

CONFIGURATION DIFFERENCES

I. Apollo 14 vs. Apollo 15

A. Summary

The most extensive change from the Apollo 14 PLSS was the configuration update from the -6 to the -7. The basic difference was the increase in expendables in order to support three 7 hour EVAs versus two 5 hour EVAs with the -6 type PLSS. The expendable comparison of the -6 and -7 PLSS is listed below:

| | <u>-6 PLSS</u> | <u>-7 PLSS</u> |
|-----------|--|--|
| Feedwater | 8.5 pounds | 12.0 pounds |
| Oxygen | EVA I 1020 psia (1.25 pounds) EVA II 980 psia (1.21 pounds) | EVA I 1440 psia (1.77 pounds) EVA II 1420 psia (1.75 pounds) & III |
| Battery | 17.4 amp-hours | 25.4 amp-hours |
| LiOH | 3.00 pounds | 3.12 pounds |

B. Specific Changes

1. Auxiliary Feedwater Reservoir

This is an additional tank, containing 3.5 pounds of water, added to the right side (as worn) of the PLSS. It has its own shutoff valve (located outboard of the three other PLSS manual controls) which is in series with the primary tank. The primary tank valve must be open in order to obtain water from the auxiliary tank. It also has its own venting connector located above the oxygen recharge connector on the right side of the PLSS.

2. Battery and Battery Locking Mechanism

The battery capacity increased from 17.4 amp-hours on the -6 PLSS to 25.4 amp-hours on the -7 PLSS. Weight of the battery has increased from 5.5 pounds to 10.5 pounds.

The battery locking mechanism was completely redesigned when the battery was enlarged.

3. Oxygen Supply

The PLSS oxygen bottle capacity was increased from 1100 psia to 1500 psia. The operating pressure and flow limiting orifice of the regulator were changed to accommodate the higher pressure.

4. LiOH Cartridge

The only change to the LiOH Cartridge was the addition of .12 pounds LiOH to the existing cartridge.

5. Hoses - Lengths and Routing

Hose lengths and routing were changed to interface with the A7LB suit. The PLSS oxygen inlet hose (suit outlet) is now routed so that it comes out of the PLSS on the right side in order to connect to one of the suit red connectors. The lengths of the hoses changed as follows:

| | |
|---------------------------------|------------------------------|
| Oxygen Inlet (suit outlet) Hose | 18.4 inches longer in the -7 |
| Oxygen Outlet (suit inlet) Hose | 1 inch longer in the -7 |
| Water Hose | 7 inches shorter in the -7 |

6. Thermal Insulation

The thermal cover was redesigned extensively on the right side in order to accommodate the auxiliary feedwater reservoir. In the area of the auxiliary shutoff valve, the thermal cover is laced to the hardcover to prevent snagging during egress and ingress.

An umbilical connection sequence decal is located on the gas separator access flap of the thermal cover. A change which evolved from thermovacuum qualification test results was the addition of thermal "booties" on the PLSS O₂ Inlet and Outlet connectors. The change was made in order to prevent moisture from condensing on the inside of the gas connectors. Without the thermal covers, moisture could accumulate in the ventilation loop and cause Fan performance to degrade.

7. PLSS Straps

The PLSS straps have remained essentially the same with the exception of the upper PGA attachment hooks, which are located on one inch standoffs. This change was made in order to allow the crewman to see the RCU panel more easily.

8. Water Diverter Valve Change

The water diverter valve has been modified internally in order to give less flow in the Minimum and Intermediate positions than was the case in the -6 configuration. This change was made when it was thought that a crewman would become too cold while riding on the LRV. The Maximum flow position is unchanged from the -6 configuration.

The diverter valve controls cooling by regulating the amount of water which is directed to the sublimator for cooling and the amount of water which bypasses the sublimator and remains

8. Water Diverter Valve Change (continued)

circulating in the Liquid Transport Loop (LCG) uncooled. A good measure of cooling in each diverter valve position therefore, is a comparison of the amount of transport loop water which goes through sublimator in each position. This comparison for the -6 and -7 PLSS configurations is given below:

| | MIN | INT | MAX |
|---------|-------------------|-------------------|-----------------|
| -6 PLSS | 3.5% (.14 lb/min) | 12.5% (.5 lb/min) | 100% (4 lb/min) |
| -7 PLSS | 1.6% (.06 lb/min) | 8.3% (.33 lb/min) | 100% (4 lb/min) |

An interesting phenomenon with the new diverter valve is the ability to obtain more cooling when the valve is set in certain locations between Minimum and Intermediate than when the valve is set to full Intermediate. The flow through the -7 Intermediate port is less than the combined flows of Minimum and Intermediate when both ports overlap the sublimator tube. In the -6 PLSS, the Intermediate position port was larger than the combined overlap of the Minimum and Intermediate ports. The condition can be more easily seen on the attached sketches comparing the diverter valves. Reference pages 20 - 22.

9. Recharge Procedure Changes

Due to the greater quantities of O_2 and water in the -7 PLSS, the recharge procedures were modified to accommodate the changes.

The initial PLSS oxygen recharge time was increased from 2 minutes to 4 minutes. The 10 minute top off remained unchanged.

The initial PLSS H_2O fill time was increased from 3 minutes to 5 minutes. Steps were also added to reflect the charging of the auxiliary feedwater tank. Also for the Apollo 15 mission the feedwater tanks were flown empty and had to be charged by the crew prior to EVA I.

10. Alignment Marks on PLSS H_2O Connector

Alignment marks have been added to the PLSS Multiple Water Connector in order to aid in connecting to the PGA and/or BSLSS.

11. RCU Dust Covers

Lexan panels have been bonded over the O₂ Quantity Indicator and Warning Flag windows on the RCU. The panels were added in order to prevent lunar dust from building up in the windows.

12. RCU Lower Hook Change

The lower PGA attachment hook on the RCU was redesigned in order to prevent the RCU from becoming disengaged from the suit "D" ring. The basic difference in the new hook is that it is inverted and the spring has been removed. Both the upper and lower attachment hooks need to be mated to the suit at the same time.

13. OPS Mods for CMP EVA

Attachment rings have been added to the OPS in order that it may be worn during CMP EVA in the "helmet mount" mode. OPS straps and a PGA Adapter Bracket (to hold the OPS on the CMP) were also added and are stowed in the Command Module.

14. OPS Actuator Cable Increase in Length

The OPS actuator cable has been increased in length by 3 inches in order to eliminate tension on it when connected to the RCU.

15. Weight Change

The -7 PLSS, RCU, and OPS weigh 133 pounds. This is 14 pounds heavier than the -6 configuration.