International Space Station (ISS) Advanced Recycle Filter Tank Assembly (ARFTA)

• Introduction/Summary

The International Space Station (ISS) Recycle Filter Tank Assembly (RFTA) provides the following three primary functions for the Urine Processor Assembly (UPA): volume for concentrating/filtering pretreated urine, filtration of product distillate, and filtration of the Pressure Control and Pump Assembly (PCPA) effluent. The RFTAs, under nominal operations, are to be replaced every 30 days. This poses a significant logistical resupply problem, as well as cost in upmass and new tanks purchase. In addition, it requires significant amount of crew time. To address and resolve these challenges, NASA required Boeing to develop a design which eliminated the logistics and upmass issues and minimize recurring costs. Boeing developed the Advanced Recycle Filter Tank Assembly (ARFTA) that allowed the tanks to be emptied on-orbit into disposable tanks that eliminated the need for bringing the fully loaded tanks to earth for refurbishment and relaunch, thereby eliminating several hundred pounds of upmass and its associated costs. The ARFTA will replace the RFTA by providing the same functionality, but with reduced resupply requirements.

The Advanced Recycle Filter Tank Assembly (ARFTA) is an essential component of the International Space Station (ISS) Water Recovery System (WRS). It incorporates an innovative new, reusable tank design that allows for a crew of 6 to reside on the International Space Station (ISS) while eliminating the need to transport and return storage tanks for on-ground refurbishment. This return of ISS hardware is no longer an option with the retirement of the Space Shuttle fleet.

The ARFTA project was managed from Boeing-Houston. This site provided the project management and technical oversight, developed, baselined and monitored the budget and schedule. All technical requirements, design, testing and delivery to NASA was performed at Boeing-Huntsville, AL, at Marshall Space Flight Center (MSFC). Additional support was provided by Boeing at Kennedy Space Center (KSC) and Huntington Beach, CA. The ARFTA bellows tank supplier, Flexial Corporation is located in Cookeville, TN. The water filter cartridge supplier, Norman Filters, is located in Chicago, IL.

The ARFTA project produced ISS hardware considered critical by NASA, which challenged Boeing to expedite the delivery to a very tight schedule to allow flight on the final Shuttle flight, ULF7. Although there were “old” RFTA tanks available on-orbit, the program identified a requirement to launch the hardware to allow for early activation and check-out prior to expending the remaining, non-reusable tanks. The ARFTA team completed the requirements development, design, manufacture, and certification to allow for ten separate deliveries of the necessary hardware to Kennedy Space Center (KSC) on an aggressive 25 month schedule.

Analysis performed during the ARFTA project indicated an issue with the launch loads and sensitive components within the hardware assembly. Additional hardware that was required to allow for the necessary protection and ultimate launch of the ARFTA tanks was identified late in the ARFTA project. A second, corresponding contract change to provide the ARFTA Flight Support Equipment (FSE) Protective End Cap project was initiated. The first two flight caps were designed and delivered only 36 days after the project received authorization to proceed. This allowed KSC to integrate the tanks and the caps in time for late stowage onto the ULF-7 Shuttle.

Two tanks were successfully launched to the ISS on the Space Shuttle mission ULF7 and the third tank was launched on the European ATV. They were installed without any issues. The ARFTA is currently in operation on-orbit.

This is an astonishing accomplishment when one considers all of the challenges plaguing the project: work stopped at various sites due to unprecedented Huntsville snow and ice storms, tornadoes, Marshall Space Flight Center (MSFC) suspending operations, and test failures (including flawed material, inadequate test procedures requiring complete revisions, and multiple issues at the vendor). The devastating tornadoes that impacted Huntsville and MSFC hit only weeks prior to the planned hardware

delivery date. The team worked double shifts and weekends to recover from the schedule impact while also working with the team members who lost their homes and possessions in the storm. It was a true team effort, with team members who weren't as affected providing back-up support to ensure the project progressed and recovered schedule to allow for delivery in time for ULF-7.

After delivering the flight-critical hardware flown and installed on orbit, the ARFTA team made 10 additional deliveries of spares, all of which were delivered between two to six months early. These spares will allow for successful ARFTA operation throughout the life of ISS.

The ARFTA recovers 70% of water from crew urine and helps conserve potable water transported to the ISS from earth. The ARFTA reduces the cost of upmass, because the tanks can be emptied on-orbit and do not need to be brought down to earth for refurbishment. The ARFTA hardware is critical to the functioning of the ISS, which is considered a National Laboratory. This hardware supports the six resident astronauts.

This project was closed-out on 5/31/12. The budget for this project was $ 18.57M. The ISS is currently baselined to stay in operation through 2020. The cost savings of replacing the RFTA with the ARFTA through 2020 is approximately $80M. If NASA decides to keep the ISS operating through 2028, the projected cost savings potentially will be approximately $160M.

• Triple Constraint (Project scope, schedule and budget)

The scope of the ARFTA project was to design, manufacture, assemble, test, and deliver an Advanced Recycle Filter Tank Assembly (ARFTA) along with associated filter assemblies, hose assemblies and installation hardware.

The ARFTA replaced the Recycle Filter Tank Assembly (RFTA) in the Urine Processor Assembly (UPA), which was part of the Water Recovery System (WRS) installed on the WRS Rack 2 located on ISS Node 3.

The ARFTA project tasks included:

1. WRS2 Mod Kit and OSE Development Tasks:
    a) Perform requirements development
    b) Perform "fit-checks" at NASA-JSC Building 9
    c) Perform design development through Critical Design Review (CDR)
    d) Complete parts procurement
    e) Complete Detailed Verification Objectives (DVOs) – development and closure
    f) Perform and complete all testing
2. Complete and deliver:
    a) WRS2 Rack Modification Kit:
        i. Tank Assembly
        ii. Brine Filter Assembly (10 micron and 100 micron)
        iii. 100 micron Product Water Filter Assembly
        iv. 20 micron Product Water Filter Assembly
        v. Brine Filter Assembly Hose
        vi. Miscellaneous installation hardware
    b) Orbital Support Equipment (OSE):
        i. Brine Transfer Hose Assembly (2)
        ii. Adapter for Rodnik/ Automated Transfer Vehicle (ATV) Tank for Brine Transfer (2)
        iii. Compressor Adapter Assembly (2)
    c) Spares:
        i. Tank Assembly (2)
        ii. Brine Filter Assembly (10 micron and 100 micron – 23)
        iii. 100 micron Product Water Filter Assembly (23)

iv. 20 micron Product Water Filter Assembly (23)
v. Brine Transfer Hose Assembly (1)
vi. Compressor Adapter Assembly (1)
vii. Adapter for Rodnik/ ATV Tank for Brine Transfer (7)

d.) viii. Miscellaneous installation hardware
Pre-Production Tank Assembly (1), set of filter assemblies for the MSFC integrated test (1)

1. Analyze samples from three returned-from-orbit RFTA filter sets for inorganic, organic and polymer composition

NASA challenged Boeing to expedite the delivery to a very tight schedule to allow the ARFTA hardware to be launched on the final Shuttle flight, ULF7. Although there were "old" RFTA tanks available on-orbit, the program identified a requirement to launch the hardware to allow for early activation and check-out prior to expending the remaining, non-reusable tanks. The ARFTA team completed the requirements development, design, manufacture, and certification to allow for ten separate deliveries of the necessary hardware to Kennedy Space Center (KSC) on an aggressive 25 month schedule.

Table 1: Hardware delivery schedule

DIL ID#	Nomenclature	Qty	Unit	Flt	H/W Fidelity	DD250	Final Destination	Baseline DD250 Date	Part #	Accelerated Delivery dates
32192	Modification Kit, Water Recovery System 2 (WRS2)	1	KT	NFS	FLT	B-MSFC	B-MSFC	9/15/2011	683-93440-1	5/31/2011
32193	Advanced Recycle Filter Tank Assembly (ARFTA) (On-orbit Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	9/15/2011	683-93450-1	5/31/2011
32194	Brine Transfer Hose Assy	2	EA	NFS	OSE	B-MSFC	B-MSFC	9/15/2011	683-93500-1	5/31/2011
32195	Compressor Adapter Assy	2	EA	NFS	OSE	B-MSFC	B-MSFC	9/15/2011	683-93505-1	5/31/2011
32196	Brine Filter Assembly (10 micron & 100 micron) (On-orbit Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	9/15/2011	683-93460-1	5/31/2011
32197	100 micron Product Water Filter Assy (On-orbit Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	9/15/2011	683-93470-1	5/31/2011
32198	20 micron Product Water Filter Assy (On-orbit Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	9/15/2011	683-93480-1	5/31/2011
32199	Advanced Recycle Filter Tank Assembly (ARFTA) (Ground Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93450-1	7/15/2011
32200	Brine Transfer Hose Assy (Ground Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93500-1	1/31/2012
32201	Brine Filter Assembly (10 micron & 100 micron) (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93460-1	5/31/2011
32202	100 micron Product Water Filter Assy (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93470-1	1/31/2012
32203	20 micron Product Water Filter Assy (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93480-1	1/31/2012
32210	Brine Filter Assembly (10 micron & 100 micron) (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93460-1	1/31/2012
32211	Brine Filter Assembly (10 micron & 100 micron) (Ground Spare)	8	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93460-1	1/31/2012
32212	100 micron Product Water Filter Assy (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93470-1	1/31/2012
32213	100 micron Product Water Filter Assy (Ground Spare)	8	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93470-1	1/31/2012
32214	20 micron Product Water Filter Assy (Ground Spare)	7	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93480-1	1/31/2012
32215	20 micron Product Water Filter Assy (Ground Spare)	8	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93480-1	1/31/2012
32216	Rodnik/ATV Tank Adapter Assy	2	EA	46P	OSE	B-MSFC	B-MSFC	9/15/2011	683-93510-1	5/31/2011
32217	Rodnik/ATV Tank Adapter Assy (Ground Spare)	7	EA	NFS	OSE	B-MSFC	B-MSFC	10/31/2011	683-93510-1	1/31/2012
32218	Compressor Adapter Assy (Ground Spare)	1	EA	NFS	FLT	B-MSFC	B-MSFC	10/31/2011	683-93505-1	1/31/2012

A project plan was developed to implement the scope. This project plan defined how the project was to be executed, monitored and controlled, and closed. This plan had the following elements:

- Project Overview and Objectives.
- Project Scope
- Customer Responsibilities
- Project Strategy and Approach
- Operating Rhythm
- Communication planning
- Project Organization
- Project Organizational Chart

- Roles and Responsibilities
- Key Personnel and Focals
- Workforce Summary
- Project Overall Budget Planning and Control
- Project Schedule
- Major Milestones
- Critical Path
- Schedule Float
- Technical Planning
- Systems Engineering
- Configuration Management
- Manufacturing Planning
- Safety, Quality, and Mission Assurance Planning
- Acceptance Planning
- Supplier Management Plan/Procurement Plan
- Project Closeout Plan

The project progress was monitored on a regular basis with weekly team meetings to review technical and schedule. Reports should be prepared by the project team detailing activities, accomplishments, milestones,
identified issues, and problems. Performance reports can be used to report the key information including, but not limited to:
• Current status,
• Significant accomplishments for the period,
• Scheduled upcoming activities,
• Forecasts, and
• Risks, Issues and Opportunities.

Budget status was reviewed on a monthly basis. However, the actual expenditures were reviewed on a weekly basis. Regular status meetings were held with all major suppliers. Monthly Program Management Reviews (PMR) were held with the tank supplier, Flexial Corp. The project plan was updated as required throughout the life cycle of the project.

All hardware was delivered either on time or early. The ARFTA hardware is currently in operation on the ISS. The CPI at the end of the project was 0.896. This was due to additional and unplanned effort required due to higher complexity than estimated, welding issues at suppliers, additional unplanned effort to resolve Brine Filter Assembly and Compressor Adapter issues and to recover from MSFC suspended ops and impacts (weld machine, facility issues).

• **Team**
The ARFTA team members were selected based on their expertise in their respective fields.
The project manager, along with the project management team, directed the performance of the planned project activities, and managed the various technical and organizational interfaces that existed within the project. Even though the different team members were at different sites, the team worked as a single unit, very aligned and focused on delivering all the required hardware on time.
Experts in welding and leak testing were utilized from Boeing-Huntington Beach, CA and Boeing-Huntsville, AL respectively. Continuous monitoring provided the project management team insight into the health of the project, and identified areas that required special attention. The team identified several issues and determined and implemented corrective actions. Some of the issues required replanning and following up on action plans to determine if the actions taken resolved the issue. The team communicated on a very regular basis through e-mails, telephone calls, weekly tagups and monthly project reviews.

Due to the natural disasters in Hunstville, AL and at MSFC, we lost almost three weeks of work during the most critical final phase of the project. After the plants were reopened, the team worked double shifts and weekends to recover from the schedule impact while also working with the team members who lost their homes and possessions in the storm. It was a true team effort, with team members who weren't as affected providing back-up support to ensure the project progressed and recovered schedule to allow for delivery in time for ULF-7.

• Stakeholders

The main stakeholder of the ARFTA project was the NASA ISS Vehicle office. Their expectations were conveyed to Boeing through a NASA directive. This directive identified the main objective of the ARFTA project, its required delivery schedule and the allowed budget. The NASA customer was kept apprised of the status of the ARFTA project through weekly meetings with the NASA project manager and monthly reporting to NASA management. All the rest of the stakeholders were kept apprised of the project status using the communication channels documented in the communication plan. The outcome at the end of the project was that all stakeholder expectations were met when all the required hardware was delivered on time.

• Risk

There were several risks identified at the beginning of the ARFTA project. In addition, a few new risks were developed during the implementation phase. All these risks were documented in the Risk Mitigation Plan as part of the project plan. These risks were managed and mitigated using the steps documented in the plan. The end result was that all risks were mitigated and certified hardware was delivered on time. Listed below are some of the significant risks and their associated mitigation plans.

1. **Containment of Toxicity 2 Fluid – Design Challenges and Safety Board Constraints** (Technical/Cost/Schedule)
   - NASA disapproval of rationale for containment of tox 2 fluid results in design changes
   - Tox 2 fluid requires 2 fault tolerance
   - MSFC style Quick Disconnects are only single fault tolerant
   - Tank fill operation (vented) is only single fault tolerant

   Risk Mitigation Action Plan:
   - Utilize existing UPA approved materials.
   - Utilize Urine Processing Assembly (UPA) Water Storage Tank Assembly (WSTA) bellows tank design approach for ARFTA tank and coordinate with ISS Fracture Control Board.
   - Utilize existing UPA Safety hazard control and Non-Conformance Report (NCR) rationale – Phase 1 SRP presentation on 3/9/10
   - Develop NCR and obtain SRP approval.
     - NCR submitted to SRP on 6/25/10.
   - Design ARFTA tank fluid containment by implementing either fracture critical component classification/control or providing two leakage barriers.
   - Utilize existing UPA Safety hazard control and NCR rationale.
   - All actions were completed and the risk was mitigated.

2. **Late Government Furnished Equipment (GFE) Government Furnished Data (GFD) Delivery** (Schedule)
   - Late delivery of GFE and/or GFD impacts margin and/or ability to delivery on-time
   - Isolation valve components delivery critical to tank and mod kit delivery schedule
   - Requirements from NASA covered in Risk #1

   Risk Mitigation Action Plan:
   - Monitor and coordinate GFE/GFD delivery schedule through regular communication with NASA.
   - Coordinate with MSFC for isolation valve components.

- Issues presented to NASA ISS/OB/Kevin Window.
- Presented risk to NASA ISS Contracting Officer Technical Representative (COTR).
- Agreement from MSFC to accelerate remaining iso valve components from 8/10/10 to 7/9/10.
- Require assessment of GFE delivery lead time to determine accurate integration schedule.
- Monitor and coordinate GFE/GFD delivery schedule through regular communication with NASA.
- All actions were completed and the risk was mitigated.

3. **Lack of defined requirements results in design changes**
   - NASA requirements not baselined
   - Tank procurement initiated prior to Mod Kit System Readiness Review (SRR)
   - Drawings being released with assumed requirements
   - Hose procurement initiated with assumptions on Brine transfer configuration
   - SRR and Preliminary Design Review (PDR) action items assigned to NASA are late

   Risk Mitigation Action Plan:
   - Coordinate requirements with NASA.
   - Define ARFTA interfaces to be same as RFTA.
   - Hold Technical Interchange Meetings (TIMs) with vendor prior to SRR.
   - Baseline Mod Kit specification.
   - Weekly telecons with NASA discussing requirement assumptions.
   - Present risk to NASA ISS COTR.
   - NASA Specification released.
   - All actions were completed and the risk was mitigated.

4. **Concurrent Qualification and Flight Hardware Development**
   - Qualification and flight units are being developed and tested concurrently; issues during qualification testing impact flight design and delivery
   - NASA system level testing performed late in development cycle results in new or revised requirements
     - NASA system level testing will be performed in parallel to Boeing component level acceptance testing
     - Boeing performed qualification testing will have been completed

   Risk Mitigation Action Plan:
   - Early requirements coordination with NASA/Boeing.
   - Provide technical support to Marshall Space Flight Center (MSFC) to assist with integrated system functional testing.
   - Complete CDR.
   - Accelerate NASA system testing – Coordinated with MSFC.
   - All actions were completed and the risk was mitigated.

5. **Vendor Certification:**
   - Lack of Flexial and Norman Filter vendor certification impacts delivery schedule
     - Vendors are not Boeing-certified
     - Effort to certify vendor processes was not included in proposal
     - Vendors are ready to begin manufacturing operations

   Risk Mitigation Action Plan:

- Obtain funding and authorization for B-HSV personnel to review Flexial processes.
- Elevated risk to B-HOU management.
- Agreement between HOU and HSV QA for HSV to lead certification effort
- HSV Flexial visit/QA review.
- MUAs submitted to NASA
- Norman Filter MUA approved.
- Flexial MUA approved.
- All actions were completed and the risk was mitigated.

• **Procurement**

On the ARFTA project there several parts that were procured from outside vendors. The metal bellows tanks were procured from Flexial Corporation. Most of the filters were procured from Norman Filters. All the QUICK DISCONNECTSs and flex hoses were procured from Parker-Hannifin. In addition, there were several suppliers that provided piece parts, welding and testing services. All procurement was performed as per the Supplier Management/Procurement Plan, which is part of the project plan. This plan documented all the requirements, make-or-buy decisions, and source selection criteria. It referenced the Supplier Statement of Work documents, long-lead/schedules, etc. It contained the Boeing-Supplier battle rhythm for communication and reviews.
The outcome was delivery of all procured parts that met Boeing's need dates so Boeing was able to deliver on time.

• **Change**

A change control board is responsible for meeting and reviewing the change requests and approving Or rejecting those change requests. The roles and responsibilities of these boards are clearly defined and are agreed upon by appropriate stakeholders. All change control board decisions are documented and communicated to the stakeholders for information and follow-up actions.
As part of the Perform Integrated Change Control process, a change control status update will indicate that some changes are approved and some are not. Approved change requests are scheduled for implementation by the project team. Approved change requests are the documented, authorized changes to expand or reduce project scope. The approved change requests can also modify policies, the project management plan, procedures, costs, or budgets; or revise schedules. Approved change requests may require implementation of preventive or corrective actions

The ARFTA project utilized the Boeing ISS Configuration Management Plan (CMP) and ISS Data Management Plan (DMP) as well the following requirements and guidelines as specified in the ISS Boeing Contract with NASA:

- Configuration Management Requirements.
- Data Management Handbook.
- Standards and Guidelines for ISS Program Documentation.
- Vehicle Data Management Plan.
- ASME Y14.100, Engineering Drawing Practices.
- ASME Y14.24, Types and Applications of Engineering Drawings.
- DOD-STD-100, Engineering Drawing Practices.
- MIL-STD-130, Identification Marking of US Military Property.
- MIL-STD-1521, Technical Reviews and Audits for Systems, Equipment, and Computer Software.
- Guidelines and Procedures for the Conduct of Functional Configuration Audit (FCA)/Physical Configuration Audit (PCA).
- MIL-STD-973, Configuration Management.
- NASA-STD-0005, NASA Configuration Management (CM) Standard.
- Configuration Management Handbook.
- Hardware/Software Acceptance Process.

- Change Engineer Handbook.
- Preparation of Program-Unique Specifications.

Compliance with the above was also required for all Project lower-tier subcontractors. A CMP was required to be submitted by the Project Subcontractor that is consistent with the above and compliant to the allocated requirements specified in the applicable Purchase Order and Subcontractor Statement of Work (SSOW).

Boeing-Houston Product Standards, Program Instructions (PI) and procedures that applied to the ARFTA are as follows:

- ISS Integrated Change Process.
- ISS Engineering Review Board (ERB).
- Houston Engineering Documentation Manual.
- Houston Product Definition Standards (HPDS).
- Boeing Product Standards (BDS).
- Houston, Huntington Beach and Canoga Park Design Manuals.
- Space Exploration Data Management Process Manual (DMPM).
- Space Exploration Configuration Management Process Manual (CMPM).
- Space Exploration Software Configuration Management Process Manual (CMPM).
- Engineering Release Procedure.
- Engineering Operations Procedure.

• Lessons Learned

One of the most important lessons learned from the past was implemented and used on the ARFTA project was the “Flawless Execution File”. This MS Excel file contained all the pertinent data pertaining to the project. The most significant tabs are listed below:

- Operating battle rhythm.
- Project calendar.
- Weekly status of accomplishments, upcoming events, Fiscal, Technical and Schedule health status.
- All completed and on-going action items.
- Budget and actual expenditure data for the entire life cycle.
- Risks and Opportunities.
- Corrective actions
- Schedule margin and Critical path
- Parts procurement status.

Some of the lessons learned during the project implementation were:

- Managing a “new”, “inexperienced” supplier.
- Supplier Non-Conformance Report (NCR) processing across multiple sites.
- Design issues due to parallel qualification and flight hardware development.

These lessons learned were documented in the Flawless Execution File on an on-going basis. After the project was closed-out, a summary of these were presented to the Project Management Working Group (PMWG). A detailed summary of all the lessons learned were documented as part of the project closeout activities. Some of these are being applied to other projects.

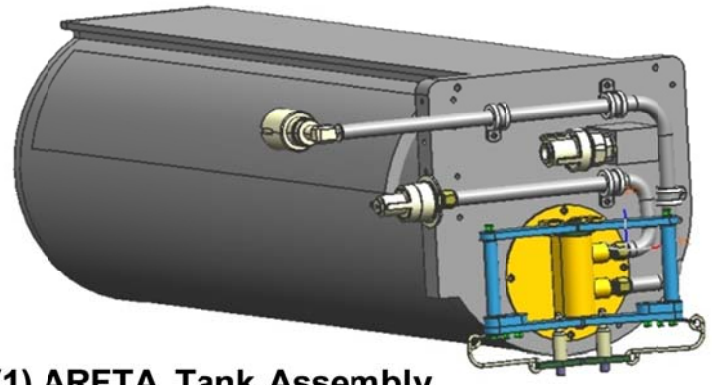
• Project Complexity

The following is a list of factors that made this project complex:

- **Team members and suppliers located at multiple sites across the country.**

  - The ARFTA project was managed from Boeing-Houston. This site provided the project management and technical oversight, developed, baselined and monitored the budget and schedule. All technical requirements, design, testing and delivery to NASA was performed at Boeing-Huntsville, AL, at Marshall Space Flight Center (MSFC). Additional support was provided by Boeing at Kennedy Space Center (KSC) and Huntington Beach, CA. The ARFTA bellows tank supplier, Flexial Corporation was located in Cookeville, TN. The filter cartridge supplier, Norman Filters, was located in Chicago, IL. The brine filter cartridge supplier was located in Cocoa Beach; FL. Managing the ARFTA project where the team members were not all co-located was a major challenge.
- **Aggressive schedule:**
  - The ARFTA hardware was originally to be delivered in 30 months. However, after the project was started, NASA directed Boeing to deliver the hardware in 25 months so it could be launched on the last Space Shuttle mission, ULF-7.

- **Natural disasters:**
  - During last few weeks before hardware delivery, Huntsville, AL and MSFC were hit with snow storms and tornadoes. The plants were closed for almost three weeks. Several team members lost their homes. In spite of all this, the team worked double shifts and weekends to recover the lost schedule.
- **Special material and special processes**:
  - The ARFTA metal bellows tank is made of titanium (cylinder) and hastelloy (bellows). These materials are very difficult to work with and the vendor had issues with the welding. Welding experts from Boeing-HB, CA were able to help resolve these issues.



(1) ARFTA Tank Assembly