# II. Decay Epoch of the "Tiangong-1" Spacecraft
# November 15, 2017

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The materials described below are the continuation of the same text name posted on the website “satmotion.ru” for November 1, 2017 [1].

**The results of the November 15, 2017**

For 60 earlier points in time, updating the orbital parameters was made through the array of source measurements, which were as known TLE. Following are the results of the most recent update. Here the coordinates (km) and velocity (km/sec) are in Topocentric Equatorial Coordinate System (as in TLE).

21867.837105- modified Julian day =November 14 $20^h$ $05^m$ $25.44^s$
6583.442803 - x
-1093.815137 - y
-0.072085 - z
0.9113363919 - Vx
5.6031927561 - Vy
5.2525352480 - Vz
0.00294 - Sb (ballistic coefficient, $m^2/kg$).

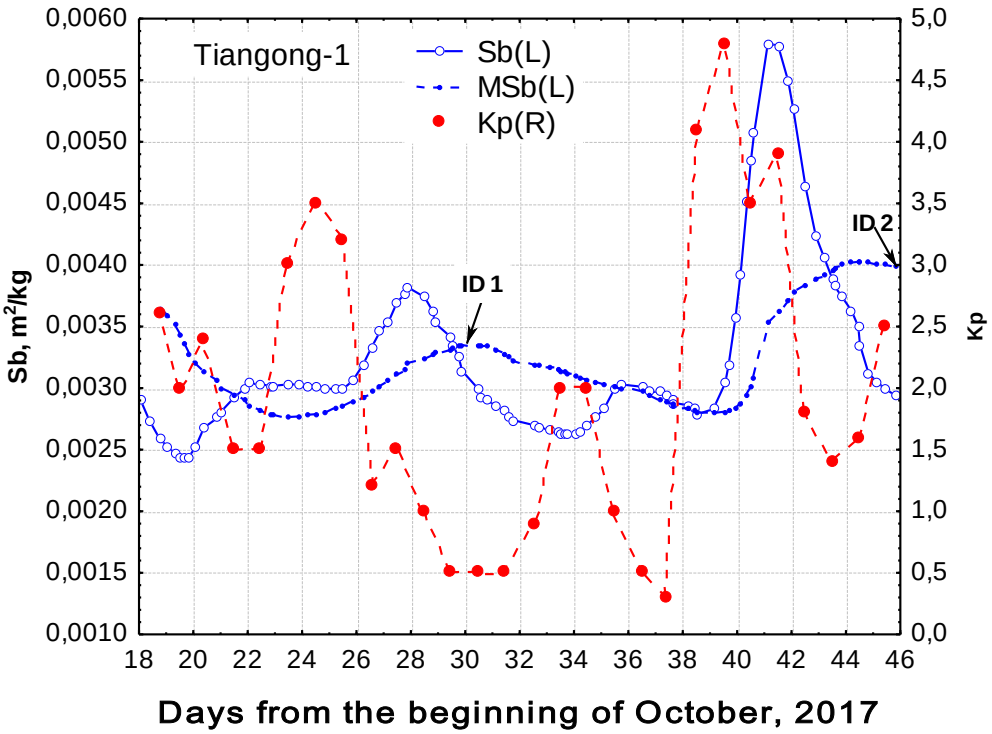



Figure 1. Sb and Kp values

Figure 1 presents the assessment of ballistic coefficient and subscript geomagnetic perturbation (Kp) for all points in time updating the orbital parameters.

Values of ballistic coefficient (Sb) vary in the range from 0.0026 to 0.0058 $m^2/kg$, i.e. 2.2 times. These assessments play an important role, as used as initial data for calculating burn up SC in the atmosphere. The most powerful variation of inhibition was observed in the time interval from November 9 to 13. Red dotted line marked by the average assessment of Sb at some previous time interval (moving average). They are used when generating initial data for prediction.

Comparison of assessments of Sb with geomagnetic perturbation index shows that the above strong variation of braking are the consequence of geomagnetic storms on November 9-13, which led to additional heating up of the atmosphere and the corresponding increase in its density. The last smoothed ballistic coefficient value (0.00399 $m^2/kg$) was used as a constant value in the prediction of the SC motion until his entering the dense layers of the atmosphere. Relevant results prediction for these initial data (ID 2) are shown in Figure 2. When this scatter plot is prepared, the time step of 10 minutes was used. That is why the figure has a peculiar appearance.

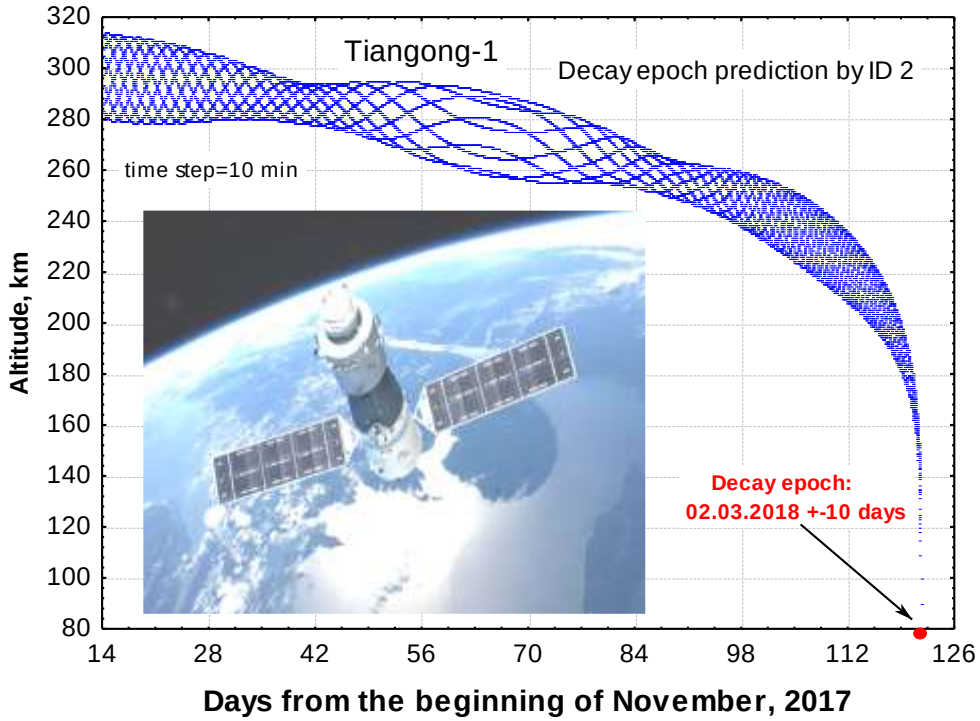



Figure 2. Altitude values as time goes on

**Reentry Information.**

**Tianging-1 is predicted to reenter in 2018, March 02 ±10 days.**

**Recent publications**

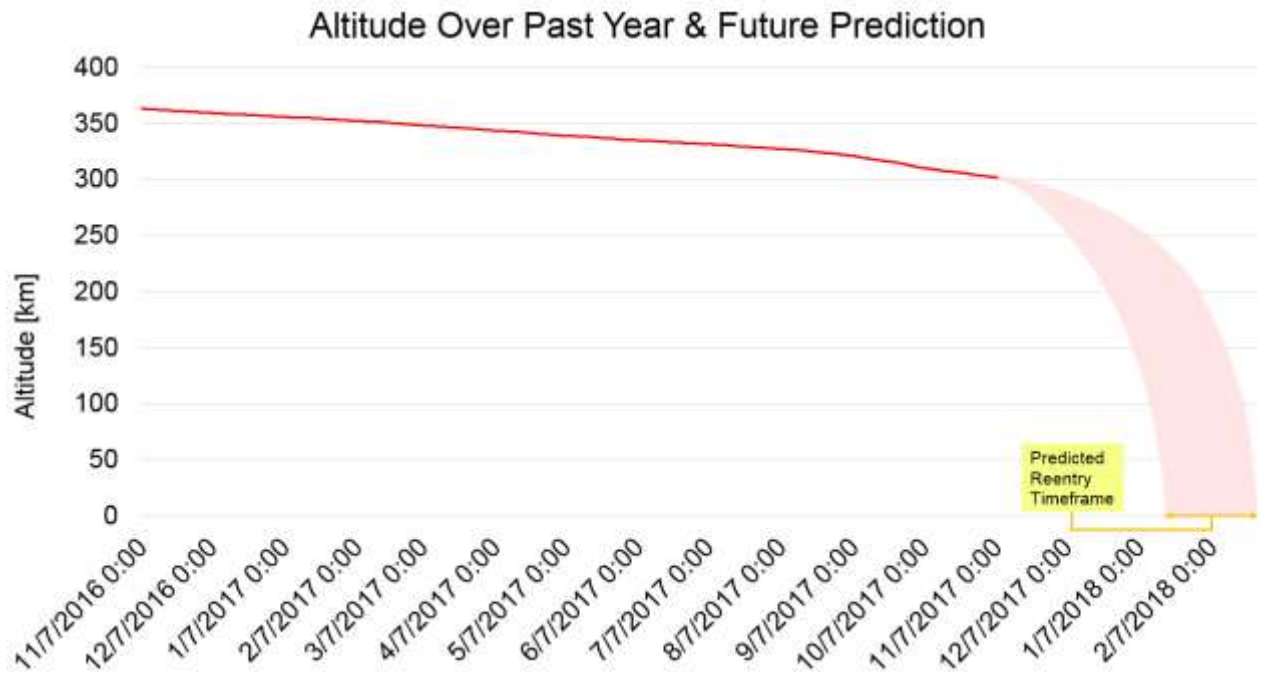
a) ESA, Published Date: Nov 10, 2017 08:52 am

The Tiangong-1 space station will make an uncontrolled reentry into the Earth in early 2018. Often such re-entry leads the spacecraft to burn up. Thus, it has been predicted that the spacecraft's fragments may fall in various parts of Europe within a specific latitude. The prediction date lies between January and March 2018.

Meanwhile, International Agency Space Debris Coordination Committee (IASDCC) members would be organising a campaign to track the re-entry of the spacecraft. The IASDCC would be conducting this to study various predictions, available data set and test them to come with proper analysis. Meanwhile, the ESA would be organising a campaign on 28 February to study various predictions and atmospheric break-up studies in this specific area.

б) This prediction was performed by The Aerospace Corporation on 2017 November 7

Tiangong-1 is predicted to reenter in early February 2018 ± 1 month.




**References**


1. A.I. Nazarenko. Decay Epoch of the "Tiangong-1" Spacecraft. November 1, 2017. Site satmotion.ru