

ROLLING METAL DIAPHRAGM PROPULSION TANKS

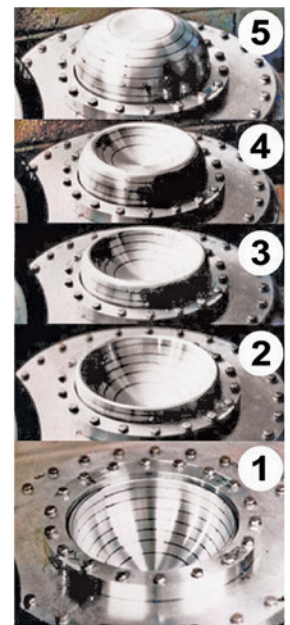
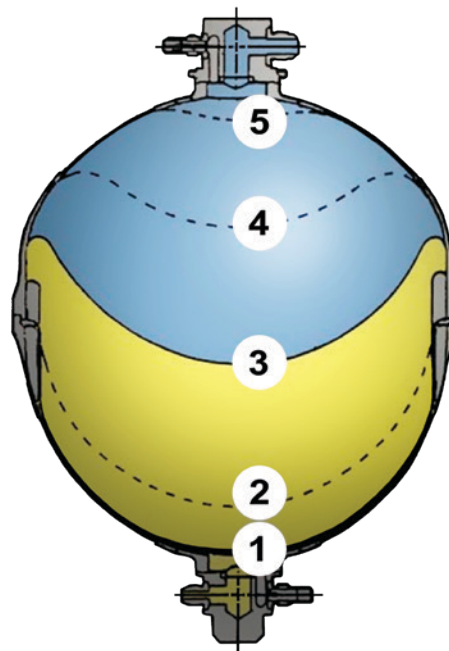


Moog has over 50 years experience in designing zero-gravity, positive-expulsion tanks: with heritage dating back to Bell Aerospace (Agena, Gemini, Apollo, Minuteman iii, etc.).

Moog tanks are fabricated from commercially available aluminum alloys providing a low-cost short lead-time alternative to titanium propellant tanks. The tanks are easily sized to meet pressure, temperature, and flow requirements. The design approach and technology has been successfully scaled to a tank greater than 30 inches in diameter. Our tanks are well suited to applications that require precise CG control or minimum propellant slosh and have demonstrated operations in demanding target and missile applications.

KEY FEATURES

- Compatible with Hydrazine, MMH, and N2O4 for long term storage
- Tanks are low cost by design (3 basic parts, conventional metal forming)
- Simplification of design allows for short fabrication cycles as compared to titanium tanks
- Patented Al rolling diaphragm design, no elastometrics
- Demonstrated scalability
- High expulsion efficiency greater than 99%
- Proven operation with warm or cold gas pressurization
- Demonstrated high g operation (axial and lateral)



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PERFORMANCE											
Features	Specifications										
Outer Diameter (inches)	5.0	5.6	6.4	7.8	9.6	12.0	12.1	18.2	18.2	9.9	9.9
Tank Shape	Oblate Spheroid	Oblate Spheroid	Oblate Spheroid	Oblate Spheroid	Near Sphere	Near Sphere	Near Sphere	Near Sphere	Near Sphere	Oblate Spheroid	Near Sphere
Body or Liner Material	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Al Alloy	Ti	Ti
Full Metal or Overwrapped	Overwrapped	Overwrapped	Full Metal	Full Metal	Full Metal	Full Metal	Full Metal	Full Metal	Full Metal	Full Metal	Full Metal
Overwrap Material	T-300 (12K) HITEX 46-9A (6K)	T-300 (12K) HITEX 46-9A (6K)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Media	MON-3	MMH, Hydrazine	Hydrazine	MON-3, MMH	MON-3, MMH	Hydrazine	Amine Fuel, MON-3	Hydrazine	MON-1, Hydrazine	Hydrazine, MMH, AF-M-315E, LMP-103S	LMP-103S
Total Volume [L]	0.9	0.9	1.3	2.0	6.5	13.8	13.8	50.8	50.8	6.4	6.4
Max. Propellant Mass [kg]	0.9	0.9	1.3	2.9	9.7	13.8	20.5	51.0	75.7	9.4	7.9
MEOP Pressure [bar]	121.0	121.0	48.3	68.9	45.9	27.6	57.2	27.6	22.4	27.6	27.6
Mounting Type	Legs	Legs	Polar	Polar	Girth	Polar	Polar	Polar	Polar	Polar or Girth	Polar or Girth
Tube Interface Type (e.g. weldable, screwed, etc.)	Screwed	Screwed	Screwed	Screwed	Screwed Weldable	Weldable	Screwed	Weldable	Weldable	Weldable	Weldable
Flight Status	Qualified Hover Test, Flight Qualified	Qualified Hover Test, Flight Qualified	Flight Qualified	Qualified, Partial System Test	Flight Qualified	Flight Qualified	Flight Qualified	Flight Qualified	Exploration	Design Verification Testing	Flight Qualified
Developed For	Hit to Kill	Hit to Kill	Strategic Missiles	Hit to Kill	Hit to Kill	LEO Satellite	Target	Target	Exploration	Space Application	Space Application

MOOG

propulsion@moog.com
www.moog.com/space



Moog Space and Defense



Moog Inc.



@Moog_Inc



@Moog.Inc

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