
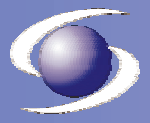

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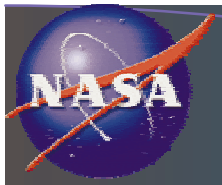
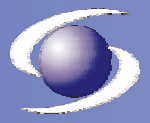
# Malleable Human Interfaces for Space Flight Applications

11 April 2002

LtCol Tom Duncavage
Mr. Joe Hamilton
Mr. John Jackson
*NASA Johnson Space Center*

Dr. Jim Whiteley, PE
Mr. Chris Slovacek
Mr. Chris Keller
Mr. Alan Gifford
*Johnson Engineering*



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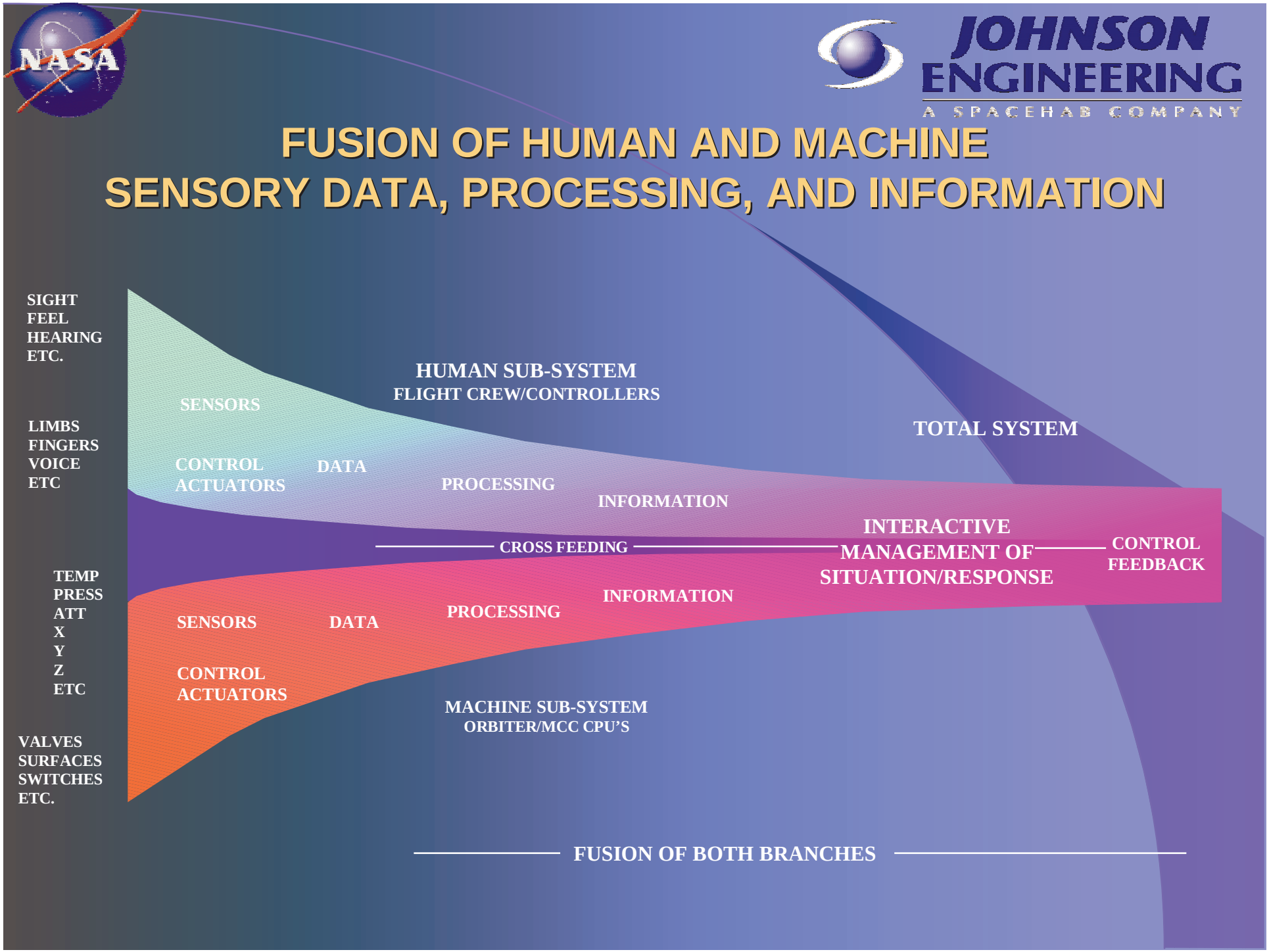
# Malleable Human Interfaces (MHI) Purpose and Top-Level Goals

- The MHI project is an endeavor to develop conventions, guidelines and standards for malleable, transportable, consistent, and common crew interfaces for human space flight.
- MHI will demonstrate utility through performance measurement of MHI conceptual interfaces applied to specific spacecraft information systems.
- MHI envisioned products will have applicability for current operational and future long duration human space flight programs.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FUSION OF HUMAN AND MACHINE
SENSORY DATA, PROCESSING, AND INFORMATION
SIGHT
FEEL
HEARING
ETC.
LIMBS
FINGERS
VOICE
ETC
TEMP
PRESS
ATT
X
Y
Z
ETC
VALVES
SURFACES
SWITCHES
ETC.
HUMAN SUB-SYSTEM
FLIGHT CREW/CONTROLLERS
SENSORS
CONTROL
ACTUATORS
DATA
PROCESSING
INFORMATION
TOTAL SYSTEM
CROSS FEEDING
INTERACTIVE
MANAGEMENT OF
SITUATION/RESPONSE
CONTROL
FEEDBACK
SENSORS
DATA
PROCESSING
INFORMATION
CONTROL
ACTUATORS
MACHINE SUB-SYSTEM
ORBITER/MCC CPU'S
FUSION OF BOTH BRANCHES

# MHI Objectives

- Further develop and refine notional user interface designs
- Conduct performance measurement and testing
- Determine utility of notional malleable interface design(s)
- Develop and maintain interface and test result library
- Formulate MHI conventions, guidelines and standards from research results

# MHI Old Timeline

- Oct 01 – Feb 02
  - Focused development of notional caution and warning interface designs
- March 02 – June 02
  - Conduct performance measurement and testing
  - Catalog results for analysis
- July 02 – Sept 02
  - Identify conventions, guidelines and standards relevant to caution and warning scenarios for human space flight
  - Document and present project findings as appropriate

# MHI Timeline FY 02

- Oct 01 – Dec 01
  - Focused development of notional caution and warning interface designs
- Jan 02 – April 02
  - SLI interface design internal/external to vehicle
- May 02 – July 02
  - Conduct performance measurement and testing
  - Catalog results for analysis
- July 02 – Sept 02
  - Identify conventions, guidelines and standards relevant to SLI scenarios for human space flight
  - Document and present project findings as appropriate

# MHI FY-2002 Milestones

- Complete MHI notional caution and warning interface(s)
- Complete performance measurement and data collection
- Analyze project research results
- Complete project summary report

# Work Performed – Internal Shuttle/SLI

- Updated the Dual Seat session in PRISMS to accommodate the forward section of the Shuttle's cockpit.
- Developed head/torso/hand model.
- Added the ability to turn virtual displays on/off using the stylus.

# Work Performed – External Shuttle/SLI

- Created a preliminary model in ProE for an SLI rocket with a CRV-like crew area at the top. Imported that model into a Prisms session to begin the evaluation of preliminary SLI concepts.
- Imported the position & orientation data for an ejection sequence of an escape pod. Created a flight path to illustrate the path in the CES (Crew Escape System) session.

# Work Performed – External Shuttle/SLI

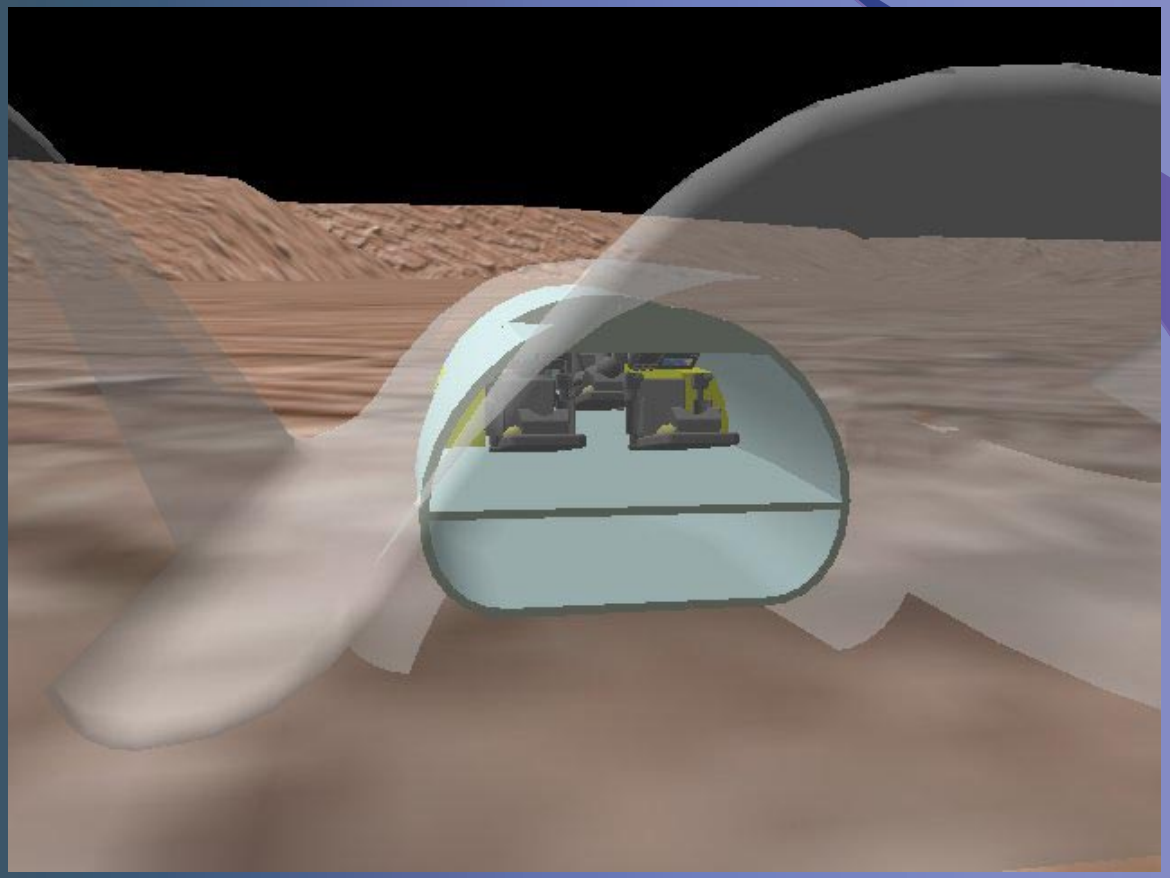
- Converted and imported a database of positions and orientation of a typical flight of the shuttle. From these values, created a visual flight path and also attached a notional SLI vehicle to fly along the flight path with the new motion rules.
- Began insertion of display outputs for the independent variables that will be modified and monitored during the Crew Escape System studies in PRISMS.

# Work Performed – External Shuttle/SLI

- Created an illustration of an explosion within the SLI session. This will be used in conjunction with the escape trajectory to determine the optimal sequence of events and visualization of appropriate crew/ground control annunciation.
- Variables such as blast model, time of explosion, time of escape system activation, and others can now be modified and monitored on an on-screen display by the experimenters.
- Created the rules and derivations to control the escape pod's activation and movement.

# CRV/SLI CTV

## Exterior



# CRV/SLI CTV

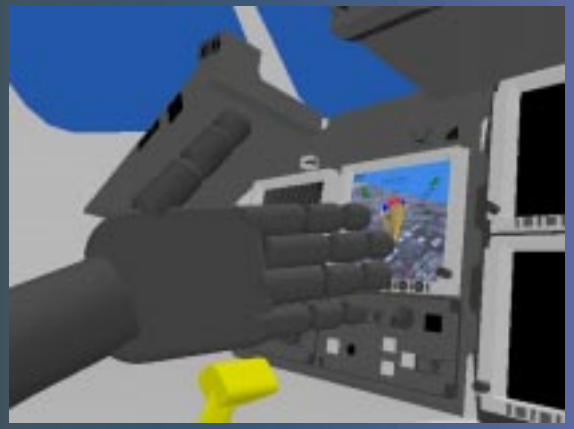
## Interior

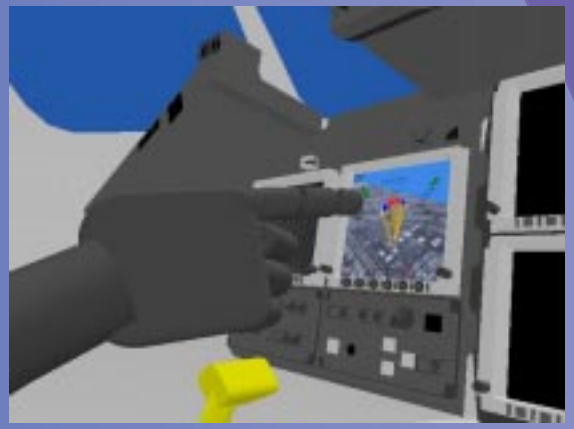
# CRV/SLI CTV

## Common Interface Set

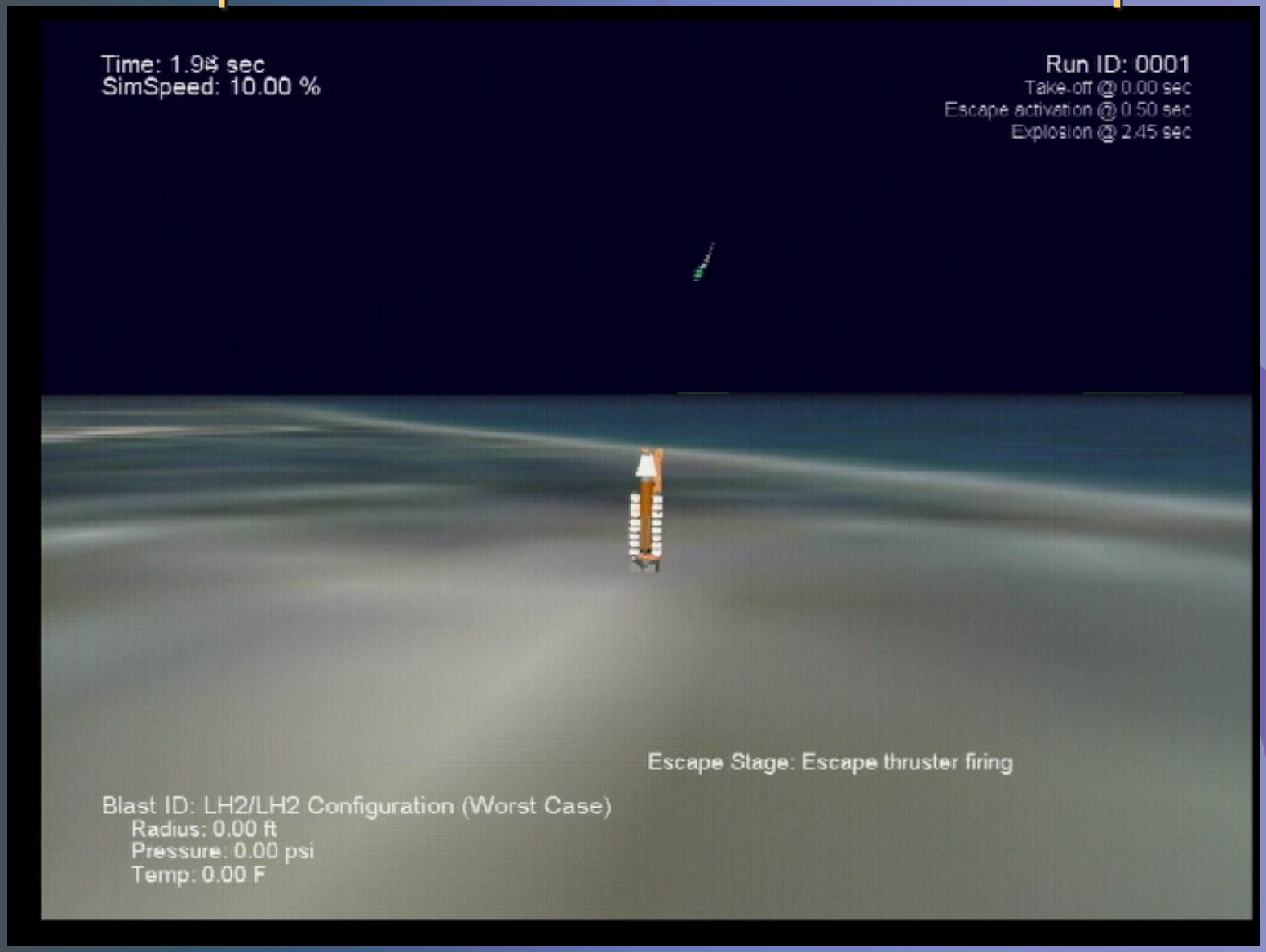
# Shuttle Common Interface Set Translation

# Virtual Interactive Crewman





# Catastrophic Failure Visualization Sequence



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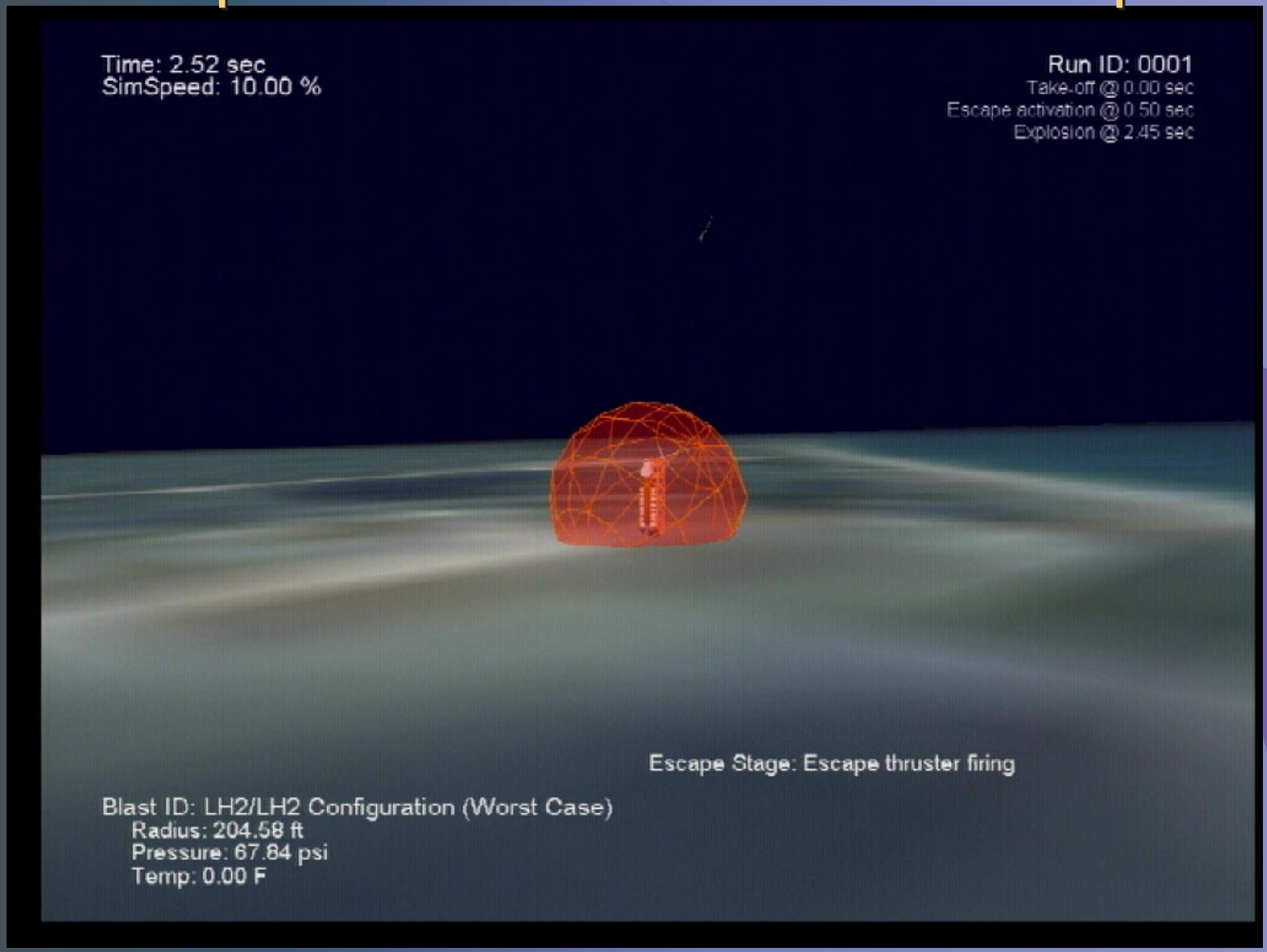

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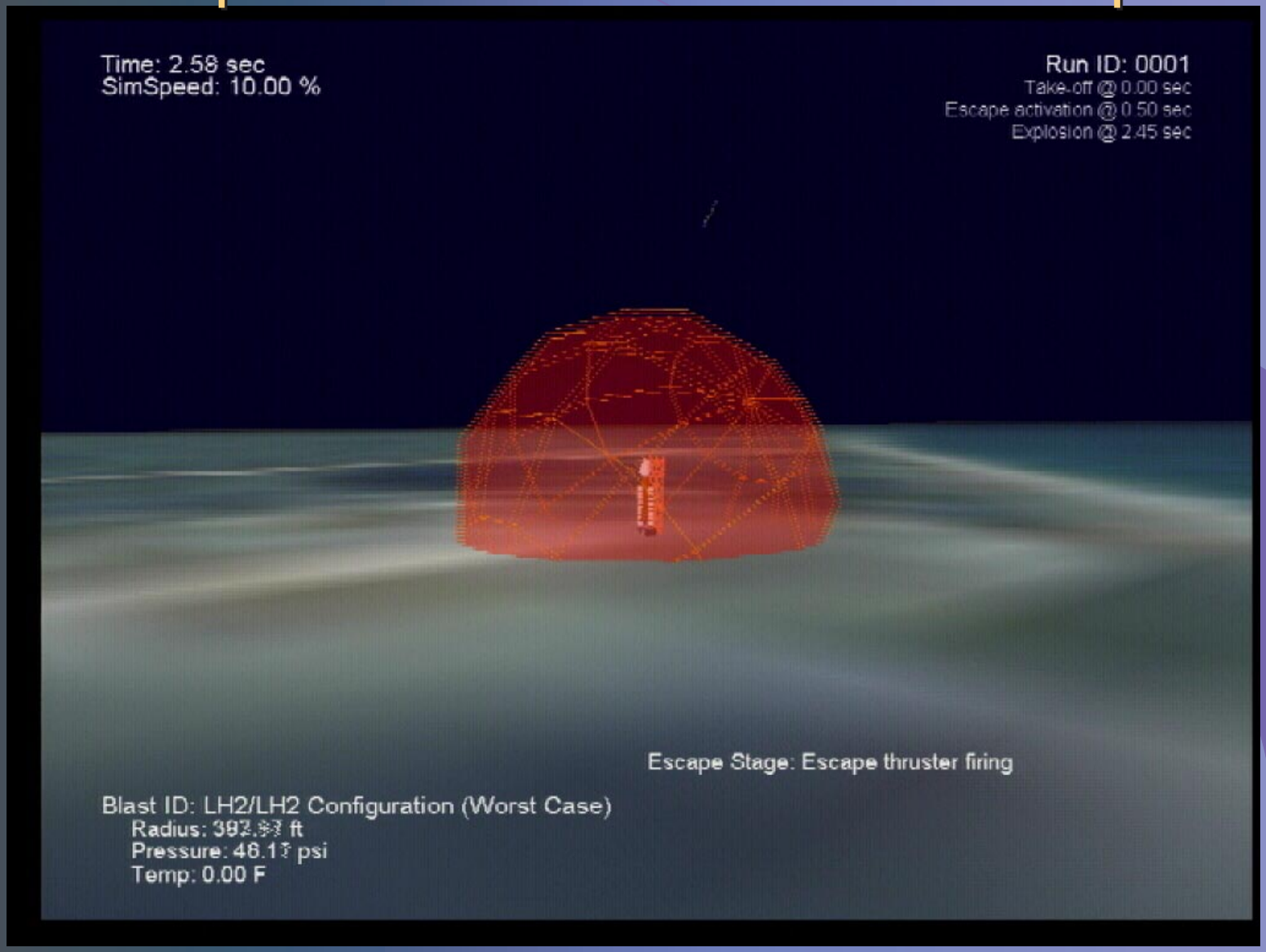


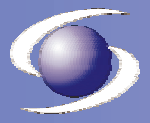

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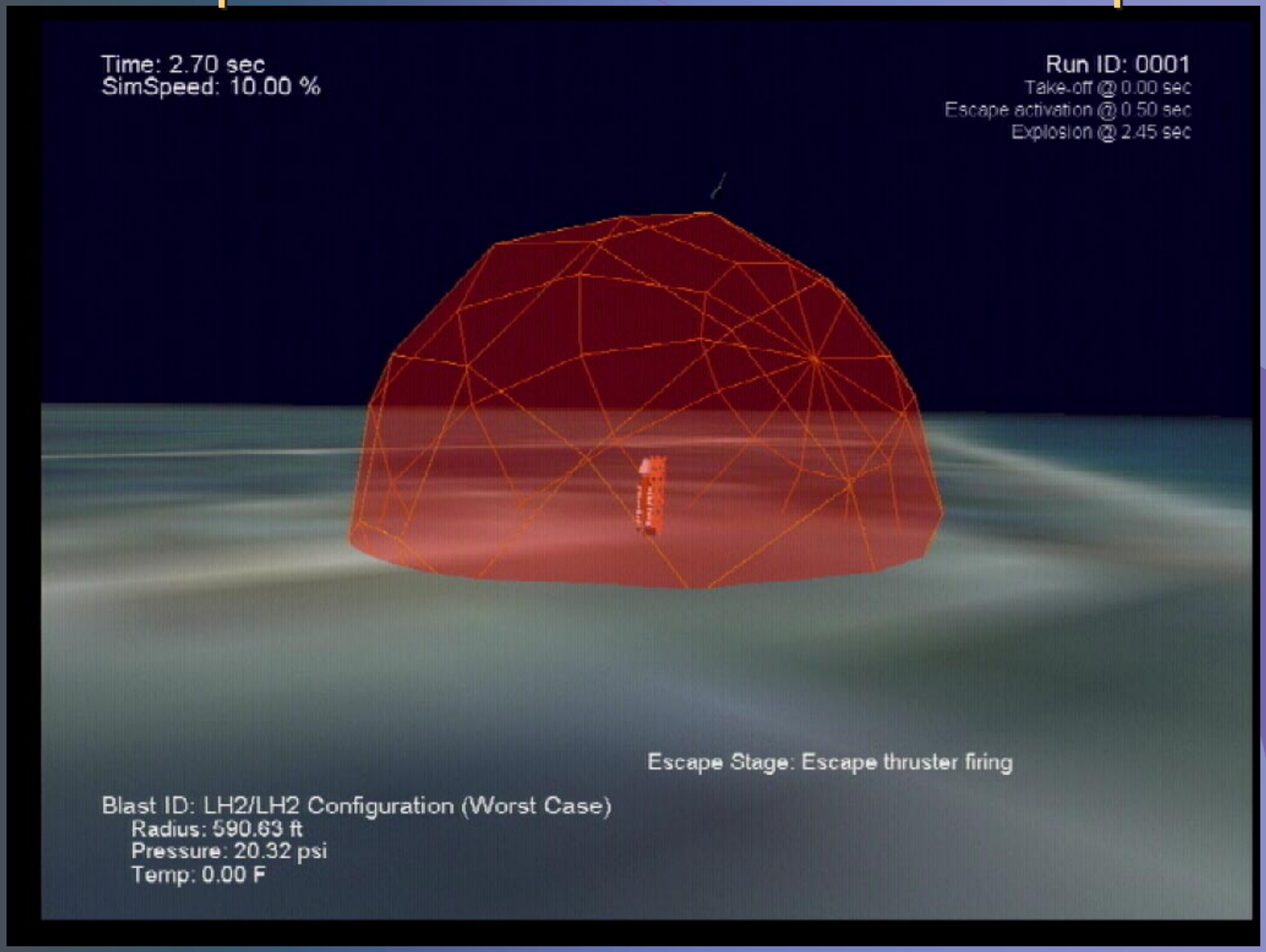


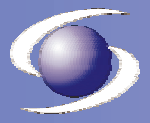

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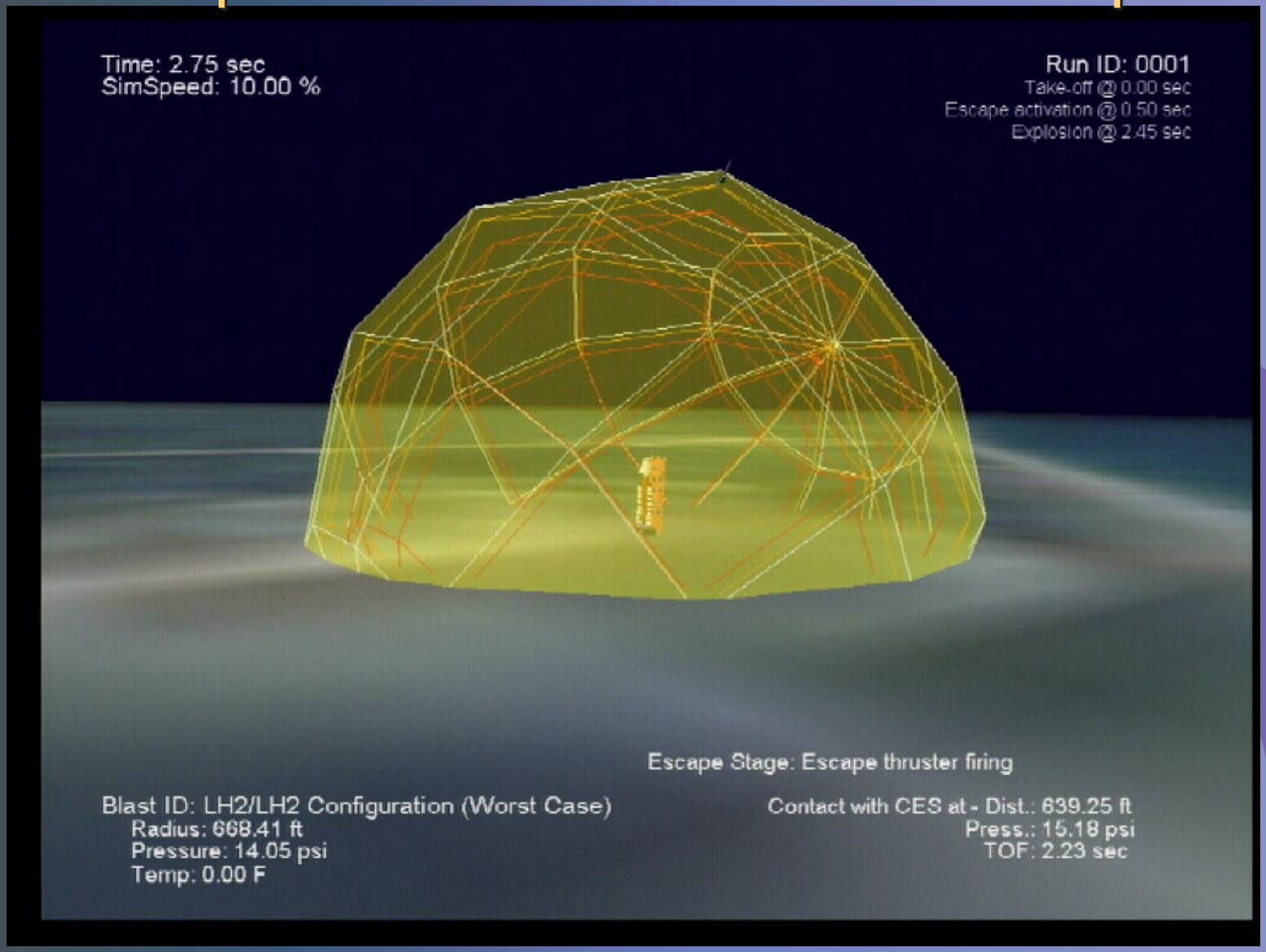

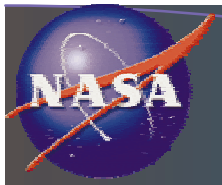


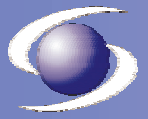

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# CEL

## CONCEPT EXPLORATION LAB