



"LAZEEZ" Cold Flow 1

Cold Flow Test Operations Procedures

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Cold Flow Test Operations Procedures

Contents

This document contains the following procedures:

- The *Pressurant Regulation Test* procedure comprises steps for determining the proper setting of the flow control valves.
- The *Fuel Flow Test* procedure comprises steps for conducting a flow test of the fuel components of the liquid engine.
- The *Oxidizer Flow Test* procedure comprises steps for conducting a flow test of the oxidizer components of the liquid engine.
- The *Cold Flow Test* procedure comprises steps for conducting a cold flow test of the liquid engine, code name LAZEEZ, using manual actuation of valves.

Personnel Required

The test operations team consists of nine personnel:

- 1 ☐ The **Operations Director [OPS]** directs operations procedures and communicates with the other test personnel.
- 2 ☐ The **Primary Fill Operator [PRIMARY]** is the main system operator. **PRIMARY** operates all manual valves.
- 3 ☐ The **Secondary Fill Operator [SECONDARY]** is the backup for **PRIMARY**, and communicates with OPS. If **PRIMARY** becomes incapacitated, **SECONDARY** is responsible for removing them from danger.
- 4 ☐ The **DAQ Technician [DAQ]** monitors and operates the test data acquisition system.
- 5 ☐ The **Control System Operator [CONTROL]** operates the test control system, including actuation of the injector valve.
- 6 ☐ **Perimeter Guard 1 [P1]**, **Perimeter Guard 2 [P2]**, and **Perimeter Guard 3 [P3]** ensure that no unauthorized personnel enter the testing area during test operations.

Background Information

All personnel should familiarize themselves with the following information prior to test start:

- All valves have two names: an alphanumeric code used in the plumbing master system, and a descriptive name used in control system code and documentation. For this test, the correspondence is as follows:
 - **BA-1** is the **Supply Valve**
 - **BA-2** is the **Supply Vent Valve**
 - **BA-3** is the **Fuel Pressurant Valve**
 - **BA-4** is the **Pressurant Vent Valve**
 - **BA-5** is the **Oxidizer Pressurant Valve**
 - **BA-6** is the **Oxidizer Vent Valve**
 - **IJ-1** is the **Injector Valve**
 - **SC** denotes a supply cylinder
 - **R** denotes a flow control valve

Sign-Off

To be completed by all test personnel after reading and familiarization with procedures

- | | | | |
|---|---|-------|-------|
| 1 | <input type="checkbox"/> Operations Director [OPS] | _____ | _____ |
| 2 | <input type="checkbox"/> Primary Fill Operator [PRIMARY] | _____ | _____ |
| 3 | <input type="checkbox"/> Secondary Fill Operator [SECONDARY] | _____ | _____ |
| 4 | <input type="checkbox"/> DAQ Technician [DAQ] | _____ | _____ |
| 5 | <input type="checkbox"/> Perimeter Guard 1 [P1] | _____ | _____ |
| 6 | <input type="checkbox"/> Perimeter Guard 2 [P2] | _____ | _____ |
| 7 | <input type="checkbox"/> Perimeter Guard 3 [P3] | _____ | _____ |
| 8 | <input type="checkbox"/> Control System Operator [CONTROL] | _____ | _____ |

Prior to Start

- 1 ☐ Ensure that the following procedures are complete:
- 2 ☐ Oxidizer Tank Assembly procedure
- 3 ☐ Plumbing Setup procedure
- 4 ☐ Oxidizer Tank Stand Setup procedure
- 5 ☐ Test Stand Setup procedure
- 6 ☐ Data Acquisition Setup procedure
- 7 ☐ RLCS Setup Procedure
- 8 ☐ Ensure that all technicians as defined above are available and have completed the sign-off.
- 9 ☐ Ensure that all spectators and test personnel are wearing safety glasses.
- 10 ☐ Ensure that **PRIMARY** and **SECONDARY** are wearing face shields and have no exposed skin.
- 11 ☐ Ensure that **PRIMARY** is wearing thermal gloves.
- 12 ☐ Ensure that the fuel tank **TK-2** has been filled with water.

Pressurant Regulation Test Procedure

- 1 ☐ **OPS**: Wrote down starting pressure: _____
- 2 ☐ **PRIMARY**: Confirm that the following valves are initially closed:
 - 3 ☐ BA-1
 - 4 ☐ BA-2
 - 5 ☐ BA-6
 - 6 ☐ BA-5
 - 7 ☐ BA-3
 - 8 ☐ BA-4
 - 9 ☐ IJ-1
- 10 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 11 ☐ **DAQ**: Confirm that all load cells are reading the determined zero point.
- 12 ☐ **PAUSE POINT**
- 13 ☐ **P1, P2, and P3**: Close the perimeter and do not allow any further personnel to enter the testing area.
- 14 ☐ **SECONDARY**: Confirm that no personnel are present in the testing area other than **PRIMARY** and **SECONDARY**.
- 15 ☐ **PRIMARY**: Connect SC-2 using the quick connect fitting.
- 16 ☐ **PRIMARY**: Connect SC-3 using the quick connect fitting.
- 17 ☐ **PRIMARY**: Connect SC-4 using the quick connect fitting.
- 18 ☐ **PRIMARY**: Slowly open SC-2 through $\frac{3}{4}$ of a turn.
- 19 ☐ If leaks are observed:
 - 20 ☐ **PRIMARY**: Close Sc-2.
 - 21 ☐ **PRIMARY**: Slowly open BA-4.
 - 22 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 23 ☐ **PRIMARY**: Slowly open SC-3 through $\frac{3}{4}$ of a turn.
- 24 ☐ If leaks are observed:
 - 25 ☐ **PRIMARY**: Close Sc-3.
 - 26 ☐ **PRIMARY**: Close SC-2.
 - 27 ☐ **PRIMARY**: Slowly open BA-4.
 - 28 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 29 ☐ **PRIMARY**: Slowly open SC-4 through $\frac{3}{4}$ of a turn.
- 30 ☐ If leaks are observed:
 - 31 ☐ **PRIMARY**: Close Sc-4.
 - 32 ☐ **PRIMARY**: Close SC-3.
 - 33 ☐ **PRIMARY**: Close SC-2.
 - 34 ☐ **PRIMARY**: Slowly open BA-4.
 - 35 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.

- 36 ☐ **PRIMARY**: Communicate the pressure reading of PI-2.
- 37 ☐ **DAQ**: Communicate the pressure reading of PT-4.
- 38 ☐ **OPS**: Confirm that the pressure readings agree.
- 39 ☐ If the readings do not agree:
 - 40 ☐ **PRIMARY**: Close Sc-2.
 - 41 ☐ **PRIMARY**: Close SC-3.
 - 42 ☐ **PRIMARY**: Close SC-4.
 - 43 ☐ **PRIMARY**: Slowly open BA-4.
 - 44 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 45 ☐ **PRIMARY**: Ensure that R-1 is at the minimum pressure by rotating the valve in the counter-clockwise direction.
- 46 ☐ **PRIMARY**: Open BA-5.
- 47 ☐ **DAQ**: Continuously communicate pressure readings from PT-3.
- 48 ☐ **PRIMARY**: Slowly turn R-1 clockwise to increase the pressure. Stop when PI-2 reads _____ psi.
- 49 ☐ **PRIMARY**: Mark the location of the knob relative to the body and communicate the number of full rotations.
- 50 ☐ **OPS**: Record the number of full rotations:_____
- 51 ☐ **PRIMARY**: Close Sc-2.
- 52 ☐ **PRIMARY**: Close SC-3.
- 53 ☐ **PRIMARY**: Close SC-4.
- 54 ☐ **PRIMARY**: Slowly open BA-4.
- 55 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 56 ☐ **PRIMARY**: Disconnect SC-2 using the quick connect fitting.
- 57 ☐ **PRIMARY**: Disconnect SC-3 using the quick connect fitting.
- 58 ☐ **PRIMARY**: Disconnect SC-4 using the quick connect fitting.
- 59 ☐ **P1, P2, and P3**: Open the perimeter.
- 60 ☐ **OPS**: Proceed with tear-down and disassembly.

Fuel Flow Test Procedure

- 1 ☐ **PRIMARY**: Confirm that the following valves are initially closed:
- 2 ☐ BA-1
- 3 ☐ BA-2
- 4 ☐ BA-6
- 5 ☐ BA-5
- 6 ☐ BA-3
- 7 ☐ BA-4
- 8 ☐ IJ-1
- 9 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 10 ☐ **DAQ**: Confirm that all load cells are reading the determined zero point.
- 11 ☐ **PAUSE POINT**
- 12 ☐ **P1, P2, and P3**: Close the perimeter and do not allow any further personnel to enter the testing area.
- 13 ☐ **SECONDARY**: Confirm that no personnel are present in the testing area other than **PRIMARY** and **SECONDARY**.
- 14 ☐ **PRIMARY**: Connect SC-2 using the quick connect fitting.
- 15 ☐ **PRIMARY**: Connect SC-3 using the quick connect fitting.
- 16 ☐ **PRIMARY**: Connect SC-4 using the quick connect fitting.
- 17 ☐ **PRIMARY**: Slowly open SC-2 through $\frac{3}{4}$ of a turn.
- 18 ☐ If leaks are observed:
- 19 ☐ **PRIMARY**: Close Sc-2.
- 20 ☐ **PRIMARY**: Slowly open BA-4.
- 21 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 22 ☐ **PRIMARY**: Slowly open SC-3 through $\frac{3}{4}$ of a turn.
- 23 ☐ If leaks are observed:
- 24 ☐ **PRIMARY**: Close Sc-3.
- 25 ☐ **PRIMARY**: Close SC-2.
- 26 ☐ **PRIMARY**: Slowly open BA-4.
- 27 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 28 ☐ **PRIMARY**: Slowly open SC-4 through $\frac{3}{4}$ of a turn.
- 29 ☐ If leaks are observed:
- 30 ☐ **PRIMARY**: Close Sc-4.
- 31 ☐ **PRIMARY**: Close SC-3.
- 32 ☐ **PRIMARY**: Close SC-2.
- 33 ☐ **PRIMARY**: Slowly open BA-4.
- 34 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 35 ☐ **PRIMARY**: Communicate the pressure reading of PI-2.

- 36 ☐ **DAQ**: Communicate the pressure reading of PT-4.
- 37 ☐ **OPS**: Confirm that the pressure readings agree.
- 38 ☐ If the readings do not agree:
 - 39 ☐ **PRIMARY**: Close SC-2.
 - 40 ☐ **PRIMARY**: Close SC-3.
 - 41 ☐ **PRIMARY**: Close SC-4.
 - 42 ☐ **PRIMARY**: Slowly open BA-4.
 - 43 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 44 ☐ **PRIMARY**: Open BA-3.
- 45 ☐ **DAQ**: Confirm that PT-3 is reading _____ psi.
- 46 ☐ **PRIMARY** and **SECONDARY**: Retreat to mission control.
- 47 ☐ **CONTROL**: Conduct the fuel flow test by opening the injector valve.
- 48 ☐ **OPS**: Proceed when the graph steadies.
- 49 ☐ **CONTROL**: Close the injector valve.
- 50 ☐ **OPS**: Confirm mass of tank. If less than half of full value:
 - 51 ☐ **PRIMARY**: Close SC-4.
 - 52 ☐ **PRIMARY**: Close SC-3.
 - 53 ☐ **PRIMARY**: Close SC-2.
 - 54 ☐ **PRIMARY**: Slowly open BA-4.
 - 55 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
 - 56 ☐ **OPS**: Restart the procedure.
- 57 ☐ If over half:
 - 58 ☐ **PRIMARY** and **SECONDARY**: Approach the plumbing.
 - 59 ☐ **PRIMARY**: Slowly turn R-1 clockwise to increase the pressure. Stop when PI-2 reads _____ psi higher.
- 60 ☐ **DAQ**: Communicate the pressure reading of PT-3.
- 61 ☐ **OPS**: Confirm the pressure readings are in agreement.
- 62 ☐ **OPS**: Return to line 46.
- 63 ☐ **PRIMARY**: Close SC-4.
- 64 ☐ **PRIMARY**: Close SC-3.
- 65 ☐ **PRIMARY**: Close SC-2.
- 66 ☐ **PRIMARY**: Slowly open BA-4.
- 67 ☐ **PRIMARY**: Disconnect SC-4.
- 68 ☐ **PRIMARY**: Disconnect SC-3.
- 69 ☐ **PRIMARY**: Disconnect SC-2.
- 70 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 71 ☐ **P1**, **P2**, and **P3**: Open the perimeter.
- 72 ☐ **OPS**: Proceed to the oxidizer flow test.

Oxidizer Flow Test Procedure

- 1 ☐ **PRIMARY**: Confirm that the following valves are initially closed:
- 2 ☐ BA-1
- 3 ☐ BA-2
- 4 ☐ BA-6
- 5 ☐ BA-5
- 6 ☐ BA-3
- 7 ☐ BA-4
- 8 ☐ IJ-1
- 9 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 10 ☐ **DAQ**: Confirm that all load cells are reading the determined zero point.
- 11 ☐ **PAUSE POINT**
- 12 ☐ **P1, P2, and P3**: Close the perimeter and do not allow any further personnel to enter the testing area.
- 13 ☐ **SECONDARY**: Confirm that no personnel are present in the testing area other than **PRIMARY** and **SECONDARY**.
- 14 ☐ **PRIMARY**: Connect SC-1 using the quick connect fitting.
- 15 ☐ **PRIMARY**: Connect SC-2 using the quick connect fitting.
- 16 ☐ **PRIMARY**: Connect SC-3 using the quick connect fitting.
- 17 ☐ **PRIMARY**: Connect SC-4 using the quick connect fitting.
- 18 ☐ **PRIMARY**: Slowly open SC-1 through $\frac{3}{4}$ of a turn.
- 19 ☐ If leaks are observed:
 - 20 ☐ **PRIMARY**: Close SC-1.
 - 21 ☐ **PRIMARY**: Open BA-2.
 - 22 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 23 ☐ **PRIMARY**: Communicate the pressure reading of PI-1.
- 24 ☐ **DAQ**: Communicate the pressure reading of PT-1.
- 25 ☐ **OPS**: Confirm that the pressure readings agree.
- 26 ☐ If the readings do not agree:
 - 27 ☐ **PRIMARY**: Close SC-1.
 - 28 ☐ **PRIMARY**: Open BA-2.
 - 29 ☐ **OPS**: Abort test procedures and revisit the test setup.
- 30 ☐ **PRIMARY**: Slowly open SC-2 through $\frac{3}{4}$ of a turn.
- 31 ☐ If leaks are observed:
 - 32 ☐ **PRIMARY**: Close SC-2.
 - 33 ☐ **PRIMARY**: Slowly open BA-4.
 - 34 ☐ **PRIMARY**: Close SC-1.

- 35 ☐ **PRIMARY**: Open BA-2.
- 36 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 37 ☐ **PRIMARY**: Slowly open SC-3 through $\frac{3}{4}$ of a turn.
- 38 ☐ If leaks are observed:
- 39 ☐ **PRIMARY**: Close SC-3.
- 40 ☐ **PRIMARY**: Close SC-2.
- 41 ☐ **PRIMARY**: Slowly open BA-4.
- 42 ☐ **PRIMARY**: Close SC-1.
- 43 ☐ **PRIMARY**: Open BA-2.
- 44 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 45 ☐ **PRIMARY**: Slowly open SC-4 through $\frac{3}{4}$ of a turn.
- 46 ☐ If leaks are observed:
- 47 ☐ **PRIMARY**: Close SC-4.
- 48 ☐ **PRIMARY**: Close SC-3.
- 49 ☐ **PRIMARY**: Close SC-2.
- 50 ☐ **PRIMARY**: Slowly open BA-4.
- 51 ☐ **PRIMARY**: Close SC-1.
- 52 ☐ **PRIMARY**: Open BA-2.
- 53 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 54 ☐ **PRIMARY**: Communicate the pressure reading of PI-2.
- 55 ☐ **DAQ**: Communicate the pressure reading of PT-4.
- 56 ☐ **OPS**: Confirm that the pressure readings agree.
- 57 ☐ If the readings do not agree:
- 58 ☐ **PRIMARY**: Close SC-1.
- 59 ☐ **PRIMARY**: Open BA-2.
- 60 ☐ **PRIMARY**: Close SC-2.
- 61 ☐ **PRIMARY**: Close SC-3.
- 62 ☐ **PRIMARY**: Close SC-4.
- 63 ☐ **PRIMARY**: Slowly open BA-4.
- 64 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 65 ☐ **PRIMARY**: Open BA-6.
- 66 ☐ **DAQ**: Communicate the tank mass.
- 67 ☐ **OPS**: Record the tank mass + 10 kg: _____
- 68 ☐ **PRIMARY**: Open BA-1 by 10 degrees.
- 69 ☐ **DAQ**: Communicate when the desired mass is reached.
- 70 ☐ **PRIMARY**: Close BA-1.
- 71 ☐ If the desired tank mass is surpassed:

- 72 ☐ **DAQ**: Continuously communicate tank mass readings.
- 73 ☐ **OPS**: Continue when the desired tank mass is reached.
- 74 ☐ **PRIMARY**: Close BA-6. If leaks are observed:
- 75 ☐ **PRIMARY**: Close SC-1.
- 76 ☐ **PRIMARY**: Open BA-2.
- 77 ☐ **PRIMARY**: Close SC-2.
- 78 ☐ **PRIMARY**: Close SC-3.
- 79 ☐ **PRIMARY**: Close SC-4.
- 80 ☐ **PRIMARY**: Slowly open BA-4.
- 81 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 82 ☐ **PRIMARY**: Open BA-5.
- 83 ☐ **DAQ**: Confirm that PT-2 is reading _____ psi.
- 84 ☐ **PRIMARY** and **SECONDARY**: Retreat to mission control.
- 85 ☐ **CONTROL**: Conduct the cold flow test by opening the injector valve.
- 86 ☐ **OPS**: Confirm mass of tank. If less than half of full value:
- 87 ☐ **PRIMARY**: Close SC-4.
- 88 ☐ **PRIMARY**: Close SC-3.
- 89 ☐ **PRIMARY**: Close SC-2.
- 90 ☐ **PRIMARY**: Slowly open BA-6.
- 91 ☐ **PRIMARY**: Slowly open BA-1 by 10 degrees.
- 92 ☐ **DAQ**: Communicate when the desired mass is reached.
- 93 ☐ **PRIMARY**: Close BA-1.
- 94 ☐ **PRIMARY**: Close BA-6.
- 95 ☐ **PRIMARY**: Open BA-5.
- 96 ☐ **PRIMARY**: Slowly turn R-1 clockwise to increase the pressure. Stop when PI-2 reads _____ psi
higher.
- 97 ☐ **DAQ**: Communicate the pressure reading of PT-3.
- 98 ☐ **OPS**: Confirm the pressure readings are in agreement.
- 99 ☐ **OPS**: Return to line 46.
- 100 ☐ If over half:
- 101 ☐ **PRIMARY** and **SECONDARY**: Approach the plumbing.
- 102 ☐ **PRIMARY**: Open BA-5.
- 103 ☐ **PRIMARY**: Slowly turn R-1 clockwise to increase the pressure. Stop when PI-2 reads _____ psi
higher.
- 104 ☐ **DAQ**: Communicate the pressure reading of PT-3.
- 105 ☐ **OPS**: Confirm the pressure readings are in agreement.
- 106 ☐ **OPS**: Return to line 46.
- 107 ☐ **PRIMARY**: Close SC-4.
- 108 ☐ **PRIMARY**: Close SC-3.

- 109 ☐ **PRIMARY**: Close SC-2.
- 110 ☐ **PRIMARY**: Close SC-1.
- 111 ☐ **PRIMARY**: Open BA-2.
- 112 ☐ **PRIMARY**: Open BA-1.
- 113 ☐ **PRIMARY**: Open BA-6.
- 114 ☐ **PRIMARY**: Slowly open BA-4.
- 115 ☐ **PRIMARY**: Disconnect SC-4.
- 116 ☐ **PRIMARY**: Disconnect SC-3.
- 117 ☐ **PRIMARY**: Disconnect SC-2.
- 118 ☐ **PRIMARY**: Disconnect SC-1.
- 119 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 120 ☐ **P1**, **P2**, and **P3**: Open the perimeter.
- 121 ☐ **OPS**: Proceed with tear-down and disassembly.

Cold Flow Test Procedure

- 1 ☐ **PRIMARY**: Confirm that the following valves are initially closed:
- 2 ☐ BA-1
- 3 ☐ BA-2
- 4 ☐ BA-6
- 5 ☐ BA-5
- 6 ☐ BA-3
- 7 ☐ BA-4
- 8 ☐ IJ-1
- 9 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 10 ☐ **DAQ**: Confirm that all load cells are reading the determined zero point.
- 11 ☐ **PAUSE POINT**
- 12 ☐ **P1, P2, and P3**: Close the perimeter and do not allow any further personnel to enter the testing area.
- 13 ☐ **SECONDARY**: Confirm that no personnel are present in the testing area other than **PRIMARY** and **SECONDARY**.
- 14 ☐ **PRIMARY**: Connect SC-1 using the quick connect fitting.
- 15 ☐ **PRIMARY**: Connect SC-2 using the quick connect fitting.
- 16 ☐ **PRIMARY**: Connect SC-3 using the quick connect fitting.
- 17 ☐ **PRIMARY**: Connect SC-4 using the quick connect fitting.
- 18 ☐ **PRIMARY**: Slowly open SC-1 through $\frac{3}{4}$ of a turn.
- 19 ☐ If leaks are observed:
 - 20 ☐ **PRIMARY**: Close SC-1.
 - 21 ☐ **PRIMARY**: Open BA-2.
 - 22 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 23 ☐ **PRIMARY**: Communicate the pressure reading of PI-1.
- 24 ☐ **DAQ**: Communicate the pressure reading of PT-1.
- 25 ☐ **OPS**: Confirm that the pressure readings agree.
- 26 ☐ If the readings do not agree:
 - 27 ☐ **PRIMARY**: Close SC-1.
 - 28 ☐ **PRIMARY**: Open BA-2.
 - 29 ☐ **OPS**: Abort test procedures and revisit the test setup.
- 30 ☐ **PRIMARY**: Slowly open SC-2 through $\frac{3}{4}$ of a turn.
- 31 ☐ If leaks are observed:
 - 32 ☐ **PRIMARY**: Close SC-2.
 - 33 ☐ **PRIMARY**: Slowly open BA-4.
 - 34 ☐ **PRIMARY**: Close SC-1.

- 35 ☐ **PRIMARY**: Open BA-2.
- 36 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 37 ☐ **PRIMARY**: Slowly open SC-3 through $\frac{3}{4}$ of a turn.
- 38 ☐ If leaks are observed:
- 39 ☐ **PRIMARY**: Close Sc-3.
- 40 ☐ **PRIMARY**: Close SC-2.
- 41 ☐ **PRIMARY**: Slowly open BA-4.
- 42 ☐ **PRIMARY**: Close SC-1.
- 43 ☐ **PRIMARY**: Open BA-2.
- 44 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 45 ☐ **PRIMARY**: Slowly open SC-4 through $\frac{3}{4}$ of a turn.
- 46 ☐ If leaks are observed:
- 47 ☐ **PRIMARY**: Close Sc-4.
- 48 ☐ **PRIMARY**: Close SC-3.
- 49 ☐ **PRIMARY**: Close SC-2.
- 50 ☐ **PRIMARY**: Slowly open BA-4.
- 51 ☐ **PRIMARY**: Close SC-1.
- 52 ☐ **PRIMARY**: Open BA-2.
- 53 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 54 ☐ **PRIMARY**: Communicate the pressure reading of PI-2.
- 55 ☐ **DAQ**: Communicate the pressure reading of PT-4.
- 56 ☐ **OPS**: Confirm that the pressure readings agree.
- 57 ☐ If the readings do not agree:
- 58 ☐ **PRIMARY**: Close SC-1.
- 59 ☐ **PRIMARY**: Open BA-2.
- 60 ☐ **PRIMARY**: Close Sc-2.
- 61 ☐ **PRIMARY**: Close SC-3.
- 62 ☐ **PRIMARY**: Close SC-4.
- 63 ☐ **PRIMARY**: Slowly open BA-4.
- 64 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 65 ☐ **PRIMARY**: Open BA-6.
- 66 ☐ **DAQ**: Communicate the tank mass.
- 67 ☐ **OPS**: Record the tank mass + 10 kg: _____
- 68 ☐ **PRIMARY**: Open BA-1 by 10 degrees.
- 69 ☐ **DAQ**: Communicate when the desired mass is reached.
- 70 ☐ **PRIMARY**: Close BA-1.
- 71 ☐ If the desired tank mass is surpassed:

- 72 ☐ **DAQ**: Continuously communicate tank mass readings.
- 73 ☐ **OPS**: Continue when the desired tank mass is reached.
- 74 ☐ **PRIMARY**: Close BA-6. If leaks are observed:
 - 75 ☐ **PRIMARY**: Close SC-1.
 - 76 ☐ **PRIMARY**: Open BA-2.
 - 77 ☐ **PRIMARY**: Close SC-2.
 - 78 ☐ **PRIMARY**: Close SC-3.
 - 79 ☐ **PRIMARY**: Close SC-4.
 - 80 ☐ **PRIMARY**: Slowly open BA-4.
 - 81 ☐ **OPS**: Abort test procedures and revisit the plumbing setup.
- 82 ☐ **PRIMARY**: Open BA-5.
- 83 ☐ **PRIMARY**: Open BA-3.
- 84 ☐ **DAQ**: Confirm that PT-2 is reading _____ psi.
- 85 ☐ **DAQ**: Confirm that PT-3 is reading _____ psi.
- 86 ☐ **PRIMARY** and **SECONDARY**: Retreat to mission control.
- 87 ☐ **CONTROL**: Conduct the cold flow test by opening the injector valve.
- 88 ☐ All observe the plume.
- 89 ☐ **PRIMARY**: Close SC-4.
- 90 ☐ **PRIMARY**: Close SC-3.
- 91 ☐ **PRIMARY**: Close SC-2.
- 92 ☐ **PRIMARY**: Close SC-1.
- 93 ☐ **PRIMARY**: Open BA-2.
- 94 ☐ **PRIMARY**: Open BA-1.
- 95 ☐ **PRIMARY**: Open BA-6.
- 96 ☐ **PRIMARY**: Slowly open BA-4.
- 97 ☐ **PRIMARY**: Disconnect SC-4.
- 98 ☐ **PRIMARY**: Disconnect SC-3.
- 99 ☐ **PRIMARY**: Disconnect SC-2.
- 100 ☐ **PRIMARY**: Disconnect SC-1.
- 101 ☐ **DAQ**: Confirm that all pressure transducers are reading atmospheric pressure.
- 102 ☐ **P1**, **P2**, and **P3**: Open the perimeter.
- 103 ☐ **OPS**: Proceed with tear-down and disassembly.