

Observations of Titan 3C-4 Transtage fragmentation debris

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ABSTRACT

The fragmentation of a Titan 3C-4 Transtage (1968-081) on 21 February 1992 is one of only two known break-ups in or near geosynchronous orbit. The original rocket body and 24 pieces of debris are currently being tracked by the US Space Surveillance Network (SSN). The rocket body (SSN# 3432) and several of the original fragments (SSN# 25000, 25001, 30000, and 33511) were observed in survey mode during 2004-2010 using the 0.6-m Michigan Orbital DEbris Survey Telescope (MODEST) in Chile using a broad R filter. This paper will present a size distribution for all calibrated magnitude data acquired on MODEST. Size distribution plots will also be shown using historical models for small fragmentation debris (down to 10 cm) believed to be associated with the Titan break-up.

In November 2010, visible broadband photometry (Johnson/Kron-Cousins BVRI) was acquired with the 0.9-m Small and Moderate Aperture Research Telescope System (SMARTS) at the Cerro Tololo Inter-American Observatory (CTIO) in Chile on several Titan fragments (SSN# 25001, 33509, 33510) and the parent rocket body. Color index data will be used to determine the fragment brightness distribution and how the data compares to spacecraft materials measured in the laboratory using similar photometric measurement techniques.

In 2012, the SSN added 16 additional fragments to the catalogue. MODEST acquired magnitude data on ten Titan fragments in late 2012 and early 2013. The magnitude distribution of all the observed fragments are analyzed as a function of time. In order to better characterize the break-up fragments spectral measurements were acquired on the original rocket body and five Titan fragments using the 6.5-m Magellan telescopes at Las Campanas Observatory in Chile. The telescopic spectra are compared with laboratory acquired spectra of materials (e.g., Aluminum and various paints) and categorized based on known absorption features for spacecraft materials.