<table>
<thead>
<tr>
<th>Medical Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Joe Dervay</td>
</tr>
</tbody>
</table>

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<tr>
<th>Approach</th>
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<td>DCS Contingency Plan Overview</td>
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<td>On-orbit Treatment Philosophy</td>
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<td>Medical Checklist</td>
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<td>Flight Rules</td>
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<td>Crew Training</td>
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<tr>
<td>Flight Surgeon / Biomedical Engineer (BME) Training</td>
</tr>
<tr>
<td>DCS Emergency Landing Site</td>
</tr>
</tbody>
</table>
Medical Operations
Spaceflight Decompression
Sickness Contingency Plan
Dr. Joe Dervay
Mission Support

On-orbit Flight Control Room (FCR) Staffing

Surgeon Console - FCR
• Current ISS Prebreathe Protocols
  – Four hour In-suit (Originally accepted by testing. Currently acceptable by analysis)
  – Campout (Accepted by analysis of related data/similarity to shuttle 10.2 psi staged protocol)
  – Exercise Prebreathe (Accepted by testing utilizing the criteria below)

• Accept Criteria for ISS EVA Prebreathe Protocols*
  – One-year “DCS Risk Definition & Contingency Plan” effort designated accept criteria of research protocol
    » Decompression Sickness (DCS) ≤ 15 % at 95% CL
    » Grade 4 Venous Gas Emboli (VGE) ≤ 20 % at 95% CL
    » No Type II (serious) DCS

* This criteria was not applied to the shuttle protocols
• **Operational Experience**
  – To date, there have been 141 person-EVAs conducted with 10.2 psi Staged PB Protocol
    » 12-16 hr stay at 10.2 --- 20 Final PB
    » 16-20 hr stay at 10.2 --- 4
    » 20-24 hr stay at 10.2 --- 12
    » 24 hr > stay at 10.2 ---- 105
  – In no case has there been any reported symptoms or signs of DCS
OBJECTIVE:

• Develop enhanced plan to diagnose, treat, and manage on-orbit DCS
  – Achieve new level of DCS awareness among flight controllers, astronauts, and the medical community

• Historically, few drivers to modify existing plan

• Significant upcoming increase in EVA activity to build and maintain ISS - “Wall of EVA’s”

• Important to involve International Partners with plan
APPRAOCH:

• Johnson Space Center multi-disciplinary team: Medical Operations, Astronaut Office, EVA Office, Mission Operations Directorate

• Consultation with military, civilian, and commercial experts

• Review of literature and databases

• Analysis of past Mission Control “Simulation” scenarios

• Overall plan reviewed by expert committee chaired by Dr. Lambertson (1998)
DCS Contingency Plan

- DCS Disposition Policy
- Ground Support Infrastructure
  - Primary Hyperbaric Landing Sites
  - Cooperative USAF/NASA Programs
  - Russian EMS Plan
- DCS Flight Rules Development
  - Mission Control DCS Simulation Program
  - Crew Flight Surgeon Training
- Improved On-Orbit DCS Treatment
  - Insuit Treatment
  - BTA Mods
  - Hyperbaric Chamber Technology Dev.
  - Adjunctive Drug Therapy
- EVA Checklist Development
  - Shuttle / EMU
  - ISS / EMU
  - Russian / ORLAN
EVA “CUFF CLASSIFICATION” SYSTEM:

- Simple operational classification of DCS symptoms relevant to EVA crewmember

- Provides clear communication of symptoms and associated operational response.

- Defines actions required to place payload in safe configuration and repress affected crewmember

- Sensible system to encourage symptom reporting
# EVA Cuff Classifications

<table>
<thead>
<tr>
<th>Cuff Class</th>
<th>Symptoms</th>
<th>Response</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Mild pain</strong>, at single or multiple sites and/or single extremity paresthesia. Difficult to distinguish from suit pressure points. <em>Symptoms do not interfere with performance.</em></td>
<td>Report in post EVA PMC. No future EVA impact.</td>
<td>1-8</td>
</tr>
<tr>
<td>2</td>
<td><strong>Moderate cuff 1 symptoms that interfere with performance.</strong></td>
<td>Terminate EVA for both crew members, perform worksite clean-up only, minimize activity of affected crew member. Perform repress.</td>
<td>3,6 9-10</td>
</tr>
</tbody>
</table>

*Set up PMC post repress.*
<table>
<thead>
<tr>
<th>Cuff Class</th>
<th>Symptoms</th>
<th>Response</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Severe cuff 1 symptoms or migratory, trunkal or multiple site paresthesia, unusual headache.</td>
<td>Terminate EVA. Assisted return of affected crew member to airlock, buddy perform worksite safing, then airlock repress. Set up PMC.</td>
<td>12,13</td>
</tr>
<tr>
<td>4</td>
<td>Serious symptoms – Central neurological, cardiopulmonary.</td>
<td>Abort EVA. Crew assisted return to airlock. Repress affected crew member. Buddy perform worksite safing, then airlock depress, repress. Set up PMC.</td>
<td>14-19</td>
</tr>
</tbody>
</table>
RATIONALE:

- Spacesuit itself creates pressure points, joint pains, and local paresthesias
- Majority of pain symptoms (86%) in historic database improved or remained the same with time
- Low risk of mild or moderate symptoms progressing to serious
- Worksite safing important for potential Shuttle de-orbit as well as Station operations
- May require 30-45 min. transit to airlock from worksite location
- With serious symptoms, may need to repress affected crewmember ASAP while solo crewmember completes clean-up tasks
### TREATMENT PHILOSOPHY:

- Oxygen, pressure, and time are definitive measures
  - Fluids and medications are adjunctive
- Provide higher pressures and longer times than proven 2-hr. Ground Level Oxygen (GLO) – treat gas phase, not just symptoms
- Avoid breaking suit integrity for 20-30 min. for installation of Bends Treatment Apparatus (BTA) [increases suit pressure to 8 psig]
- Development of treatment flows, extensions
- Conversion into Malfunction (MAL) Procedures
- Enhanced Medical Checklist
- Aftercare
  - Addresses late and recurrent “hit”
If STS at 10.2 psi
- Stay in Press Mode
- 20 Min in Suit
  \( (10.2 + 4.3 = 14.5 \text{ psi}) \)
  - Yes: Sx Resolved
  - No: Doff Suit
    - Aftercare
      - CMO PE/Neuro Check
      - Hydrate (Isotonic Fluid po, 1 liter/hr)
      - Limit activity
      - PMC
      - RTD 24 Hrs.
      - Medical Check Prior to EVA
        \( (72 \text{ Hr}) \)

If STS at 14.7 psi
- ISS at 14.7 psi
  - Possible Suit LiOH Change out
- Repress STS to 14.7 psi
- Remain in Suit 150 Min.
  \( (14.7 + 4.3 = 19 \text{ psi}) \)
  - Sx Resolved
  - Sx Unresolved, Worse or No Change
    - 20 Min. Extension
    - Sx Unresolved, Worse or No Change
      - 20 Min. Extension
      - Sx Unresolved, Worse or No Change
        - Doff Suit
          - Aftercare
            - Periodic Medical Eval.
            - RTD 24 Hr.
            - Reduced Pressure/EVA
              \( \text{(Case by Case)} \)
              \( (72 \text{ Hr. - 7 Days}) \)
            - Block 1
              - (+) 2 Hr O\(_2\) by Mask

Block 1

If any symptoms remain, Check MCC/PMC
  - Possible Additional O\(_2\), BTA, Orlan Ops.

No Rx Required

Terminates EVA; In Airlock on SCU

Repress

P M C

ISS at 14.7 psi

A

B

Class 1

No Rx Required

Class 2,3

Terminate EVA; In Airlock on SCU

Repress

P M C

If STS at 14.7 psi

Remain in Suit 160 Min.

Doff Suit

PM C

Stay in Press Mode
20 Min in Suit

Sx Resolved

Sx Unresolved, Worse or No Change

Sx Unresolved, Worse or No Change

20 Min. Extension
DCS Neurological exam:

- Simple exam to assess symptoms, and follow over time (in-suit & out-of-suit)
- Can be performed by non-physician Crew Medical Officer (CMO)
- Challenge to perform exam with patient in the suit

<table>
<thead>
<tr>
<th>Facial Nerves</th>
<th>AB</th>
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<tr>
<td>Facial Muscles</td>
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<td>Arm Bending Strength</td>
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<td>Leg Bending Strength</td>
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<td>Coordination Functions</td>
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<td>Finger-to-Finger</td>
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<td>Sensory Function</td>
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</tbody>
</table>
Spaceflight Decompression
Sickness Contingency Plan

Medical Operations
Dr. Joe Dervay
MEDICAL KITS

• IV Fluids
  – Shuttle: 3.1 liters normal saline
  – ISS: 12.1 liters normal saline

• Medication
  – Compiled to cover broad range of potential conditions
    » Includes limited quantities of Dexamethasone and Lidocaine

• ISS Respirator – Autovent 2000 (Allied Health)

• ISS Defibrillator – PD 2000 (Zoll Medical)
FLIGHT RULES:

• Pre-established rules for Flight Control Team to respond in coordinated manner

• Avoid miscommunication across multiple disciplines

• Documents Cuff Classes, deorbit requirements to Primary Hyperbaric Care site (3 CONUS, Hickam, Guam), deorbit within 10 hrs. for unresolved Type II symptoms
TRAINING:

• Astronauts
  – MAL checklists
  – New class on Medical Evaluation of DCS
    » Physiology, symptoms, treatment, neuro exam
    » Video of DCS Neurological exam

• Flight Surgeon/Biomedical Engineer
  – DCS syllabus, console requirements, CME courses

• Mission Control Simulations
DCS EMERGENCY LANDING SITES

• Primary Hyperbaric Care Landing Sites
  – Chamber capabilities, proximity to trauma center, points of contact being coordinated with DDMS medical personnel

• Russian Landing Site Capability and Response
  – Work in progress to further document plan
Medical Operations
Spaceflight Decompression
Sickness Contingency Plan
Dr. Joe Dervay
Medical Operations
Spaceflight Decompression
Sickness Contingency Plan
Dr. Joe Dervay
Medical Operations
Spaceflight Decompression
Sickness Contingency Plan
Dr. Joe Dervay
Upright dual arm and leg cycle exercise (ALE)

Semi-recumbent intermittent light exercise simulating astronaut tasks (ILE)
**RESULTS: 2 HOUR PROTOCOLS**

(not to scale)

- **Phase I**: Rest 10 min
  - Altitude 10 min
  - 9 DCS/47 trials = 19%
  - 4 hr

- **Phase II**: Rest 75% VO$_2$ peak 40 min
  - Light Work
  - 0/45 = 0%
  - EVA

- **Phase III**: Rest
  - Light Work
  - 2/10 = 20%
  - (1 cerebral DCS)
  - Simulation

- **Phase IV**: Rest 95 min Light Work
  - 8/57 = 14%
Medical Operations

Spaceflight Decompression

Sickness Contingency Plan

Dr. Joe Dervay

Mission Support

Extravehicular Activity (EVA) Monitoring
DCS Contingency Plan

EVA Checklist Development
- Shuttle / EMU
- ISS / EMU
- Russian / ORLAN

Improved On-Orbit DCS Treatment
- Insuit Treatment
- BTA Mods
- Hyperbaric Chamber Technology Dev.
- Adjunctive Drug Therapy

DCS Flight Rules Development
- Mission Control DCS Simulation Program
- Crew Flight Surgeon Training

Ground Support Infrastructure
- Primary Hyperbaric Landing Sites
- Cooperative USAF/NASA Programs
- Russian EMS Plan

DCS Disposition Policy
EVA “CUFF CLASSIFICATION” SYSTEM:

- Simple operational classification of DCS symptoms relevant to EVA crewmember
- Provides clear communication of symptoms and associated operational response
- Defines actions required to place payload in safe configuration and repress affected crewmember
- Sensible system to encourage symptom reporting
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- Documents Cuff Classes, deorbit requirements to Primary Hyperbaric Care site (3 CONUS, Hickam, Guam), deorbit within 10 hrs. for unresolved Type II symptoms
20.1 DCS TREATMENT

1. Determine Cuff Class
   - Cuff Class 1
   - Cuff Class 2 or 3
     (Report to MCC)
   - Cuff Class 4
     (Report to MCC)

2. Continue EVA
   - If symptoms resolve upon REPRESSION, go to Cuff Class 2
   - Report to Surgeon next PM

3. Terminate EVA (Cuff Cl. 7)
   - Unaffected crewmember slow safety tether, perform worksite cleanup and/or PLB safety
   - MCC for PLB config
   - Perform INGRESS (Cuff Cl. 4)

   If terminating for Cuff Class 3:
   - FMC on AVG 1
   - COMM Mode - HL (A/R)
   - AUD CTR UHF AVG 2 - T/R
   - AVG 1 - OFF

   (L2)
   - OA/N2 CNTLR VALV SYS 1.2 (two) - OP
   - Perform PRE-REPRESSION (DEPRESS Cur Card)
   - Perform VAPRESS, opmt step 2 (DEPRESS/REPRESSION Cur Card)
   - Perform DCS exam (MED Cl.1)
   - Remain on SCU
   - MCC

   Class MCC require EMU LOCH changeout?

4. Perform LOCH REPLACEMENT
   - (CREWMEMBER IN SUIT) EMU CONT/PLB, omitting steps 3, 17, 18

5. Perform 10.2 PSI MAINTENANCE
   - Leave O2 ACT - PRESS for 20 min

   DCS signs or symptoms resolved?

6. Leave O2 ACT - PRESS for addt 160 min
   - CMO report changes in DCS symptoms per DCS exam criteria to Surgeon as requested

7. For Cuff Class 3, affected crewmember waiting in AL needs to be in contact with Surgeon via MCC due to severity and potential progression of symptoms

8. Cuff Class 4 symptoms may be secondary to Type 2 DCS which is a medical emergency. Unstowing the resuscitator enables IV crew to be prepared to administer CPR, if needed. Because it is critical to repress a Cuff 4 quickly, this may result in a one crewmember repress.
Medical Operations
Spaceflight Decompression
Sickness Contingency Plan
Dr. Joe Dervay
RESULTS: 90 MIN PROTOCOLS

(not to scale)

Altitude (ft)

Time (min) 0 160 200 250 550

V-1

Rest 44 min 2/2: 60% 3 DCS/10 trials = 30% 4 hr EVA

V-2

Rest 34 min 3/2: 60% 0/2 = 0% Simulation
<table>
<thead>
<tr>
<th>Spaceflight Decompression Sickness Contingency Plan</th>
<th>Medical Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dr. Joe Dervay</td>
</tr>
</tbody>
</table>
Dr. Joe Dervay

Medical Operations

Spaceflight Decompression

Sickness Contingency Plan

C/L Depress (30 min) 2:45

POST SLEEP 75 min

2:35

EMU PREBREATHE 4 hours

4:57

EMU Donning 55 min

Ck

POST EVA w/o H2O

13:57

* It is possible to perform METOX Change-Out (manned) to allow for maximum EVA PET capability. Provided that Crew Day Length violations can be approved, we could support a 6:30 EVA PET.

Note: Assume depress pump and EMERG MPEV & AL V/2; 30 min C/L depres without built at 5 psi. With 2 hours of Pre-sleep, STS Crew Day length = 17:17.

EVA DAY SUMMARY

- Post Sleep (1 hour 15 mins total)
  - EVA Prep (1 hour 30 mins)
  - Suit Purge (12 mins)
  - EMU Prep for Donning (30 mins)
- Suit Donning at 10:2 (1 hour)
- Airlock Repress to 14.7
- In-suit Prebreathe (4 hours)
- Crewlock Depress to vacuum (30 mins)
- EVA tasks (6 hours 30 mins)
- Airlock Repress (20 mins)
- Post EVA without EMU H2O Recharge or METOX Regeneration
- Pre Sleep (2 hours)
## CEVIS Exercise Protocol Timeline

### Spaceflight Decompression

#### Sickness Contingency Plan

<table>
<thead>
<tr>
<th>Time</th>
<th>Action Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:15</td>
<td>POST SLEEP 75 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EVA PREP 170 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exercise PB/Prep for Donning - 80 min on mask total</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 min on mask prior to start of 10.2 depress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EV1 ex*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EV2 ex*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Req'd 45 min mask P/B after exer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45 min reqd before below 11.8 psi</td>
<td></td>
</tr>
<tr>
<td>4:05</td>
<td>EMU Donning 55 min</td>
<td></td>
</tr>
<tr>
<td>4:17</td>
<td>Purge</td>
<td></td>
</tr>
<tr>
<td>5:17</td>
<td>EMU Prebreathe (60 min)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C/L Dep (35 min)</td>
<td></td>
</tr>
<tr>
<td>12:22</td>
<td>EVA PET = 6:30</td>
<td></td>
</tr>
<tr>
<td>13:42</td>
<td>Rep</td>
<td>POST EVA w/o H2O</td>
</tr>
</tbody>
</table>

---

### EVA DAY SUMMARY

- **Post Sleep (1 hour 15 mins)**
- **EVA Prep (Total of 2 hours 50 mins)**
  - Mask Prebreathe (1 hour 20 mins)
  - 10 mins exercise for EV1
  - 10 mins exercise for EV2
  - 10.2 psi Airlock Depress (20 mins)
  - Mask Prebreathe Termination
  - Suit Donning at 10.2 (1 hour)
- **Suit Purge (12 mins)**
  - Airlock Repress to 14.7
- **In-suit Prebreathe (60 mins)**
- **Crewlock Depress to vacuum (35 mins)**
- **EVA tasks (6 hours 30 mins)**
- **Airlock Repress (20 mins)**
- **Post EVA without EMU H2O Recharge or METOX Regeneration (1 hour)**
- **Pre Sleep (2 hours)**

---

* EV1 must start exercise within 10 min after PB initiate, EV2 must start exercise within 25 min after PB initiate to maintain 45 minute of mask time after exercise per FR

Note: Assume depress pump and EMERG MPEV & AL VAJ; 40 min C-Lk depress with built in hold at 5psi PET = 25. With 2 hours of Pre-sleep, **STS Crew Day length = 15:42.**
### Shuttle 10.2 PSI Staged Protocol Timeline

#### Spaceflight Decompression

**Sickness Contingency Plan**

**Dr. Joe Dervay**

**A/L Dep (15 min)**

- **Note:** Assume depress with AIRLK DEPRESS vlv; 15 min. With 2 hours of Pre-sleep, **STS Crew Day length = 14:17**.

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 min Mask PB</td>
<td></td>
</tr>
<tr>
<td>*12 HOURS AT 10.2 psi</td>
<td></td>
</tr>
<tr>
<td>POST SLEEP 75 min</td>
<td></td>
</tr>
<tr>
<td>EVA PREP 90 min</td>
<td></td>
</tr>
<tr>
<td>Purge</td>
<td></td>
</tr>
<tr>
<td>EMU PREBREATHE 75 min*</td>
<td></td>
</tr>
<tr>
<td>10.2 Dep</td>
<td></td>
</tr>
<tr>
<td>45 min before 12.5</td>
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</tr>
<tr>
<td>4:23</td>
<td></td>
</tr>
</tbody>
</table>

**EVA PET = 6:30**

**POST EVA w/o H2O**

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rep</td>
<td></td>
</tr>
<tr>
<td>POST EVA w/o H2O</td>
<td></td>
</tr>
</tbody>
</table>

* If the EVA is scheduled within 36 hours of 10.2 Dep, this table may be used to calculate the Final EMU PB time.

** The less time spent at 10.2, the longer the Final EMU Prebreathe time will be; thus, resulting in an overall longer crew day length. See chart.

*** If the EVA is scheduled later than 36 hours from 10.2 Dep, the initial PB may be eliminated and the final in-suit PB is 40 mins.

Note: Assume depress with AIRLK DEPRESS vlv; 15 min. With 2 hours of Pre-sleep, **STS Crew Day length = 14:17**.

#### 1 OR MORE DAYS PRIOR TO EVA DAY
- Mask Prebreathe (1 hour)
- Depress Shuttle Crew Cabin to 10.2 psi (12 hours minimum)

#### EVA DAY SUMMARY
- Post Sleep (1 hour 15 mins total)
- EVA Prep (1 hour 30 mins)
  - EVA Prep for Donning (30 mins)
  - Suit Donning at 10.2 (1 hour)
- Suit Purge (8 mins)

**EVA DAY SUMMARY (continued)**
- In-suit Prebreathe (40 to 75 mins depending on the time at 10.2 psi)
- Crewlock Depress to vacuum (15 mins)
- EVA tasks (6 hours 30 mins)
- Airlock Repress (20 mins)
- Post EVA without EMU H2O Recharge or METOX Regeneration (1 hour)
- Pre Sleep (2 hours)
### Table 1: Prebreathe Protocols—Observed and Estimated Risks

<table>
<thead>
<tr>
<th>Prebreathe Protocol</th>
<th>Observed Risk (total DCS) Ground Trials</th>
<th>Flight Experience</th>
<th>Predicted Risk Accounting for Flight Factors* (microgravity, purge, leak check, depressurization rate, etc.)</th>
<th>Predicted Risk (serious Type II DCS) Accounting for Flight Factors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXERCISE (CEVIS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>45</td>
<td>0 / 34</td>
<td>1.7% (&lt;4.0% @ 95% cl)***</td>
<td>1 / 4972 (1/3447 – 1/8928 ci)</td>
</tr>
<tr>
<td><strong>DCS</strong></td>
<td>0% (&lt;6.5% @ 95% cl)**</td>
<td></td>
<td>1.7% (&lt;4.0% @ 95% cl)***</td>
<td></td>
</tr>
<tr>
<td><strong>Grade IV VGE</strong></td>
<td>6.6% (&lt;16.3% @ 95% cl)</td>
<td></td>
<td>3.8% (&lt;12.4% @ 95% cl)</td>
<td></td>
</tr>
<tr>
<td>4.0 HOUR (In-suit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>28</td>
<td>0 / 4</td>
<td>4.6% (&lt;9.4% @ 95% cl)</td>
<td>1 / 1372 (1/960 – 1/2402 ci)</td>
</tr>
<tr>
<td><strong>DCS</strong></td>
<td>21% (&lt;38.0% @ 95% cl)</td>
<td></td>
<td>4.6% (&lt;9.4% @ 95% cl)</td>
<td></td>
</tr>
<tr>
<td><strong>Grade IV VGE</strong></td>
<td>39% (&lt;56.6% @ 95% cl)</td>
<td></td>
<td>9.9% (&lt;32.2% @ 95% cl)</td>
<td></td>
</tr>
<tr>
<td>CAMPOUT (ISS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>No direct ground tests N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DCS</strong></td>
<td>2.8% (&lt;5.9% @ 95% cl)#</td>
<td></td>
<td>2.8% (&lt;5.9% @ 95% cl)#</td>
<td>1 / 936 (1/656 – 1/1635 ci)#</td>
</tr>
<tr>
<td><strong>Grade IV VGE</strong></td>
<td>5.8% (&lt;19.0% @ 95% cl)#</td>
<td></td>
<td>5.8% (&lt;19.0% @ 95% cl)#</td>
<td></td>
</tr>
<tr>
<td>10.2 PSIA STAGED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>35</td>
<td>0 / 141</td>
<td>3.8% (&lt;7.6% @ 95% cl)</td>
<td>1 / 311 (1/217 – 1/549 ci)</td>
</tr>
<tr>
<td><strong>DCS</strong></td>
<td>23% (&lt;37.5% @ 95% cl)</td>
<td></td>
<td>3.8% (&lt;7.6% @ 95% cl)</td>
<td></td>
</tr>
<tr>
<td><strong>Grade IV VGE</strong></td>
<td>23% (&lt;37.5% @ 95% cl)</td>
<td></td>
<td>8.0% (&lt;26.0% @ 95% cl)</td>
<td></td>
</tr>
</tbody>
</table>

*Includes operational margin, microgravity simulation (non ambulation), accounts for exercise with CEVIS protocol. Published/peer-reviewed models.

**cl is upper 95% binomial confidence limit, based on observation of test result.

***ci is the upper part of the 95% confidence interval, based on a statistical regression.