

# Telescoping Boom

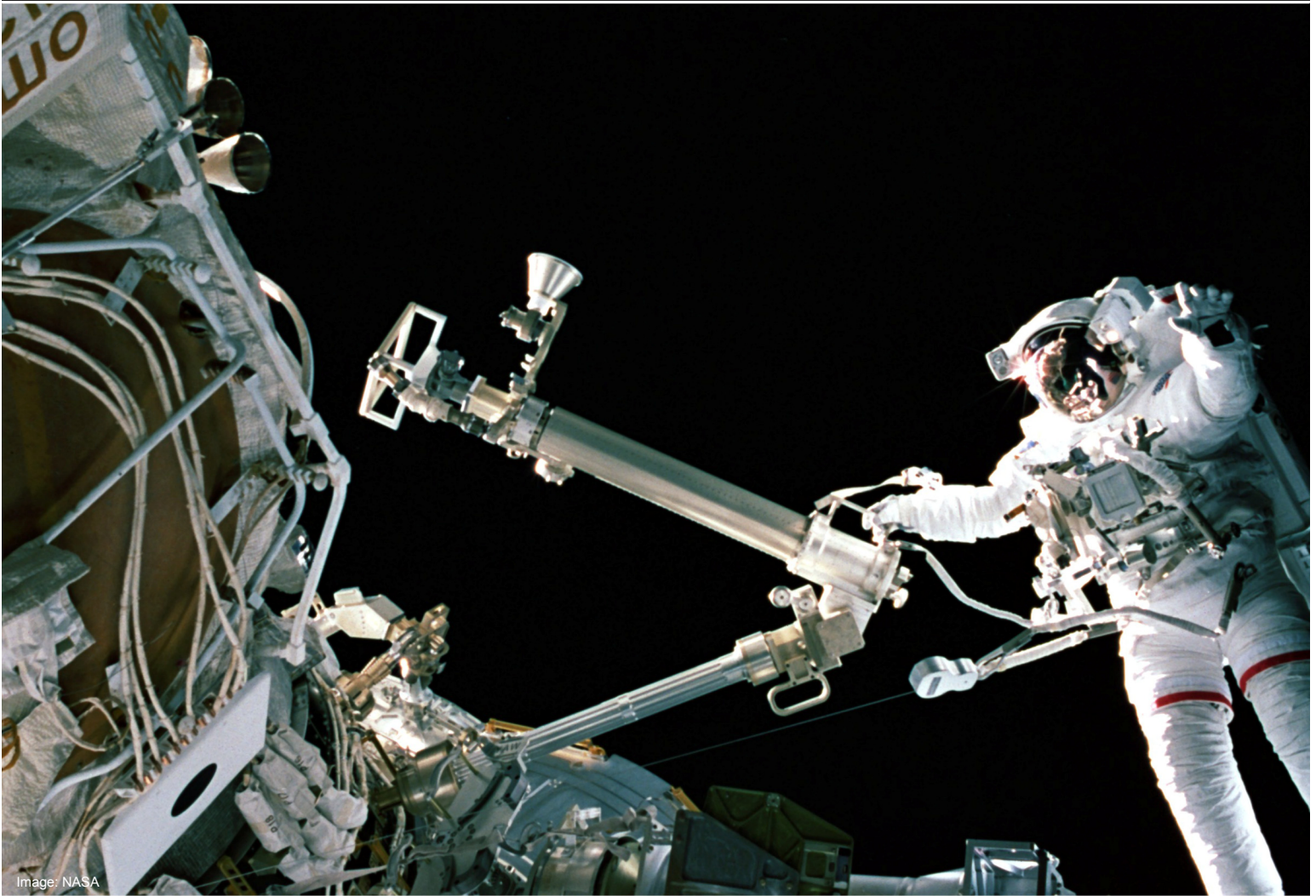


Image: NASA

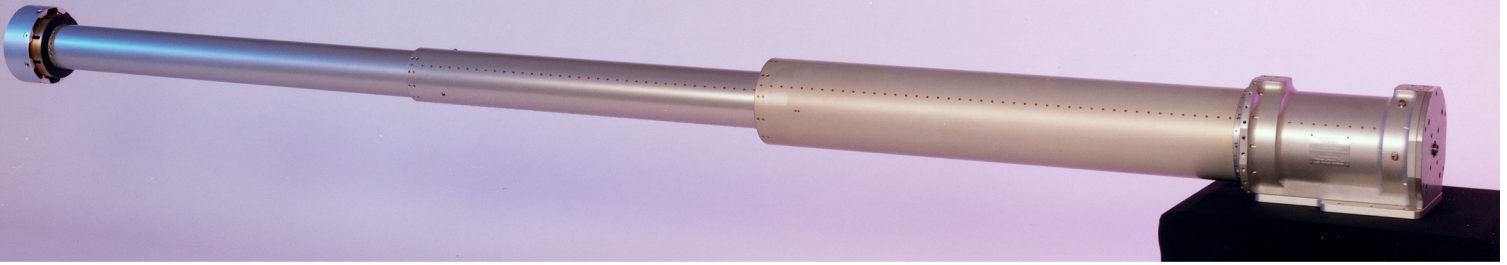
## Performance Features

- Robust design intended for many deploy/retract cycles: life tested to 10,000 cycles
- Preloaded latches at joints available for precise/repeatable deployment positions
- Extreme deployment/retraction force available due to robust lead-screw drive train
- Available with load limiter for minimizing the reaction loads associated with moving very large masses
- Metallic and composite materials can be chosen to optimize stiffness, strength, weight, or dimensional stability

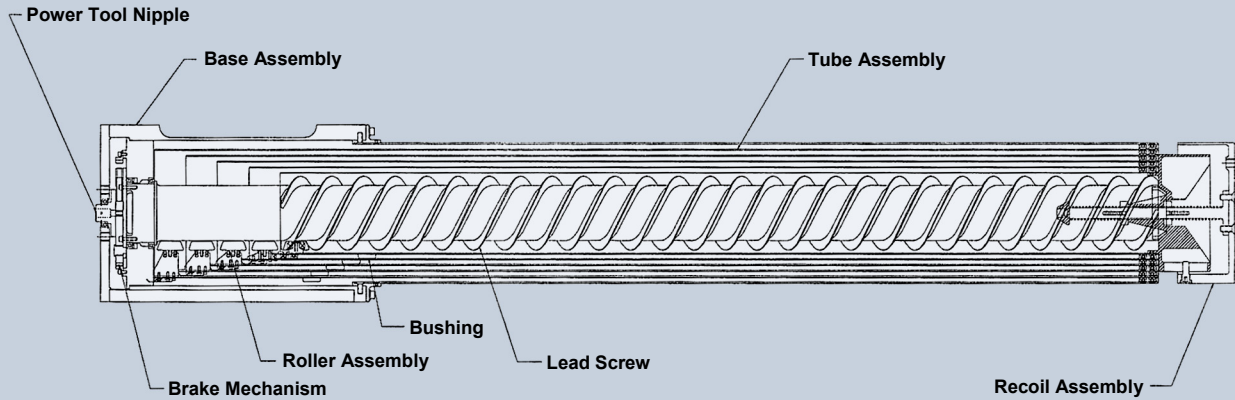
## Application Benefits

- Flight proven design; currently being used for the International Space Station build
- High torsion and bending strength
- Very scalable design; available from 3-inch diameter to 30-inch diameter or more
- EVA safe design
- Electronically conductive to prevent static discharge
- Can be manually deployed and retracted during integration/test
- Cabling and utility compatible

# Telescoping Boom



Telescoping Boom Components



## Applications

Program	Customer	Flight	Application
ORU Transfer Device	Lockheed	STS-87, Columbia	Hardware Demonstration
ORU Transfer Device	Lockheed	STS-101, Atlantis	Permanent Installation onto Space Station

## ORU\* Transfer Device (OTD) Boom Demonstrated Performance

- Size: 6-inch diameter, 44-inch length stowed, 216-inch deployed length
- Number and size of tube sections: 6 tubes ranging from 6 to 3.5 inches in diameter
- Materials: Aluminum construction
- Push force: 422-lb push force with 372 in-lb of input torque
- Weight: 45 lbs
- Bending Strength: 16,200-lb
- Torsional Strength: 1350 in-lb
- Reliability: Met all performance requirements after exposure to 10,000 deploy/retract cycles

\* Space Station Orbit Replacement Unit

## Telescoping Boom Sizing Guidelines

For each tube section, there is a minimum 0.5 inch reduction in diameter from the outermost tube. For example, a 4 tube boom that has a maximum diameter of 4 inches, the tubes would be 4, 3.5, 3, and 2.5 inches in diameter.

For each tube section, there is a reduction in length of approximately 2 inches. The stroke of each tube is approximately 1.5 diameters shorter than tube length.

For latched and preloaded tube joints, stiffness approaching that of a tapered tube of the same dimensions as the deployed boom can be reached for loads that do not exceed the joint preloads.

For latched and non-preloaded tube joints, stiffness approaching that of a tapered tube of the same dimensions as the deployed boom, can be reached after the dead-band of the joints is removed.

For unlatched tube joints, there will be a dead-band on the order of  $(\tan^{-1}) 0.01/\text{tube overlap length}$  for each tube segment

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