

# Joint Research (JR) Training Rodent Research and General JR

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# Outline



- ◆ Flight changes for Rodent Research (RR) missions
- ◆ RR Operator training for cosmonauts
- ◆ Protocol affecting I53/54 (52S/53S)
- ◆ Training Proposal for I53/54
- ◆ Backup slides
  - ◆ RR-5 Tasks
  - ◆ Russian Rodent Mission Tasks
  - ◆ Other Joint Research
  - ◆ Tools Training and Support
  - ◆ Payload Rack Training
  - ◆ Rodent Research Training Flow
  - ◆ Rodent Research Training Objectives
  - ◆ Rodent Research Hardware



# Flight Changes for Rodent Missions



- ◆ Changes in Flight schedules for Rodent Research (RR)
  - ◆ RR5 has moved up to SpX-11 (from SpX-12)
    - ✦ Current Launch 2/1/17 – Increment 50/51
  - ◆ Russian Rodent mission and/or JAXA RR (TBD) SpX-12
    - ✦ Current Launch 6/1/17 – Increment 51/52
  - ◆ RR6 or Russian Rodent mission (TBD) SpX-13?
    - ✦ Current Launch Sept 2017 – Increment 52/53/54
- ◆ All Joint Rodent Research missions beginning with RR5 will involve special skills and will require operator level training for cosmonauts (as defined on the following slide).
- ◆ Indications are that Rodent Joint Research is going to continue indefinitely and that the Rodent missions will alternate with each Space X flight between a Joint Research and a Russian Crew Ops missions. Example: SpX-11 is Joint Research; SpX-12 is expected to be a Russian Crew Ops flight; SpX-13 would be Joint Research (TBD); .....



# RR Operator Level training for Cosmonauts



The following facility and Rodent Research classes are required for operators (based on current RR5 & Russian Rodent Mission tasks):\*

◆ Animal Consent Briefing**	(0.50 Hr.)
◆ Animal Care Briefing	(0.50 Hr.)
◆ Generic Rodent Skills Lab	(4.00 Hr.)
◆ Rodent Habitat Animal Transfer	(1.25 Hr.)
◆ Rodent Habitat Familiarization	(2.00 Hr.)
◆ Rodent Skills 1 (See backup for details)	(3.00 Hr.)
◆ Rodent Skills 3 (See backup for details)	(3.00 Hr.)
◆ Rodent Skills 4 (See backup for details)	(3.00 Hr.)
◆ Rodent JR Increment Skills	<u>(3.00 Hr.)</u>
<b>Total Rodent Training</b>	<b>20.25 Hr.***</b>
◆ HRF Rack Familiarization	(0.25 Hr.) support class
◆ HRF Refrigerated Centrifuge	(0.50 Hr.) support class
◆ Cold Transfer Skills	(1.00 Hr.) support class
◆ MSG Facility Familiarization	(1.00 Hr.) support class
<b>Total Support classes</b>	<b>2.75 Hr.</b>

\*If dissections or other TBD tasks are added, training hours could increase by 8 hours or more. (current tasks are in backup slides)

\*\*ICBs expected to take place in Russia starting in July/August 2016 with 51S & 52S cosmonauts

\*\*\*Interpretation time will be added – in general 30% overhead = total of 30 hrs.





# Proposed training for I53



Joint Research training planned: (hours below do not include interpretation)

**All cosmonauts will receive payload rack training\*. Both Skv & Vgn will have the below red text placeholders in their payload training plan until assignments &/or ICB are completed. GCTC concurrence needed by August 5, to support training start in Sept 2016.**

## I53 (52S) / Skvortsov and Vagner

★ Payload Rack training for cosmonauts has been approved via ITCB, ETRIP, and MPTP to begin with I53/54 (52S). Classes are scheduled in September for Skv & Vgn.

### ◆ Payload Rack classes, 4.5 hrs.

- ✦ EXPRESS Rack, 1 hr.
- ✦ HRF Rack, .25 hr.
- ✦ HRF Refrigerated Centrifuge, .5 hr.
- ✦ HRF Ultrasound 2, .25 hr.
- ✦ MELFI, .75 hr.
- ✦ MSG, 1 hr.
- ✦ WORF, .75 hr.

### ◆ Rodent Research (Operator) – 21.25 hrs.

- ✦ Consent Briefing, .5 hrs. \*\*
- ✦ Care Briefing, .5 hrs. (Sept 2016)
- ✦ Generic Rodent Skills, 4 hrs. (Sept 2016)
- ✦ Rodent Skills 1, 3 hrs. (Dec 2016)
- ✦ Rodent Skills 3, 3 hrs. (May 2017)
- ✦ Rodent Skills 4, 3 hrs. (May 2017)
- ✦ Rodent JR Increment Skills, 3 hrs. (June 2017)
- ✦ Rodent Habitat Animal Transfer, 1.25 hrs. (June)
- ✦ Rodent Habitat Fam for JR, 2 hrs. (June 2017)
  - ◆ Support classes:
    - ✦ Cold Transfer Skills, 1.0 hrs. (June 2017)

### ◆ FCF Cool Flames/ACME JR, 3.5 hrs.

- ✦ Cool Flames/ACME specific, 2 hrs. (June 2017)
- ✦ Support classes, 1.5 hrs. (MWA & ARIS) (May)

\*\* Expect ICBs to be in Russia in July/August 2016 – if not, Sept at JSC.



# Proposed training for I54



Joint Research training planned: (hours below do not include interpretation) Payload training plan **will have the below red text placeholders for Ryz until assignments &/or ICB are completed. GCTC concurrence is needed in August, to support training start in Nov 2016.**

## I54 (53S) / Ryazanskiy

### ◆ Payload Rack classes, 4.5 hrs.

(November 2016)

- ✦ EXPRESS Rack, 1 hr.
- ✦ HRF Rack, .25 hr.
- ✦ HRF Refrigerated Centrifuge, .5 hr.
- ✦ HRF Ultrasound 2, .25 hr.
- ✦ MELFI, .75 hr.
- ✦ MSG, 1 hr.
- ✦ WORF, .75 hr.

### ◆ Rodent Research (Operator) – 21.25 hrs.

- ✦ Consent Briefing, .5 hrs. \*
- ✦ Care Briefing, .5 hrs. (Nov 2016)
- ✦ Generic Rodent Skills, 4 hrs. (Nov 2016)
- ✦ Rodent Skills 1, 3 hrs. (Feb 2017)
- ✦ Rodent Skills 3, 3 hrs. (June 2017)
- ✦ Rodent Skills 4, 3 hrs. (June 2017)
- ✦ Rodent JR Increment Skills, 3 hrs. (Aug 2017)
- ✦ Rodent Habitat Animal Transfer, 1.25 hrs. (Aug)
- ✦ Rodent Habitat Fam for JR, 2 hrs. (Aug 2017)
  - ◆ Support classes:
    - ✦ Cold Transfer Skills, 1.0 hrs. (Aug 2017)

### ◆ FCF Cool Flames/ACME JR, 3.5 hrs.

- ✦ Cool Flames/ACME specific, 2 hrs. (June 2017)
- ✦ Support classes, 1.5 hrs. (MWA & ARIS) (Feb)

\* Expect ICBs to be in Russia in July/August 2016 – if not, Nov at JSC.



# Backup



# RR-5 Tasks



- ◆ Transfer animals from 2 Transporters to 4 Habitats
- ◆ Initial MSG Set up for the mission duration
- ◆ Animal Transfer from Habitats to MSG (Multiple times)
- ◆ Cleaning of the Access Unit after activity
- ◆ Gather and organize operational support hardware in MSG for Operations
- ◆ Transfer animals from 2 Habitats to 1 Transporter (if Live Animal Return)
- ◆ Perform Bone Densitometry
- ◆ Insert science samples into MELFI
- ◆ Final MSG Clean up and Stow, post mission
- ◆ End of mission inventory check
- ◆ Habitat Preparation & Insert into Express Locker
- ◆ Bag and Stow Transporter
- ◆ Change out of food bars in Habitat Refresh
- ◆ Water Box checks
- ◆ Bag and Stow Habitat
- ◆ Perform Injections and Recovery in MSG
- ◆ Perform Euthanasia (Cardiac Puncture) in MSG



## Russian Rodent Research Mission Assumptions



- ◆ All rodent on orbit operations will be done by cosmonauts.
- ◆ Animals up/down on the same flight (~30 days)
- ◆ No dissections
- ◆ Euthanize and freeze
- ◆ Bone densitometry and anything requiring anesthesia recovery is TBD
- ◆ Other ops on-orbit (such as injections) – science objectives and content are not fully defined and are still being discussed
- ◆ No new Experiment Unique Equipment or on-orbit operations
- ◆ Crew time target 50 – 100 hrs (depending on final science objectives)

Disclaimer: Tasks and science content of the mission is still being determined. The above is assumed but not confirmed. Long term goal is to have Russian crew only missions as a standard once per year.

If dissections and other TBD tasks are added to mission tasks, the training time could increase by 8 hours or more.



## Other Joint Research



- ◆ Cool Flames & ACME (4.5 Hrs.) 3.5 Hrs. w/o Interpretation
  - ◆ 2 Hrs. Cool Flames and/or ACME specific
  - ◆ 1.5 Hrs. system prerequisites
  - ◆ 1.0 Hrs. (30% for interpretation)
- ◆ Fluid Shifts – (18.5 Hrs.)/14 Hrs. w/o Interpretation (completed with Increment 50 crewmembers)
  - ◆ Hours do not include BDC
  - ◆ 11.75 Hrs. Fluid Shifts payload training
  - ◆ 2.25 Hrs. Med Ops prerequisites
  - ◆ 4.5 Hrs. (30% for interpretation)
- ◆ Robonaut – currently no ground training
- ◆ SPHERES-ZR – currently no ground training
- ◆ EarthKAM – currently no ground training



# Tools Training & Support



- ◆ Interpreters will be able to support Sims, crew training, and other activities to prepare for Rodent missions
- ◆ Interpreters will be trained on all Joint Research payloads so that they have a better understanding of concepts
- ◆ Interpreters will support on orbit operations
- ◆ All cosmonauts will receive payload rack training beginning with I53/54 crews. (Details in next slide)
- ◆ Procedures for training and on orbit use are translated
- ◆ Crew training will be conducted over several US trips in order to build required skills
- ◆ Time for interpretation will be added to all classes
- ◆ Cosmonauts will participate in RO Sims where extra tools training will be provided – refresh and practice using IPV/PODF, OPTIMUS Viewer, Stowage Notes, and calls to POIC in Huntsville. (Lesson learned)



# Payload Rack Training



◆ Agreement in place to train all cosmonauts on payload racks as follows – beginning with I53/54 cosmonauts:

- ◆ MELFI (.75 Hr.)
- ◆ EXPRESS RACK (1 Hr.)
- ◆ MSG (1 Hr.)
- ◆ HRF RACK (.25 Hr.)
- ◆ HRF Ultrasound 2 (.25 Hr.)
- ◆ HRF Refrigerated Centrifuge (.5 Hr)
- ◆ WORF (.75 Hr.)
- ◆ 30% interpretation = ~1.25

**Total for above racks = 5.75 Hrs.**



# Typical Rodent Research Flow for USOS, page 1



- ◆ Pre-assignment
  - ◆ Generic Rodent training (includes consent briefings)
  - ◆ 40 hours (one week) optimally
  - ◆ 16 hours (2 days) minimally – when a crewmember is identified too late to get the total week
  - ◆ **Cosmonauts are planned for 4 hours**
  
- ◆ Payload Facilities – Assigned Flow
  - ◆ MELFI Fam – .5 Hr.
  - ◆ MSG Fam – .75 Hr.
  - ◆ HRF Rack – .25 Hr.
  - ◆ HRF Refrigerated Centrifuge – .25 Hr
  - ◆ Cold transfer Skills – 1 Hr.



# Typical Rodent Research Flow for USOS, page 2



## ◆ Skills – Assigned Flow

### ◆ General Skills

- ✦ Rodent Skills 1 – 3 Hrs.
- ✦ Rodent Skills 2 – 3 Hrs.
- ✦ Rodent Skills 3 – 3 Hrs.
- ✦ Rodent Skills 4 – 4 Hrs.
- ✦ Rodent Habitat & Animal Transfer – 1.25 Hrs.

### ◆ Increment Specific Skills

- ✦ Increment Specific Skills – 4 Hrs.
- ✦ Increment JR Specific Skills – 3 Hrs.

### ◆ Totals

- ✦ Pre-assignment: 40 Hours
- ✦ Increment Specific: 24 Hours



# Rodent Research Lesson Objectives, p. 1



- ◆ Skills 1 Objectives (on bench top)
  1. Animal handling/scruffing
  2. Subcutaneous (SubQ) injection
  3. Intraperitoneal (IP) injection, verify no toe pinch reflex
  4. Cardiac puncture (open-chest and closed-chest methods); 0.5 mL blood minimum
  5. Cervical dislocation
  6. Carcass preparation
- ◆ Skills 2 Objectives (not required for Increment 51-54 cosmonauts, due to heavy dissection objectives of the class)
  1. Animal handling/scruffing
  2. Subcutaneous (SubQ) injection refresher/practice
  3. Intraperitoneal (IP) injection refresher/practice; verify no toe pinch reflex
  4. Cardiac puncture (open-chest and closed-chest) refresher/practice; 0.5 mL minimum
  5. Cervical dislocation refresher/practice
  6. Removal of spleen
  7. Removal of liver
  8. Removal of bilateral hind limbs
  9. Removal of bilateral eyes
  10. Removal of brain
  11. Carcass preparation



# Rodent Research Lesson Objectives, p. 2



- ◆ Skills 3 Objectives (Same as Skills 1, but inside MSG simulator. Skip Grip Strength for cosmonauts)
  1. Animal handling/scruffing
  - ~~2. Grip Strength measurements~~
  3. Subcutaneous (SubQ) injection
  4. Intraperitoneal (IP) injection; verify no toe pinch reflex
  5. Cardiac puncture (open-chest and closed-chest methods); 0.5 mL blood minimum
  6. Cervical dislocation
  7. Carcass preparation
  
- ◆ Skills 4 Objectives (Inside MSG simulator; eliminate dissection skills for cosmonauts. Reduced time from 4 to 3 hours)
  1. Animal handling/scruffing
  2. Subcutaneous (SubQ) injection refresher/practice
  3. Intraperitoneal (IP) injection refresher/practice; verify no toe pinch reflex
  4. Adhesion of animal to Exam Tray and use of the Exam Box for bone densitometry scanning; application of eye ointment
  5. Use of the Anesthesia Recovery System (ARS) and recognition of recovery signs
  6. Cardiac puncture (open-chest and closed-chest) refresher/practice; 0.5 mL minimum
  - ~~7. Dissection and tissue collection practice~~
    - ~~★ a. Spleen~~
    - ~~★ b. Liver~~
    - ~~★ c. Eyes~~
    - ~~★ d. Brain~~
    - ~~★ e. Hind limbs~~
    - ~~★ f. Tissue preparation/use of Rodent Tissue Box~~
  8. Cervical dislocation
  9. Carcass preparation



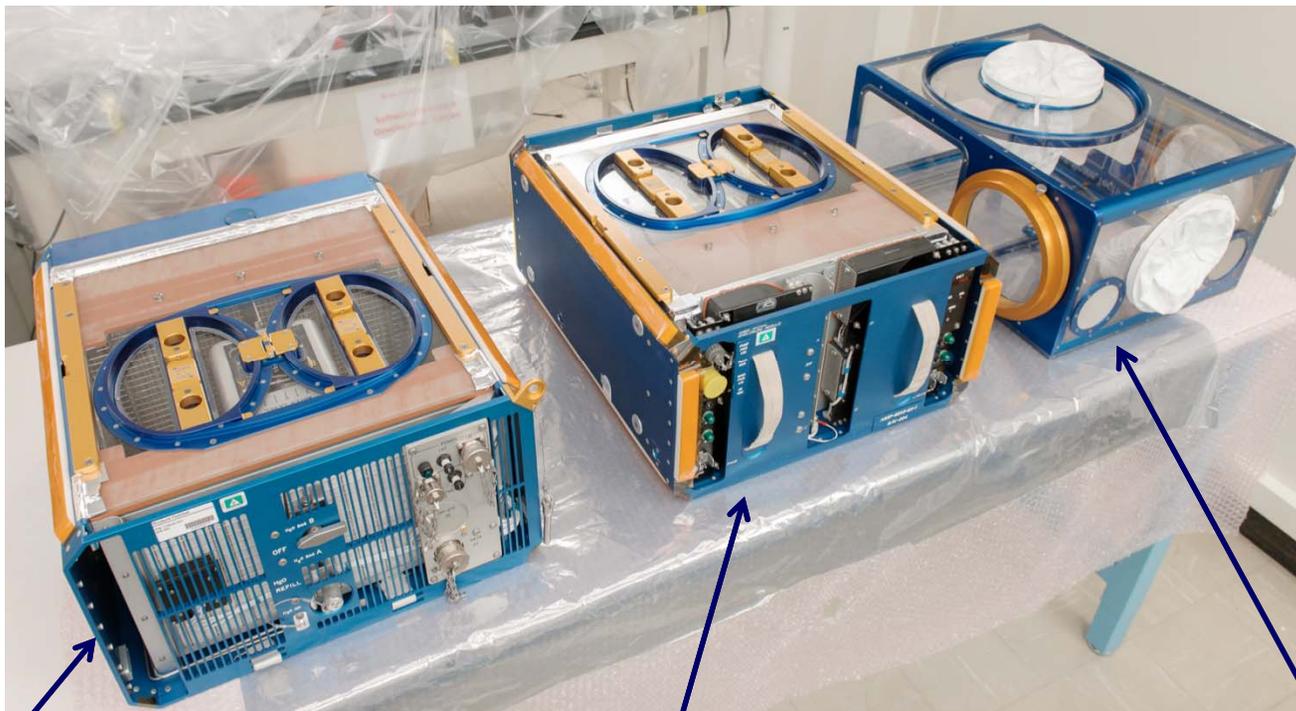
# Rodent Research Lesson Objectives, p. 3



- ◆ Increment Specific Skills (RR-5/UCLA, inside MSG simulator)
  1. Animal handling/scrudding
  2. Subcutaneous (SubQ) injection
  3. Intraperitoneal (IP) injection
  4. Adhesion of animal to Exam Tray and use of the Exam Box for bone densitometry scanning; application of eye ointment
  5. Use of the Anesthesia Recovery System (ARS) and recognition of recovery signs
  6. Cardiac puncture (closed-chest); minimum of 0.5mL per animal
  7. Cervical dislocation (secondary method of euthanasia)
  8. Carcass preparation



# Rodent Research Hardware Overview



## HABITAT

- 10 mice or 3 – 6 rats
- No thermal control
- Video monitoring (4 cameras)
- Lighting (Visible and IR)
- In-flight access
- Launches and returns passive

## TRANSPORTER

- Up to 20 mice, up to 12 rats
- Powered for ascent
- Powered on ISS during Animal Transfer Operations
- No visual checks of the animals (no cameras)
- Lighting (Visible)
- Returns passive for used Transporters, returns powered for live animal return

## ACCESS UNIT

- Attaches to either Transporter or Habitat
- Provides for animal access and transfer of animals
- Remains on orbit in stowage between increments



# Operational Support Hardware Overview



- ◆ A fully set up MSG with Operational Support Hardware (OSH)

