Leak Detection & Repair for ISS
Status presentation for In Space Inspection Workshop

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Background

- The ISS On-Orbit Leak Detection and Repair Panel was established in 2000 with participation by all of the IPs
  - The Joint Panel has developed a proposed approach for ISS leak detection and repair for atmospheric leaks from the ISS pressurized elements

- The development plan has been documented in
  - Risk 4669 “Pressurized Module Leak Detection and Repair“
  - The development plan includes hardware items to locate and repair atmospheric leaks from the pressurized elements on ISS
  - Risk 4669 includes a mitigation step for each required item
## Mitigation tasks for Risk 4669

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task Description</th>
<th>MO</th>
<th>Hardware status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IVA Leak Repair. Pressure Wall Repair Kit (PWRK).</td>
<td>O B</td>
<td>USOS, RS Cert Completed</td>
</tr>
<tr>
<td>2</td>
<td>IVA Leak Location US ULD and “BAR”.</td>
<td>O B</td>
<td>Completed</td>
</tr>
<tr>
<td>3</td>
<td>Ground testing for US elements.</td>
<td>O B</td>
<td>Completed</td>
</tr>
<tr>
<td>6</td>
<td>EVA Russian &quot;&quot;Pressurizer&quot;&quot; Leak Repair Kit</td>
<td>O B</td>
<td>RS Cert completed</td>
</tr>
<tr>
<td>7</td>
<td>NDE Inspection. COTS Device cert for IVA use.</td>
<td>O B</td>
<td>Pending</td>
</tr>
<tr>
<td>8</td>
<td>Automatic Pressure Wall Leak Location System (APLLS).</td>
<td>O B</td>
<td>Pending</td>
</tr>
<tr>
<td>9</td>
<td>EVA Structural Repair with Bonded Doublers</td>
<td>O B</td>
<td>Pending</td>
</tr>
</tbody>
</table>
Status of mitigation tasks for Risk 4669

- **IVA Leak Repair**
  - The US segment IVA repair kit PWRK is completed
    - Certified for use on the USOS and RS.
    - It is onboard ISS, Crew training is provided

- **IVA leak location**
  - The handheld IVA leak location hardware is completed
    - US developed ULD is certified and is onboard ISS, it is certified for use on USOS and RS
    - Russian developed BAR set is onboard ISS

- **IVA NDE inspection**
  - IVA NDE option. The proposal is to adopt a COTS NDE device for NDE inspection
    - Development testing was conducted to select commercially available NDE equipment
Status of mitigation tasks for Risk 4669 (Cont’d)

Automatic Pressure wall Leak Location System (APLLS)
  - AE sensors hardware to be installed in permanent ISS modules

EVA Leak Repair
  - The Russian “Pressurizer” EVA repair kit is onboard ISS
    - It is certified for use on Russian segment
  - EVA Structural repair with bonded doublers
    - Structural doublers utilizing EVA bonded doublers
    - Planning and CR in work
  - EVA NDE inspection
    - The proposal is to adopt a COTS NDE device for EVA NDE inspection
    - Device selection is pending depending on type of EVA repair that is flown to ISS

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Leak Location and Repair accessibility and damage inspection

- Required hardware for gaining access and inspection of systems
  - Tools for removal and reinstallation of hardware (IVA and EVA)
    - Current tool complement on ISS is capable of performing tasks where the equipment is designed for removal. (USOS MMOD panels, US racks, etc.)
    - Additional tools may be required in areas with non removable hardware, or damaged by MMOD impact
  - Inspection devices
    - HD Cameras, video scopes, sensors (Far field and near field)
    - Robotic inspection devices (Imagery, backscatter x-ray, IR)
      - Future development