

THE VALUE OF PERFORMANCE.

**NORTHROP GRUMMAN**



## *Telescoping Boom Systems*

*Robust and Highly Reliable  
Linear Motion*

**N**orthrop Grumman's Telescoping booms are designed and manufactured for the placement and maneuvering of massive payloads.

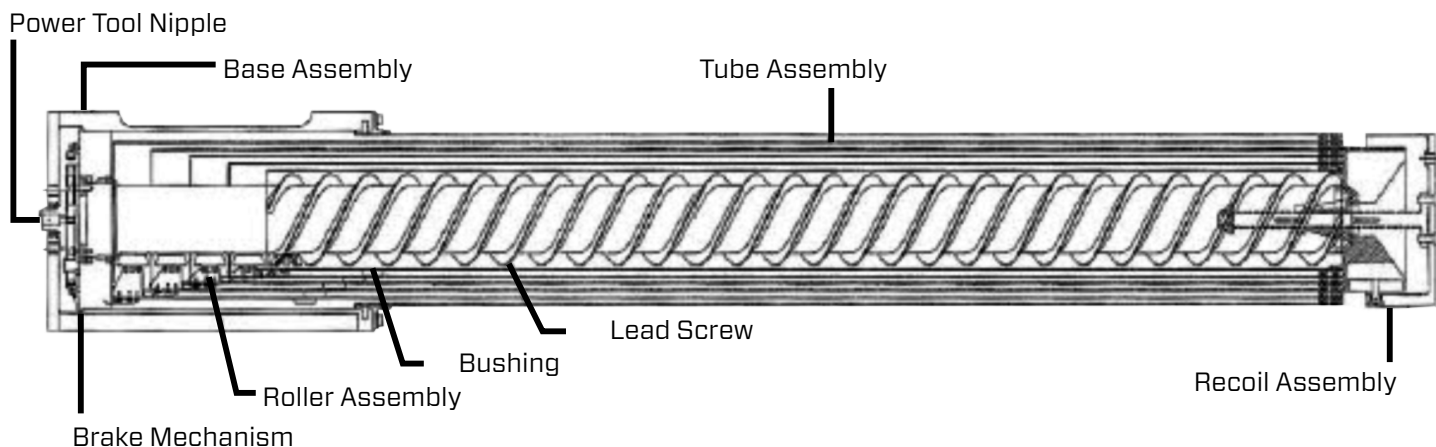
### **Performance Features**

- Boom diameters typically 15 cm to 80 cm
- Deployed lengths from <5m to >50m
- Mid-length payload capability
- Stowed lengths from ~0.75m to ~5m
- Unlimited deploy/retract cycles (10,000 cycles proven)
- Extreme deploy force due to lead screw drive train
- Highest stiffness and strength boom type available for a given stowed diameter
- Composite or metallic construction options

### **Application Benefits**

- Tailorable for stiffness, strength, stability and/or low mass
- 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)

## Telescoping Boom Components



## 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 forces: 422-lb push force with 372 in-lb of input torque
- Weight: 45 lb
- Bending Strength: 16,200 in-lb
- Torsional Strength: 1,350 in-lb
- Reliability: Met all performance requirements after operating for 10,000 deploy/retract cycles
- \* International Space Station Orbit Replaceable Unit

## Telescoping Boom Sizing Guidelines

- For each tube section, there is a minimum 0.5 inch reduction in diameter from the outer most 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 tube length of approximately 2 inches. The stroke of each tube is approximately 1.5 diameters shorter than the tube length
  - Approximately 10 boom segments maximum for practical designs
- Deployed boom stiffness approaches that of a continuous tapered tube of the boom's base and tip segment diameters
- A partially-deployed boom has usable strength and stiffness, but will have structural deadband from the unlatched segments
  - 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

## More Information

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