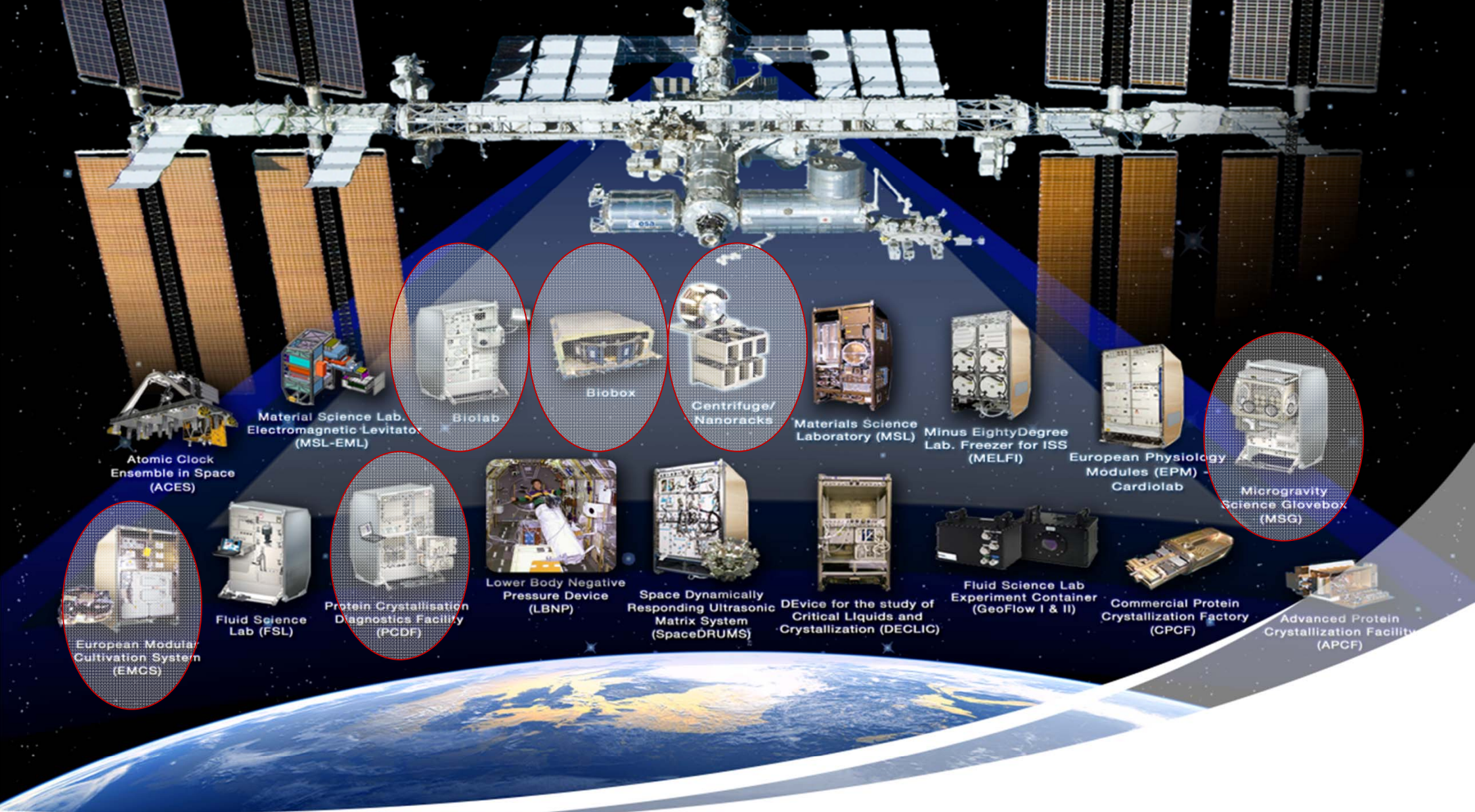
Life Science TSPOE3 in Friedrichshafen



## | We Deliver for Science

### CAPABILITIES

- Life and Physical Science Facilities & Experiments
- Payload & Mission Integration Services
- Mission & System Management
- Software Engineering
- Sustaining Engineering
- ISS Increment Management
- Simulation Platform Operation, Test, & Maintenance
- Astronaut and Flight Controller Training
- Flight Operations
- Science Consulting



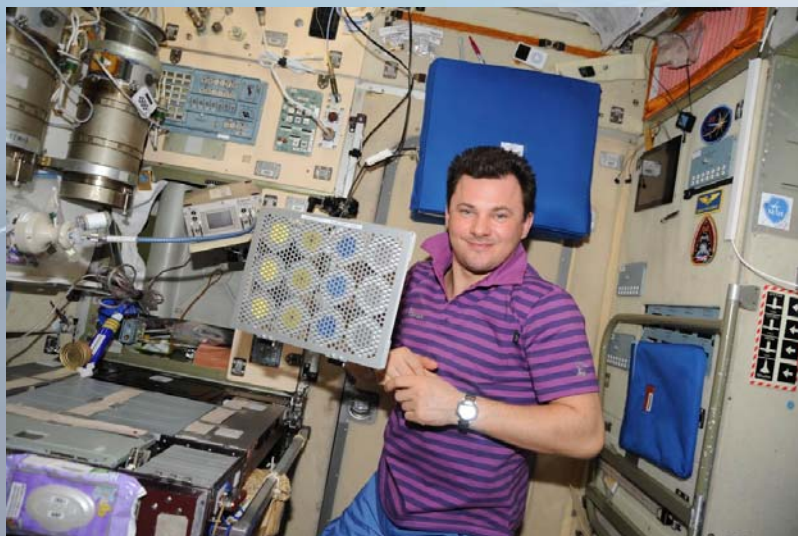
## ISS Life Science & Commercial Facilities and Lab Equipment



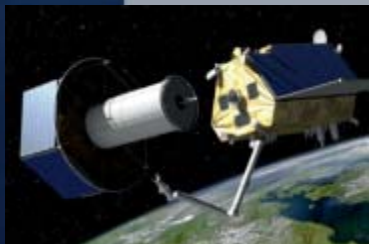
# Life Science TSPOE 3



## E-Nose



Program manager  
T. Hummel - Life Science TSPOE3  
Project manager breath gas analysis:  
V. Fetter, - Life Science TSPOE3

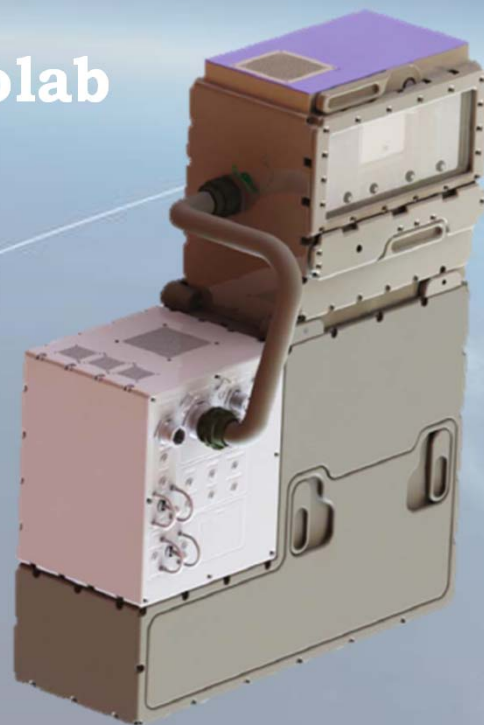




# Life Science TSPOE 3



## Immunolab



Project manager:  
Till Eisenberg, Life Science TSPOE3





# Life Science TSPOE 3



## EMCS/BIOLAB Experiments



Project manager:  
Luca Briganti, Life Science TSPOE3



# BLB Experiments

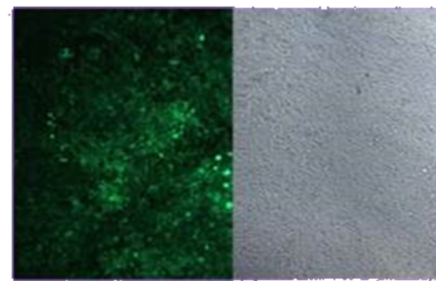
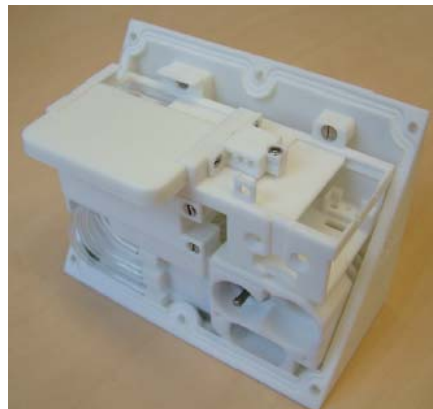
## CellRad Experiment

The experiment focuses on the cellular response to radiation in space and studies the combined effects of radiation with microgravity.

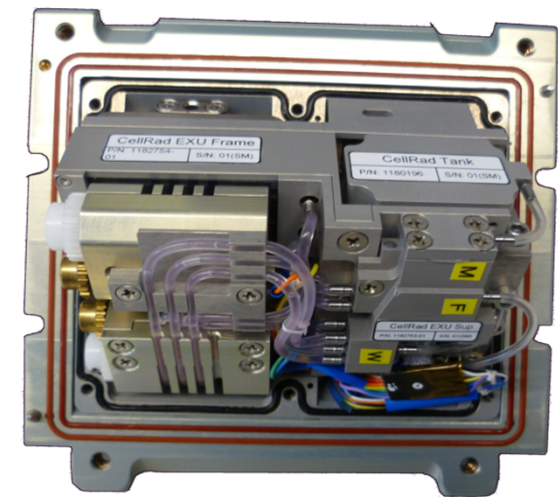
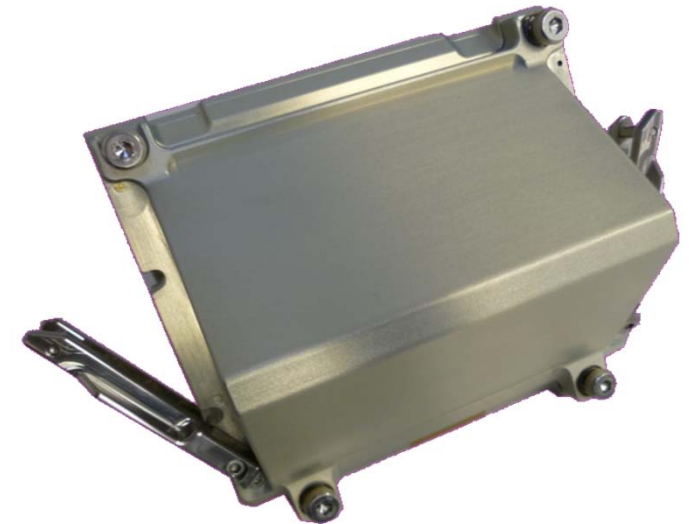
Cultures are exposed in-flight to artificial  $\beta$  radiation (Pm-147) doses, simulating certain aspects of the space radiation environment. After exposure, the cell cultures are incubated for different durations, to start the DNA repair process fixed and stored until the analysis on ground.

Organism: Human embryonic kidney cells

Status: phase C / CDR successfully completed, design flightworthy and **radiation containment approved by NASA safety**



Microscopy image of cells





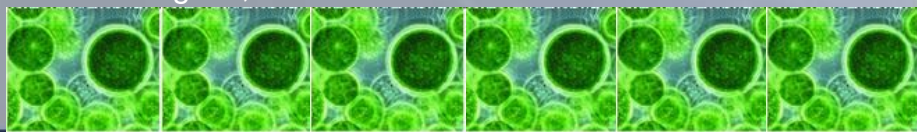
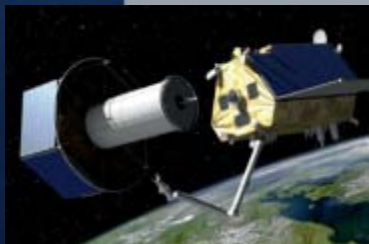
# Life Science TSPOE 3



## PhotoBioReactor



Project manager:  
Luca Briganti, Life Science TSPOE3





# Life Science TSPOE 3



## my\_biorack BIORACK INFRASTRUCTURE IN NANORACKS



Project Managers:  
C. Bruderrek, J. Segerer , Life Science TSPOE3

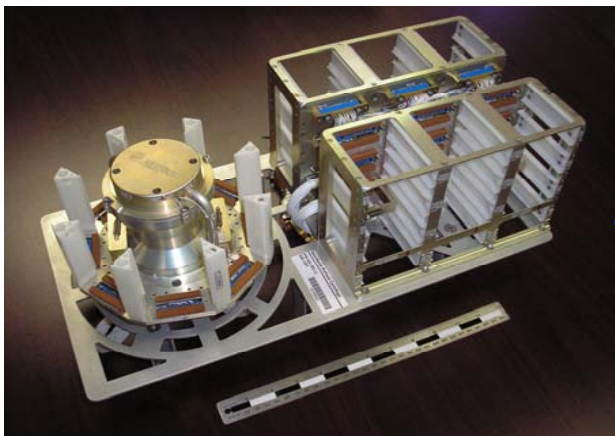
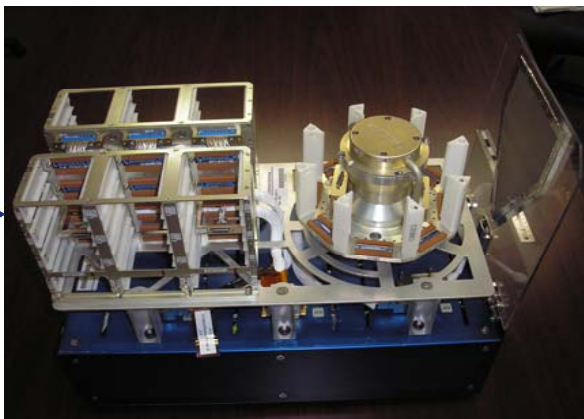


# My\_biorack on Frame-3 NR

**NANORACKS** Frame-3



BIORACK  
INFRASTRUCTURE  
IN NANORACKS



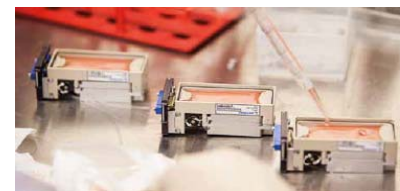
**my\_biorack**  
end-to-end service for  $\mu$ g research

**NANORACKS**

NASA Space Act Agreement:  
\_access to launcher capacities  
\_access to crew activities / on-orbit OPS  
\_late access / early retrieval possibilities

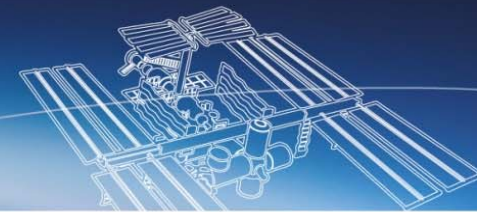
**AIRBUS**  
DEFENCE & SPACE

Standardized Hardware:  
\_compatible with Experiment Controllers  
\_compatible with Experiment Containers  
\_compatible with Experiment Inserts

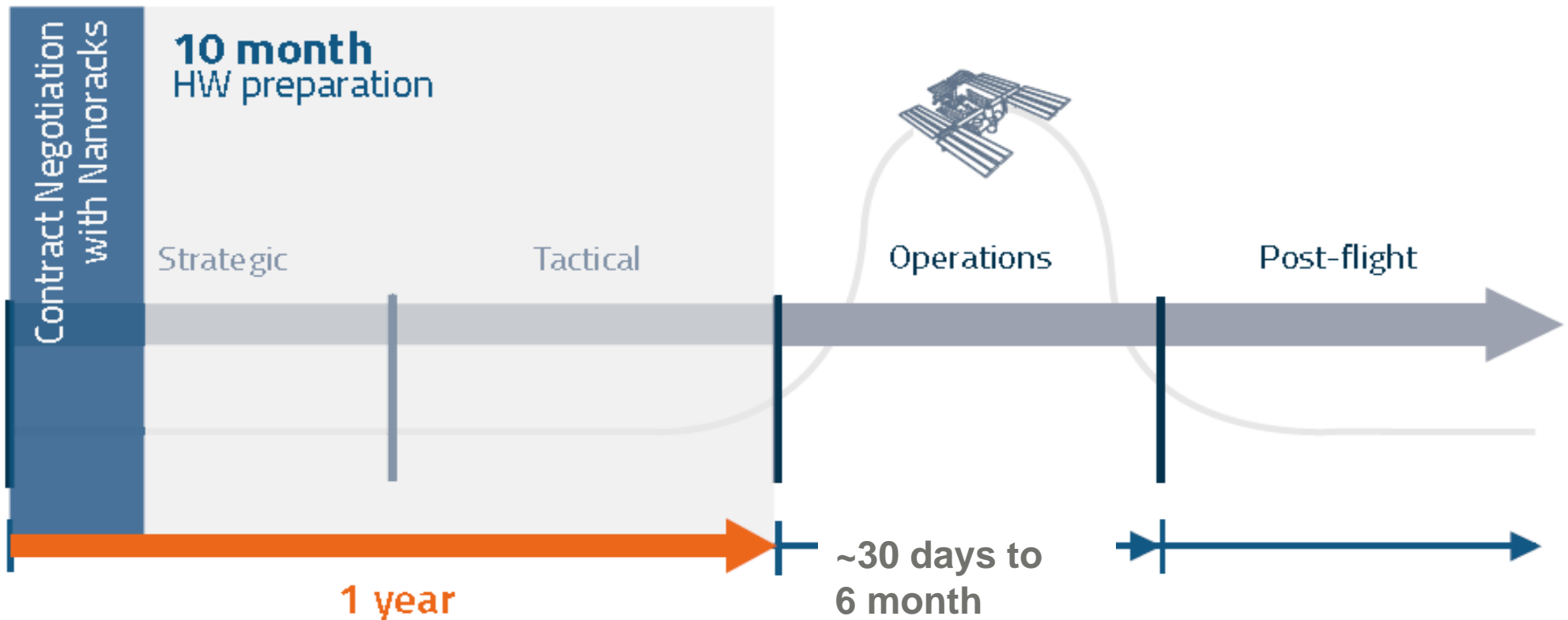


**AIRBUS**  
DEFENCE & SPACE BIORACK Infrastructure

**AIRBUS**  
DEFENCE & SPACE 10



# My\_biorack on Frame-3 NR



- Depending on the selected Experiment Insert and required modifications
- Depending on the launch availability

## my\_biorack Experiment Examples - CELLBOX



**CONTRACT SIGNATURE:** December 2012

**FLIGHT:** SpX-3 April 2014 (Launch Delayed from April 2013)

### **Principal Investigators and Experiments:**

- Prof. Daniela Grimm, University Aarhus, Denmark  
*Effect of Microgravity on Human Thyroid Carcinoma Cells*
- Prof. Oliver Ullrich, University of Zürich, Switzerland  
*Primary Human Macrophages in Microgravity Environment*

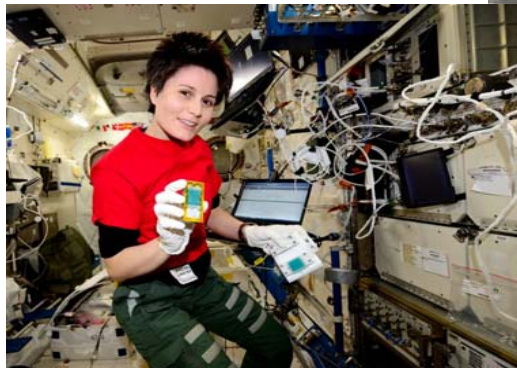
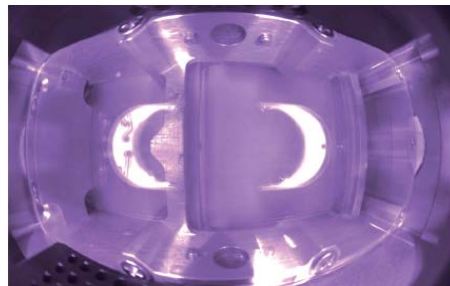
### **Used Hardware:**

- Experiment Container: Standard I-BEX, re-flight approach, small modifications (elctrical)
- Experiment Insert: Type-IV, re-flight approach, only re-furbishment
- Experiment Controller: KAB, new development
- 12 Flight Units, 6 Controllers (remain on ISS), 8 Ground Units, supporting Tools and EGSEs

## my\_biorack Experiment Examples - Fruit Fly Lab 01



NASA Ames Honor Award 2015



**CONTRACT SIGNATURE:** November 2013

**FLIGHT:** SpX-5 January 2015

### **Principal Investigators and Experiments:**

- Sharmila Bhattacharya, NASA Ames Research Center, USA  
*Studying Fruit Flies in space aboard the International Space Station*

### **Used Hardware:**

- Experiment Container: Observation Unit, new development
- Experiment Insert: FLY cassette, re-flight approach, provided by Ames
- Experiment Controller: Control Unit, new development, by Kayser Italia
- 14 Flight Units, 2 Controllers, supporting Tools and EGSEs

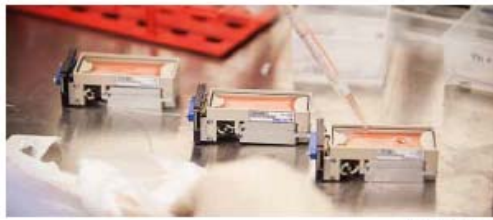




## my\_biorack Experiment – Upcoming Experiments



petri dishes: 8 Chambers



Experiment Insert Type IV  
Standard my\_biorack Controller

### Principal Investigators and Experiments:

- Dr. Maria Araceli Espinosa de los Monteros, UCLA, USA  
*"Effects of Real Microgravity on Oligodendrocyte proliferation, lineage progression and proteomic profile"*

### Planned Hardware:

- Experiment Container: Standard I-BEX, re-use of existing H/W
- Experiment Insert: petri dishes 8Chambers and Type IV, re-use of existing H/W
- Experiment Controller: KAB, standard my\_biorack controller

### Principal Investigators and Experiments:

- Prof. Daniela Grimm, University Aarhus, Denmark
- Prof. Oliver Ullrich, University of Zürich, Switzerland
- Dr. Florian Kohn, University of Tübingen, Germany  
*"CELLBOX Re-flight"*

### Planned Hardware:

- Experiment Container: Standard I-BEX, re-use of existing H/W
- Experiment Insert: Type-IV, re-use of existing H/W
- Experiment Controller: KAB, standard my\_biorack controller



### ✓ GREENHOUSE



Insert, Greenhouse



Experiment Insert Greenhouse

### Principal Investigators and Experiments:

- John Z. Kiss, University of Mississippi, USA  
*"Studying the effects of altered gravity on plant development and plant-microbe interactions on Medicago truncatula"*

### Planned Hardware:

- Experiment Container: KIC, re-use of existing H/W
- Experiment Insert: Greenhouse, re-use of existing H/W
- Experiment Controller: KAB, standard my\_biorack controller