

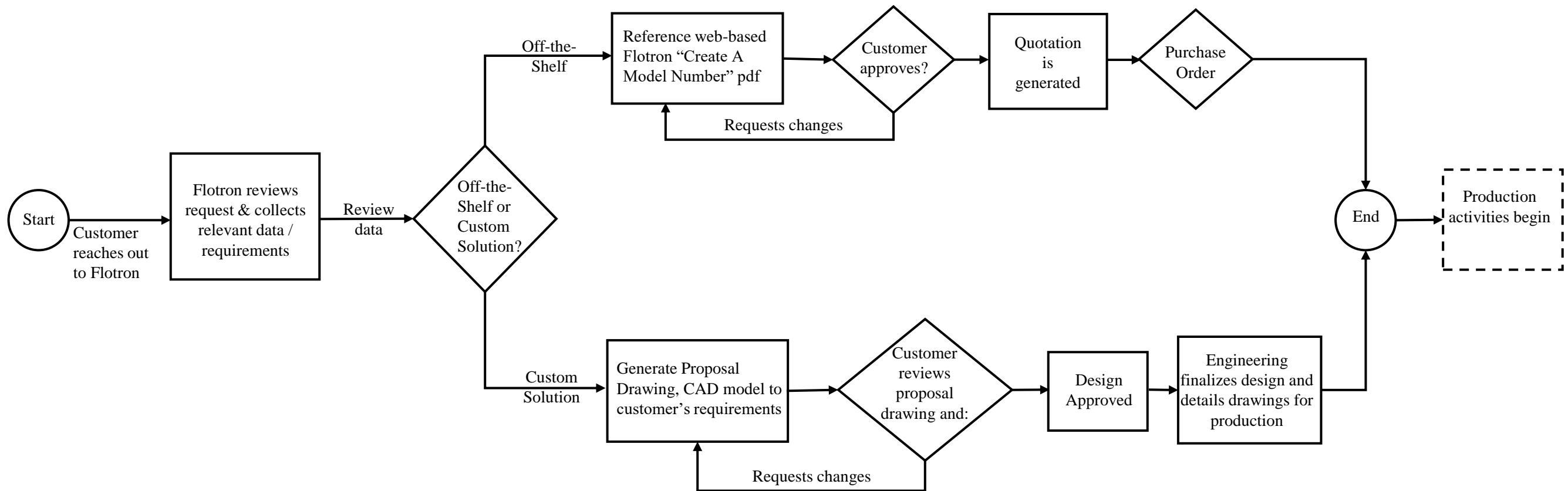
- Vista, California
- Flotron designs and manufactures mechanical ground support equipment to support ergonomic assembly, integration, test, transportation and finish applications



Navigating Flotron's website and creating a model number

<https://flotron.com/>

Control of Design



Small Satellite CTL Series

CANTILEVERED ROTATION FIXTURES WITH SECONDARY AXIS

Flotron's off-the-shelf small satellite rotation fixture product line is offered in four models. The CTL36, CTL48, CTL60, CTL-AH models have rotation centerline heights of 36", 48", 60" and adjustable height, respectively. The design intent is to support complete small satellites assemblies or satellite instruments during assembly, integration, and test activities.

The spaceflight hardware can be supported in a cantilevered orientation so that the longitudinal axis is parallel to the floor and then rotated 360 degrees. In this configuration, the CTL series has a maximum dynamic load rating of 3,000 lbs with a 30" CG offset from the interface plate and 3" offset from the primary rotation axis considering a simultaneous $\frac{1}{2}$ G side load and 1G vertical load and $SF_y = 3$ / $SF_u = 5$.

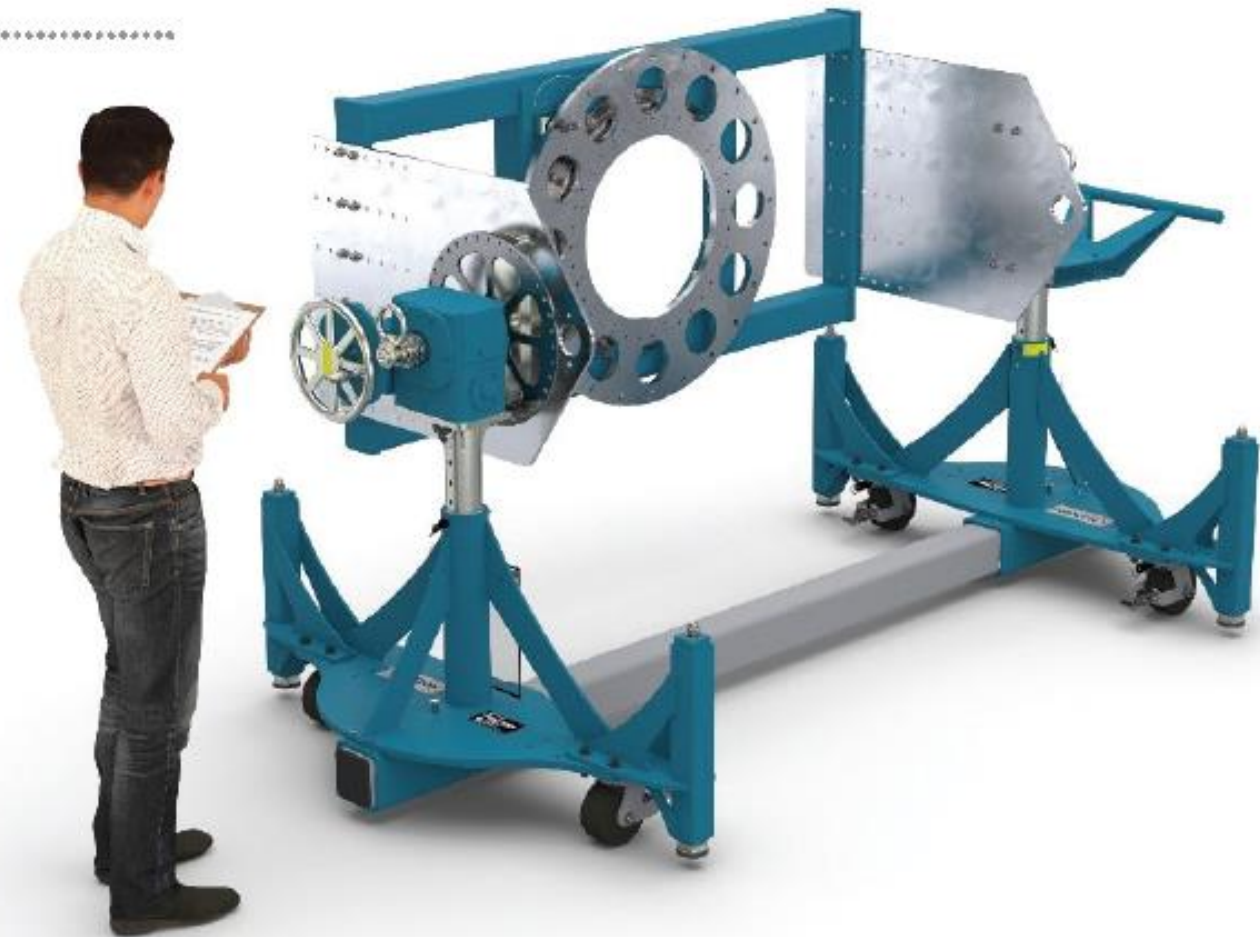
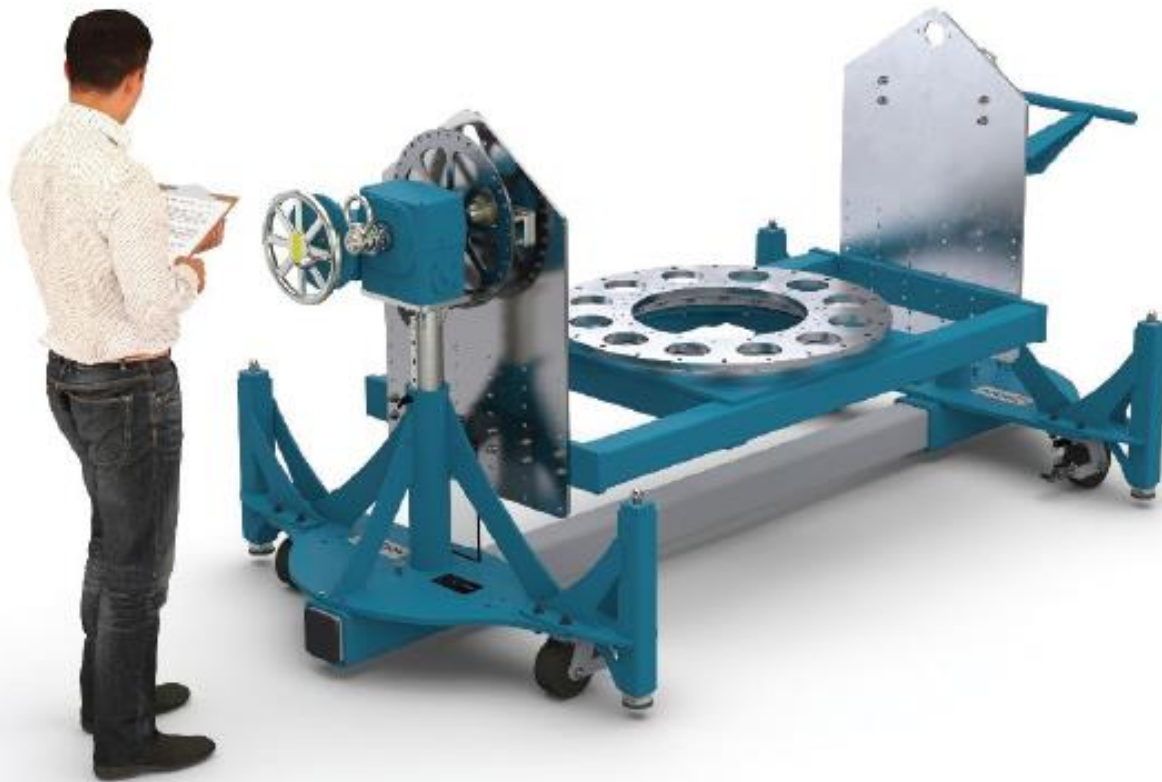
Alternatively, the Secondary Axis (SA) option can be specified. In addition to providing a rotation axis along the payload centerline, the SA option allows the technician to tilt the payload from vertical to horizontal or fully invert the vehicle. In this configuration, the CTL series has a maximum dynamic load rating of 2,000 lbs with a 22" CG offset from the interface plate and 3" offset from the primary rotation axis considering a simultaneous $\frac{1}{2}$ G side load and 1G vertical load and $SF_y = 3$ / $SF_u = 5$.



700 Series

SMALL FOOTPRINT DUAL SUPPORT WITH OPTIONAL CRADLE

Flotron's Small Foot Print (SFP) 700 series Rotation Fixtures are a higher capacity version of the 700 series. The fixture can support a 2,500 lb payload and a maximum torque on the gearbox of 7,200 in-lbs. The SFP-700 series includes additional features and options; lift points above the CG capable of lifting the Flotron (with the payload integrated), flat leg design to lower the rotation centerline height without sacrificing available payload swing radius, dual needle roller bearings in the non-gearbox-side trunnion for smooth, low friction rotation, as well as an option for a cordless hand drill to rotate the gearbox.



This series is offered in two standard single beam configurations with adjustable riser heights. They are supplied with heavy-duty, hollow shaft, stairstep resistant gearboxes to handle large, off-center loads which may occur during assembly of the mounted payload.

SMALL SATELLITE UPENDER

Flotron's Small Satellite Upender (SSU) allows for ergonomic transportation of small satellites during their move through a customer's facility. The SSU can rotate 90 degrees from horizontal to vertical, or vice versa to allow solar array deployment, satellite integration, or pass through hallways and doorways among other applications.



The cart can support a 1,000 lb payload with a 25" CG offset from the interface plate. A hard stop with audible alarms limits the travel to prevent damage to the payload. Custom modifications are available; however, stability and keep out zones will limit the design.

PAYLOAD POSITIONER

Flotron's off-the-shelf cantilevered rotation fixture product line is now offered with the electro-mechanical lift (EML) feature. The EML option automates height adjustment and has a range of 36" – 48", as measured from the floor to the rotation centerline. The design intent is to support payload or small satellite assembly, integration, and test activities.

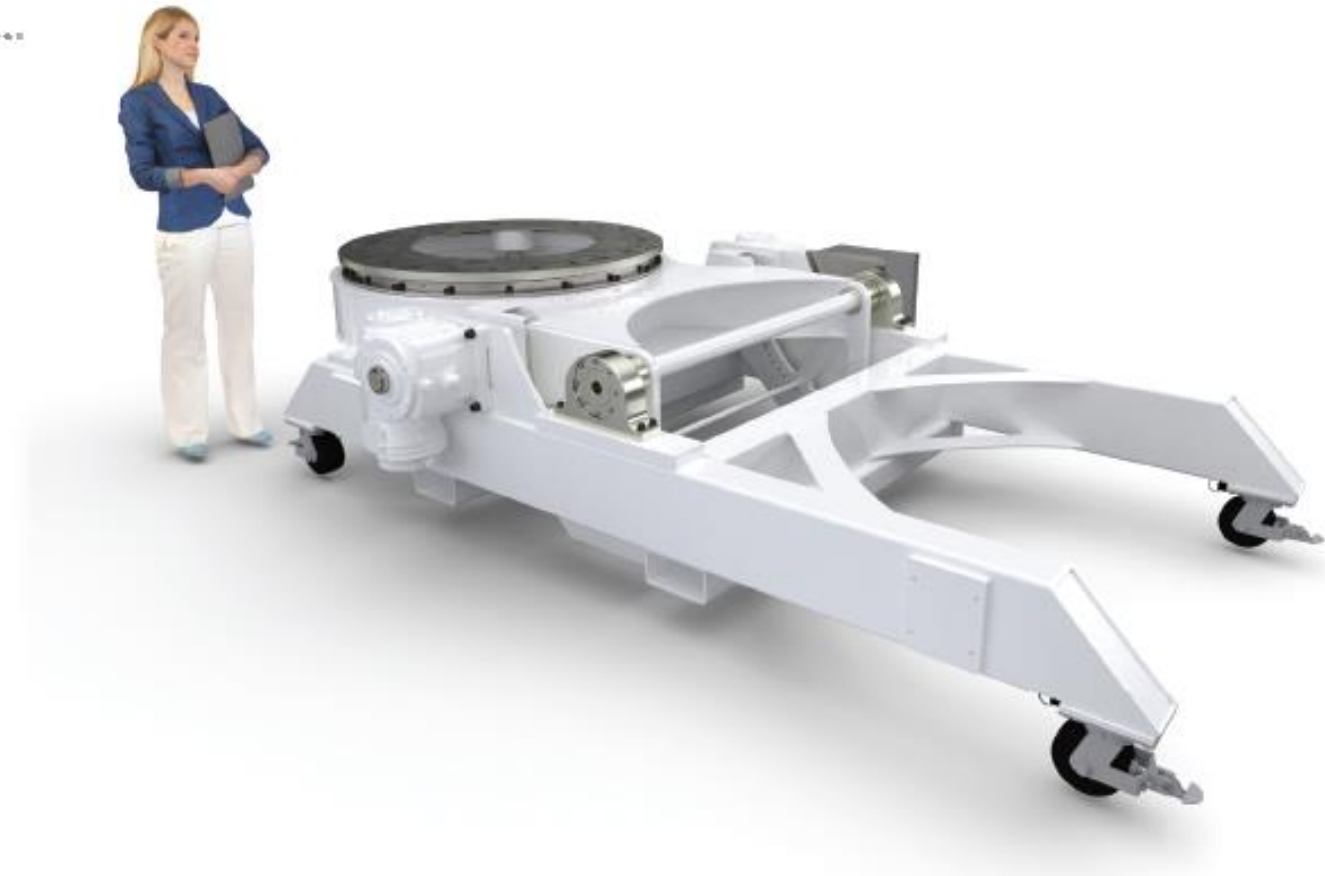
The payload or small satellite can be supported in a cantilevered orientation so that the longitudinal axis is parallel to the floor and then rotated 360 degrees. In this configuration, the fixture has a dynamic load rating of 580 lbs with a 26" CG offset from the primary axis interface plate considering a simultaneous 1G vertical load and ½ G side load and SFy = 3 / SFu = 5.



Additionally, the Secondary Axis (SA) option can be specified. In addition to providing a rotation axis along the payload centerline, the SA option allows the technician to tilt the payload from vertical to horizontal or fully invert the vehicle. In this configuration, the fixture has a dynamic load rating of 390 lbs with an 11.75" CG offset from the secondary axis interface considering a simultaneous 1G vertical load and ½ G side load and SFy = 3 / SFu = 5. The secondary axis cradle bearing through access may support propulsion integration or wiring.

MOBILE TWO AXIS POSITIONER

Flotron's Mobile Two Axis Positioner allows for ergonomic tilting and rotation of the spaceflight hardware while being supported in a cantilevered configuration. The positioner can tilt 90 degrees from horizontal to vertical, or vice versa. The positioner can also rotate the hardware 360 degrees along its longitudinal axis utilizing a two axis UL approved control system. Over-travel limit switches have been incorporated at both ends of the tilt range. The interface has through access which may support propulsion integration or wiring.



The cart can support a 2,000 lb payload with CG located at 48" from the mounting interface and 5" from the rotation centerline considering a $\frac{1}{2}G$ side load and 1 G vertical load and $SF_y = 3 / SF_u = 5$. Two mechanically synchronized low backlash, non-back driving gearboxes are used for tilting, each of which is capable of supporting the rated moment. The H-frame design provides ergonomic access from either end of the fixture. The maximum available swing envelope is 106". There are forklift tube pockets for lifting the empty fixture. The positioner is compatible in a Class 10K (ISO 7) clean room.

U-SHAPED DUAL SUPPORT MECHANICAL LIFT ROTATION FIXTURE

Flotron's U-Shaped dual support mechanical lift rotation fixture has a load rating of 1,800 lbs at 3.3" maximum eccentricity considering $SF_y = 3$ and $SF_u = 5$ in addition to a simultaneous dynamic loading condition of $\frac{1}{2}$ G side load and 1G vertical load.

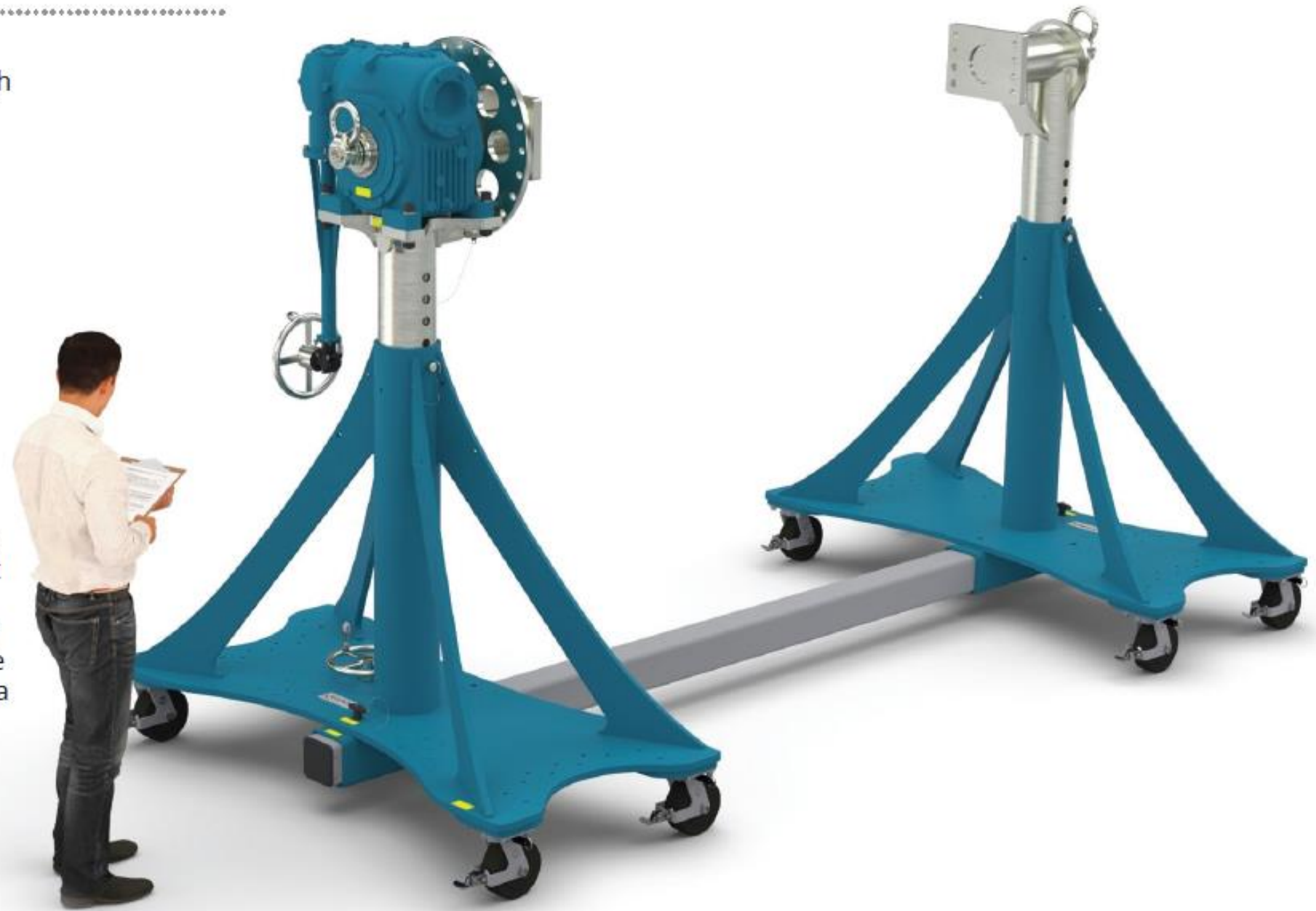
Mechanically synchronized ACME screw lift jacks raise the carriages with bearing blocks along precision linear guide bearings rails through a 28.7" range using a drill drive with anti-rotation bracket. Hard stops limit the travel to prevent damage to the payload and a safety clutch has been incorporated to prevent damage to the power transmission. A ± 1.0 " axial float on the non-gearbox-side trunnion provides interface distance adjustment and allows for ergonomic payload integration and removal. The U-shaped design allows access for a secondary cart to roll in from the side without interfering with the longitudinal main beam.



LARGE CAPACITY DUAL SUPPORT ROTATION FIXTURES

Flotron's small footprint 900, 1000, & 1200 Series Dual Support Rotation Fixtures are high capacity, more compact version of the large standard 900, 1000, & 1200 series fixtures. The load capacities range from 7,500 lbs – 15,000 lbs and maximum gearbox torque ratings range from 20,500 in-lbs to 55,000 in-lbs to handle large, off-center loads which may occur during assembly of the mounted payload. These models are especially suited for large, heavy assemblies.

Additional features and options include lift points above the CG capable of lifting the Flotron (with the payload integrated), one inch of axial float on the non-gearbox side trunnion to ease payload integration, flat leg design to lower the rotation centerline height without sacrificing available payload swing radius, elimination of single failure points for launch site compatibility, a clutch to eliminate gearbox overtorque, as well as an option for a cordless hand drill to rotate the gearbox.



Flotron's Multi-Axis Positioner is designed to ergonomically orient payloads on two axes of rotation and provide safe and ergonomic access to install and remove the hardware without interfering with the Flotron inner gimbal frame.

The primary rotation axis is accomplished utilizing an off-the-shelf SFP-862 Dual Support Rotation Fixture. The outer gimbal frame spans between the mounting interfaces of the SFP-862 and has been designed to provide the stiffness and strength to support the inner gimbal frame at various angular orientations. The inner gimbal frame is designed to interface and provide sufficient clearance to integrate and remove the payload.





Example Proof Load Test

Flotron XDNE-759-J3-INDS15-B30-B070-PLT Proof Load Test Report

PROOF LOAD TEST PROCEDURE:

1. STATIC PROOF LOAD TEST
2. VERTICAL LOAD ONLY
3. 200% VERTICAL LOAD, 100% TORQUE; 2.0 X 960 lbs. = 1,920 lbs.
4. HOLD LOAD FOR 5 MINUTES MINIMUM
5. CUSTOMER MAY WITNESS TEST
6. PAINT AND PLATING COVERS ALL WELDS
7. VISUALLY INSPECT ONLY FOR CRACKS, DEFORMATION, ETC.
8. DELIVERABLE REPORT REQUIRED

Results:

Part Number: XDNE-759-J3-INDS15-B30-B070-PLT	Quantity: 2
Rated Load: 960 lbs.	Applied Load: 1,926 lbs.
Duration: Hold for 5 minutes	
Inspection Methods: Visual	
Weld Inspection Results: No cracks or deformation were found	

Example Proof Load Test

XDNE-759-J3-INDS15-B30-B070-PLT Proof Load Test Report

200% Vertical Load, 100% Torque

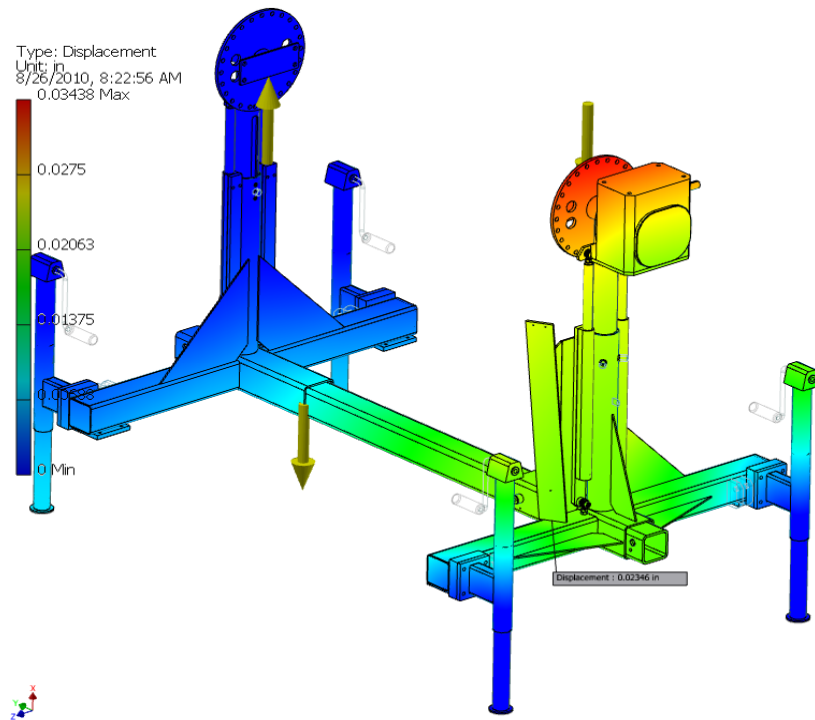


Initial Load @ 12:40 PM



Post 5 minutes @ 12:45 PM

- Flotron's engineering uses ANSYS workbench FEM software to perform stress analysis.
- AWS qualified welding team; all welding is performed in-house.
- Most of our manufacturing processes are completed in-house
 - plating, powder coat painting, anodizing are processed through our third-party suppliers.



Flotron's Quality Policy

Flotron's commitment to continuous improvement drives us to consistently deliver high quality innovative solutions on time and with exceptional service that exceeds customer expectation.