

## MATERIALS AND STRUCTURES SYMPOSIUM (C2)

Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Mr. Vincent Fraux  
Oxford Space Systems, United KingdomDr. Juan Reveles  
United Kingdom  
Mr. Mike Lawton  
United KingdomASTROTUBE MAX: THE DEVELOPMENT AND TESTING OF A LOW MASS EXTENDIBLE CFRP  
TELESCOPIC BOOM FOR SATELLITE APPLICATIONS.**Abstract**

This paper describes the AstroTube™ Max space boom design and test campaign. The AstroTube Max is a Carbon Fibre Reinforced Plastic (CFRP) telescopic extendible boom which combines a flight proven telescopic outer structure combined with a novel actuation system using a motorised Flexible Composite Member (FCM). The fully retractable boom, designed for a variety of space applications, is highly scalable to achieve 1m to 12m in extendable length. Typical applications include the deployment of large deployable antennas, electric propulsion engines or any payload requiring precise positioning away from the spacecraft platform. Optional features can be added to the boom without involving great design effort due to its versatile architecture; for example, rotation of 0 to 360 around the boom axis during deployment. This is achieved via the addition of rifling on the telescopic tubes. Additionally, electrical and gas feeds can be embedded within the FCM to serve the payload, thus avoiding the need for an external harness. The AstroTube Max can also be made retractable. Oxford Space Systems (OSS) has progressed the AstroTube Max concept by constructing a 2.2m Engineering Model (EM) for environmental testing. The EM weighs 3.057 kg, has a stowed length of 0.4m and an extendible length of 1.8m. The EM was subjected to, and successfully passed, high-sine vibration up to 20g, random vibration up to 14.15g<sup>2</sup>/Hz during 120s, shock test up to 1,000g and thermal cycling from -60C to +120C. The boom developed by Oxford Space Systems can also be adapted to small and micro-satellites by scaling down the actuation system, removing the outer telescopic tubes and using the FCM as an ultralight boom structure.