

## **ABSTRACT**

### **Implementation of Joint Multi-Segment Training**

**by**

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The highest level of training for ISS flight is Joint Multi-Segment Training (JMST) simulations. These simulations allow two or more partners to conduct multi-segment training for their respective Mission Control Centers (MCC), include actual crew members, and usually include training facilities in each of the participating International Partner (IP) locations. It is the dress rehearsal for those events that exercise the interface between different IP modules and/or the decision making process between the different MCCs involved.

This presentation will describe the challenge of successfully implementing JMST. It will start with a brief overview of who is involved, where they are located, and when JMSTs are required. Finally, it will illustrate many of the complications involved in just running a JMST between MCC-M and MCC-H. The viewer will leave with a much better appreciation for the complexities involved in successfully conducting a JMST of this nature, as well as an idea of how the picture will change as the other partners and payloads become involved.

# Implementation of Joint Multi-Segment Training

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National Aeronautics  
and Space Administration  
International Space Station Program



Russian  
Space  
Agency



Canadian Space  
Agency

Agence spatiale  
canadienne



esa  
european space agency



NASDA  
宇宙開発事業団

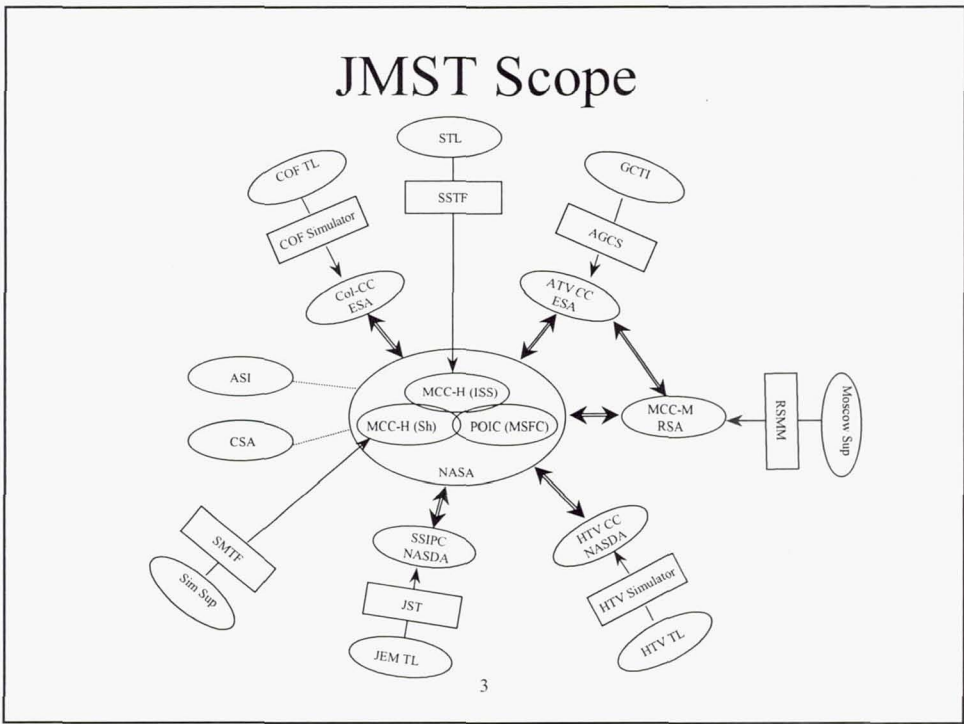
1

## JMST Definition

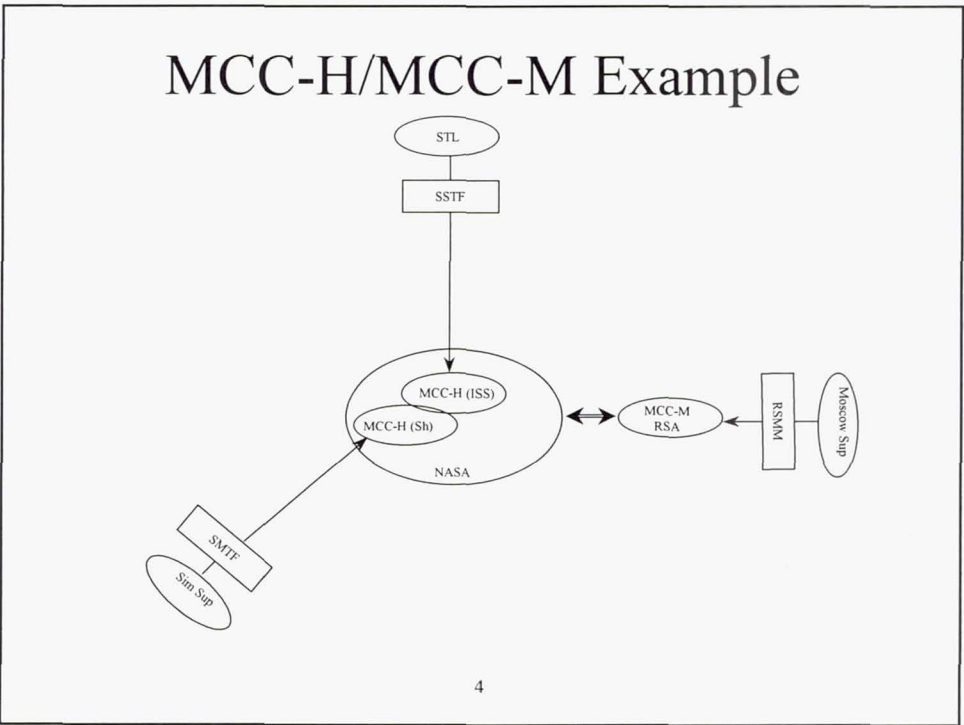
- Joint Multi-Segment Training (JMST) is high fidelity simulations focused on multi-segment interactions involving two or more ISS partner control centers
- Allows partner control centers to practice working together for activities where multiple control centers have responsibilities
- Generally occur between L-12 and L-4 weeks of launch

2

# JMST Scope



# MCC-H/MCC-M Example



## MCC-H/MCC-M Example

In the case of MCC-H/MCC-M JMSTs, several unique challenges exist:

- Different simulators in each country, which must be kept in synch verbally for every planned or unplanned input:
  - nominal crew procedural and ground commands
  - scripted malfunctions
  - malfunction recovery steps
  - crew or MCC mistakes
  - simulator anomalies
- Keeping simulators that communicate in synch
- Language barrier between simulation teams
- Same MCC-M flight control team for mission support and sim, so
  - Simulation start time tied to actual Russian Ground Station passes
  - simulators must go to run on time, even if all simulators/MCCs aren't ready, or simulation start gets delayed 90 min. (1 rev)

5

## Concluding Thoughts

- JMST offers highest fidelity training environment for interactions involving multiple control centers
- JMST will be difficult to implement, and will require extensive research and well coordinated scripts by the simulation teams in advance
- Challenges and constraints change depending on the participants
- Extensive future work required with each partner to determine constraints, capabilities, requirements, and JMST operations concepts

6

## Acronyms

ATV	- Automated Transfer Vehicle
ATV CC	- ATV Control Center
AGCS	- ATV Ground Control Simulator
ASI	- Italian Space Agency
COF	- Columbus Orbital Facility
COF TL	- Columbus Orbital Facility Training Lead
Col-CC	- Columbus Control Center
CSA	- Canadian Space Agency
ESA	- European Space Agency
GCTI	- Ground Controller Training Instructor (ATV)
HTV	- H-IIA Transfer Vehicle
HTV CC	- HTV Control Center
HTV TL	- HTV Training Lead
JEM	- Japanese Experiment Module
JEM TL	- JEM Training Lead

7

## Acronyms

JMST	- Joint Multi-Segment Training
JST	- Japanese Segment Trainer
MCC-H (ISS)	- Mission Control Center - Houston (ISS)
MCC-H (Sh)	- (Mission Control Center - Houston (Shuttle)
MCC-M	- Mission Control Center - Moscow
MSFC	- Marshall Space Flight Center
NASA	- National Aeronautics and Space Administration
NASDA	- Japanese Space Agency
POIC	- Payload Operations Integration Center
RSMM	- Russian Segment Math Models
Sim Sup	- Simulation Supervisor
SMTF	- Shuttle Mission Training Facility
SSIPC	- Space Station Integration and Promotion Center
SSTF	- Space Station Training Facility
STL	- Station Training Lead

8