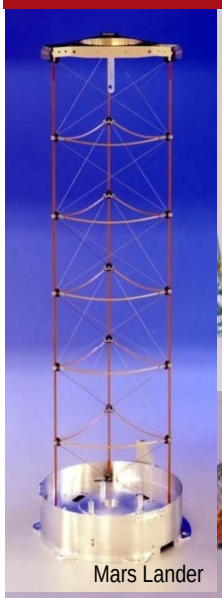
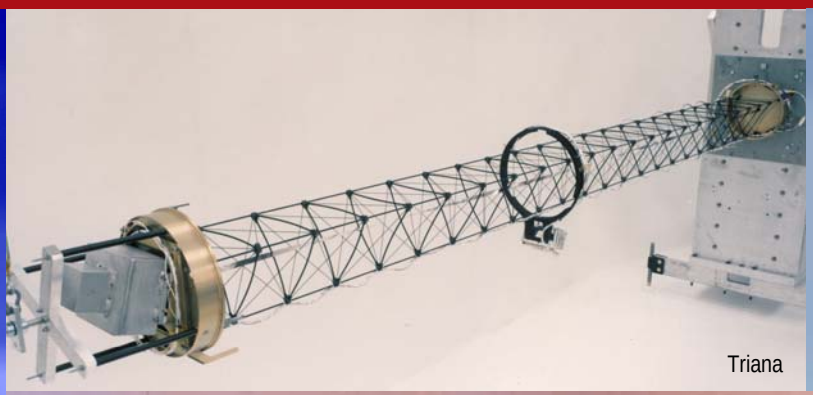
Coilable Boom Systems


Mars Lander


Triana


IMAGE


GGS

Benchmark performance with extensive success heritage

ATK's Coilable booms are designed and manufactured for the deployment of a variety of critical spacecraft payloads. Typical applications include magnetometer instruments and antennas. Specialty applications range everywhere from high-precision (arc-second) optics deployment to very large (>100m) gossamer spacecraft system deployment.

Performance Features

- Boom diameters typically 16 to 100 cm
- Lengths from <1m to >100m
- Elastic strain energy provides passive deployment
- Multiple deployment/retraction methods available
- Can be made magnetically "clean" and/or electrically conductive
- Mid-length payload capability
- Engineered for multi-unit production applications
- Unlimited deploy/retract cycles; simple manual re-stowage process
- Compact mast stowage (2% of deployed length typical; <0.7% for lightweight variants)

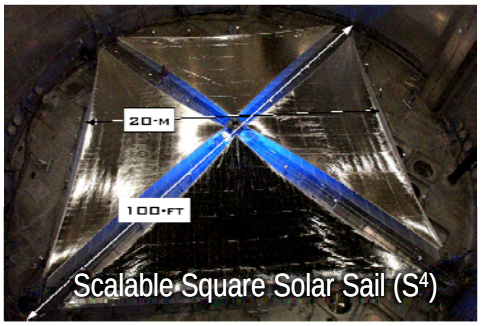
Application Benefits

- Extremely mass efficient (<35 g/m)
- Tailorable for stiffness, strength, stability, and/or low mass
- Excellent thermal stability by pre-twist or thermal sock
- Extremely repeatable deployment due to preloaded structure
- Designs and interfaces can be optimized for specific application needs
- High reliability, heritage deployment system
- Adaptable electrical and mechanical interfaces including payload cable harness and/or antenna(s)

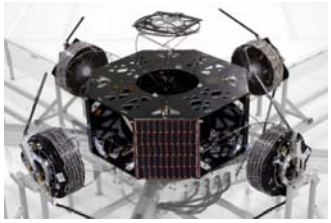
INTERFACE / ACCOMMODATION OPTIONS

Coilable boom systems are widely configurable to suit specific applications.

- Canister mounting: side-mount or base-mount
- Cable harness/utilities routing along longerons
- Deployment rate control: eddy current damper, rotary friction damper, or electric motor (for on-orbit retractability)
- Partial-length payloads: may be mounted to external ring, internally within a rigid batten, or within a fixed truss bay
- Thermal stability optimization: building booms with constructional pre-twist and/or adding an external sock improves Coilables' already excellent stability



Scalable Square Solar Sail (S^4)




Orbcomm Helical Quadrifilar


DSX Y-Axis

Coilable Boom Systems

TYPICAL DEPLOYMENT SEQUENCE

1. Power is applied to the tip/payload release actuator(s).
2. Boom self-deploys under internal strain energy. Deploy rate (typically ~1-3 in/sec) is regulated by lanyard to boom tip paid off a spool on canister-mounted rotary damper. Full stiffness is developed from root mounting as longerons rotate to their deployed angle. Boom uncoils from stack at tip end.
3. Boom is fully deployed. Boom may be retracted manually by re-coiling, or on-orbit by a lanyard-operated bridle mechanism and a motor drive.

EXAMPLE APPLICATIONS

- Magnetometer/Instrument deployment
- Gravity gradient mass deployment/retraction
- Antenna deployment: as payload or integrated conductor e.g. helical quadrifilar
- Instrument deployment/retraction
- Solar array blanket deployment
- Solar sail membrane deployment
- Occulter plate/edge deployment
- Telescope optics (focal length) deployment

Program	Customer	Launch Date	Length each (m)	Diameter (in)	EI (lb*in^2)
SAFE	Lockheed/ NASA	3-Feb-84	32	14.4	1.79E+06
Galileo	JPL	18-Oct-89	3.5	12.5	1.34E+07
Galileo	Univ. of Iowa/JPL	18-Oct-89	6.45	12.5	1.34E+07
LACE	Naval Research Laboratory	14-Feb-90	44.5	10	4.97E+06
UARS	GE Astro	15-Sep-91	4.9	12.5	1.41E+07
EUVE	Fairchild Space	7-Jun-92	1.6	17.64	5.01E+07
GGS WIND	Martin Marietta	1-Nov-94	12.4	12.5	1.34E+07
GGS POLAR	Martin Marietta	24-Feb-96	6.2	12.5	1.34E+07
Mars Pathfinder	JPL	4-Dec-96	0.8	7.2	1.79E+06
Cassini	JPL	15-Oct-97	4.8	12.5	1.75E+07
Lunar Prospector	Lockheed Martin	7-Jan-98	2.6	8	2.20E+06
EOS-AM (Terra)	Lockheed Martin	18-Dec-99	9	13.75	
MIDEX IMAGE	U. Mass Lowell	25-Mar-00	9.9	7.2	9.00E+05
GOES N	Boeing	24-May-06	8.4	10	6.39E+06
Classified	Lockheed Martin	1-Jun-03			
GOES O	Boeing	26-Jun-09	8.4	10	6.39E+06
GOES P	Boeing	4-Mar-10	8.4	10	6.39E+06
GOES R	Lockheed Martin	In Work	8.5	12.5	1.34E+07
DSX Z-Axis	AFRL	delivered	8	10	4.97E+06
DSX Y-Axis	JPL/ AFRL	delivered	40	9.5	2.40E+06
LADD	Northrop Grumman/NASA/SIDO	Delivered	8	16.67	4.45E+07
Triana	Orbital	Delivered	3.5	10	4.97E+06
Mars Polar Lander	NASA JPL	21-Jun-05	0.8	7.2	1.80E+06
ST8 SAILMAST	JPL	delivered	40	9.5	2.80E+06
MMS	LASP	delivered	12	10.24	4.56E+06

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