

Lead Screws for Unmanned Aerial Vehicles



Uses for Lead Screws in Unmanned Aerial Vehicles

Helix Linear Technologies Product Capabilities

The military role of UAV is growing at unprecedented rates. In 2005, tactical and theater level unmanned aircraft (UA) alone, had flown over 100,000 flight hours in support of Operation ENDURING FREEDOM (OEF) and Operation IRAQI FREEDOM (OIF).

THE ROLE OF TECHNOLOGY

Rapid advances in technology are enabling more and more capability to be placed on smaller airframes which is spurring a large increase in the number of Small Unmanned Aircraft Systems "SUAS" being deployed on the battlefield. The use of SUAS in combat is so new that no formal DoD wide reporting procedures have been established to track SUAS flight hours. As the capabilities grow for all types of UAV, nations continue to subsidize their research and development leading to further advances enabling them to perform a multitude of missions. UAV no longer only perform intelligence, surveillance, and reconnaissance (ISR) missions, although this still remains their predominant type.

Their roles have expanded to areas including electronic attack, strike missions, suppression and/or destruction of enemy air defense, combat search and rescue, and derivations of these themes.

These UAV range in cost from a couple thousand dollars to hundreds of millions of dollars, and the aircraft used in these systems range in size from a miniature weighing less than a few pounds to large aircraft weighing over 50,000 pounds.

LEAD SCREWS

Lead screws, acme screws, linear actuators and motion control systems on Unmanned Aerial Vehicles (UAVs) are designed to perform under high force, with high linear precision and in wide temperature ranges. The combination of these specifications makes using lead screws a viable option for aerospace and unmanned vehicle applications.

Lead screws can perform in -50° to 140°F environments well when thermal expansion of the stainless steel screws and bronze or polymer nuts is incorporated into their design. High forces can also be managed by selecting an appropriately high tensile strength material for the nut. Bronze nuts are used most commonly and polymers with glass, and Kevlar can also be used along with a PTFE coating on the screw as a dry lubricant.



MIL-SPEC GREASES

Mil-Spec greases can also be added to a lead screw assembly with a PTFE coating for increased reductions of friction.



APPLICATIONS

Below is a list of the types of UAVs that utilize automated wings and fins to guide their flight.

- Global Hawk
- Predator A & Predator B
- X-47A & X-47B
- Mariner
- Altair
- Fire Scout
- ER/MP UAS
- Hunter
- I-GNAT
- Army IGnat – ER

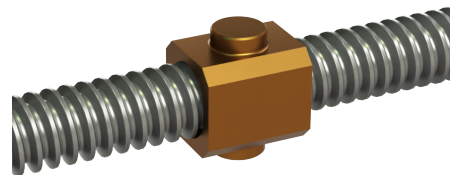
LEAD SCREW CUSTOMIZATION

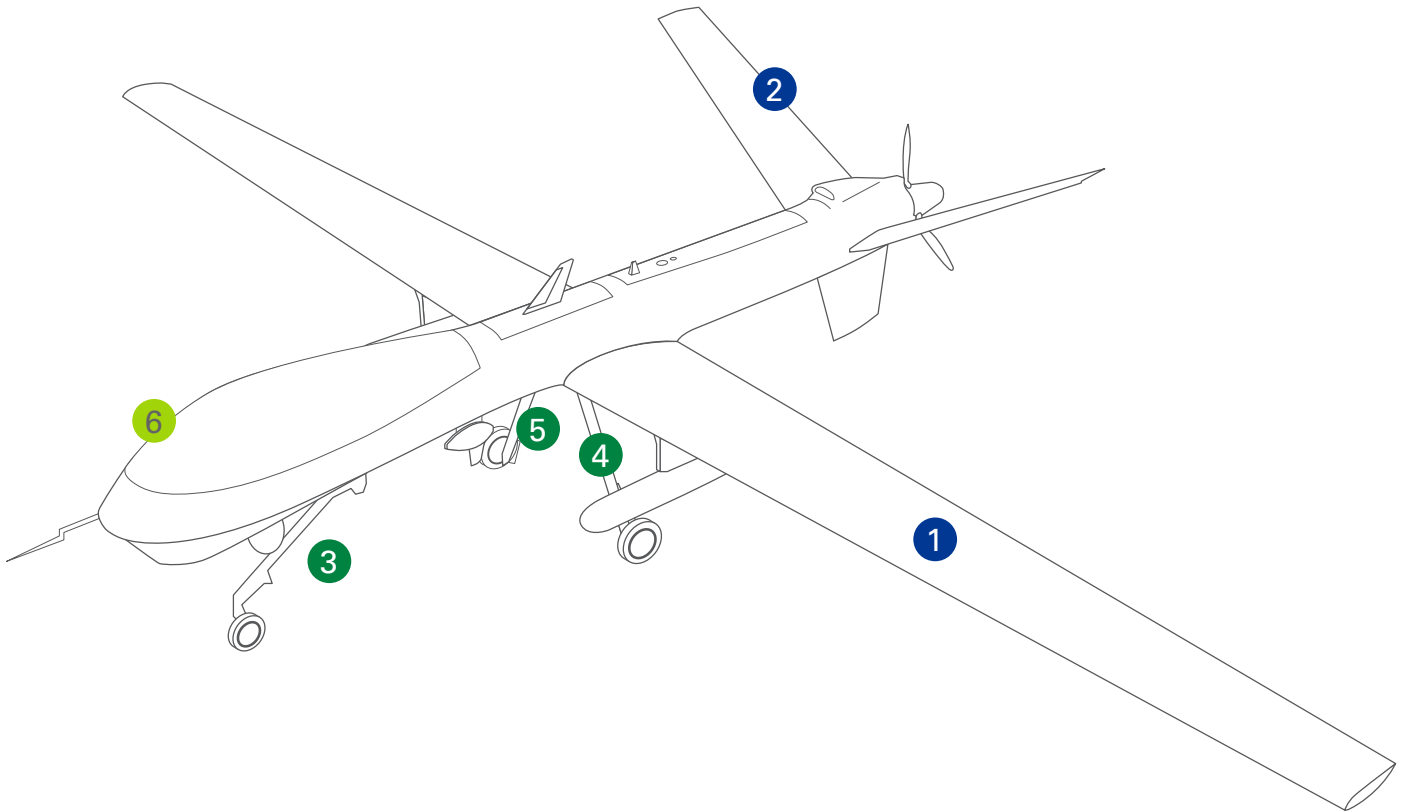
The design of acme nuts and lead screw nuts can easily incorporate other components and customized mounting dimensions. Threaded inserts can be added to the nut design using ultrasonic welding or using inserts welding processes.

Lead screws can also be manufactured from a wide array of materials to meet the specific requirements of UAV. The following materials can be used to manufacture lead screws precisely and cost effectively.

- Titanium
- Stainless Steel
- Aluminum
- High strength Alloys
- Bronze

All of these materials can also be used to manufacture hollow screws for weight reduction purposes. The ends of the lead screws can be machined to accommodate bearings, pulleys, couplings, motors and other components of the assembly.





Flight Control

1. Wing flap actuators – titanium screws with bronze or polymer nuts
2. Tail fin actuation – titanium screws with bronze or polymer nuts

Landing Systems

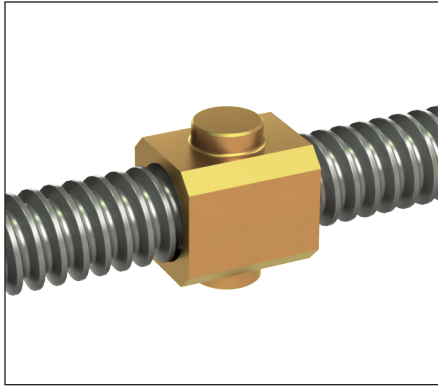
3. Landing gear actuators – extend and retract
4. Door actuators – open and close landing gear and payload doors
5. Parking Brake Actuators

Data Acquisition

6. Pan/Tilt Actuation of cameras and vision systems

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TRUNION MOUNTED NUT

- Standard C.O.T.S. Trunion Mounted Nuts
- **Nut Material:** Bronze, High Strength Polymers, Steel, Aluminum



MACHINING

- Bearing Journals
- Keyways
- Flats
- Hex I.D./O.D.



MINIATURE SCREWS

- 3, 4, 5, 6mm Ø
- Fine Pitch and High Lead Screw Threads
- High Volume Production Available
- Prototype Screws Delivered in 3-4 Weeks



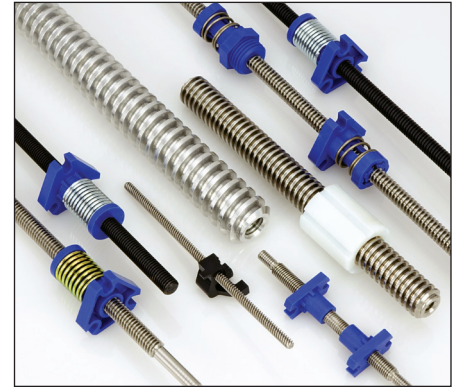
TESTING AND VALIDATION

- Torque Testing and Validation
- Tensile Testing and Validation
- Efficiency Testing and Validation
- Life Testing



PTFE COATINGS

- Dry Lubricant
- Clean Room Compatible
- Increases Efficiency



CUSTOM SCREW SIZES

- Custom Screw Sizes Available
- 4mm - 50mm Diameter
- Quick Delivery on Prototypes

Our products make us industry leaders.
Our people make us world class.

Christopher M. Nook, CEO
Helix Linear Technologies, Inc.

