Attitude report
ICI4 Campaign

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Abstract

The attitude calculations are based on measurements by the on-board ASC magnetometer. The calculations are valid from flight time 66 up to 560 seconds.
ICI4 had a coning half-angle of approximately 6.6º and coning period-time of 18.2 seconds. The apparent spin frequency is approximately 3.2 *Hz* after the boom release.
The residuals of the calculations indicate that the fitted orientation differs with less than 4.0 degrees from the measured orientation.
The magnetometer data was extracted from the telemetry stream with the actual bitrate of 3333331.025 *bit/s*, and flight time $t = 0$ when format counter goes from 0 to 1.

1. Introduction

This report covers attitude calculations for the ICI4 campaign. The trajectory calculations are covered in earlier report, «ICI4 final trajectory», presented a few days after launch.
The attitude calculations are based on measurements by the on-board magnetometer for flight time from 66 up to 550 seconds. The coning vector have been set to parallell to the velocity vector of the rocket at S30 separation at 26s flight time.
The magnetometer data was extracted using the ARS tool TMRead set up with bitrate 3333331.025 *bit/s*, and flight time $t = 0$ when format counter goes from 0 to 1.

2. Magnetometer orientation

The magnetometer orientation in the ICI4 payload is as given in figure 1.

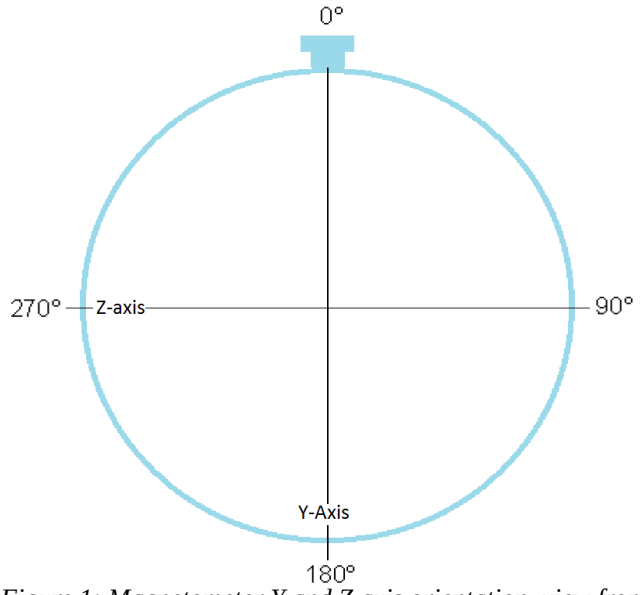

Figure 1: Magnetometer Y and Z axis orientation, view from front.

3. Attitude

3.1 Calculation results

A summary of key values are listed in table 1 below.

Apparent spin [Hz] after boom release	*Coning half-angle [deg]*	*Coning period time [s]*
3.2	6.6	18.2

Table 1: A summary of key values.

The apparent spin frequency is plotted in figure 2 below.

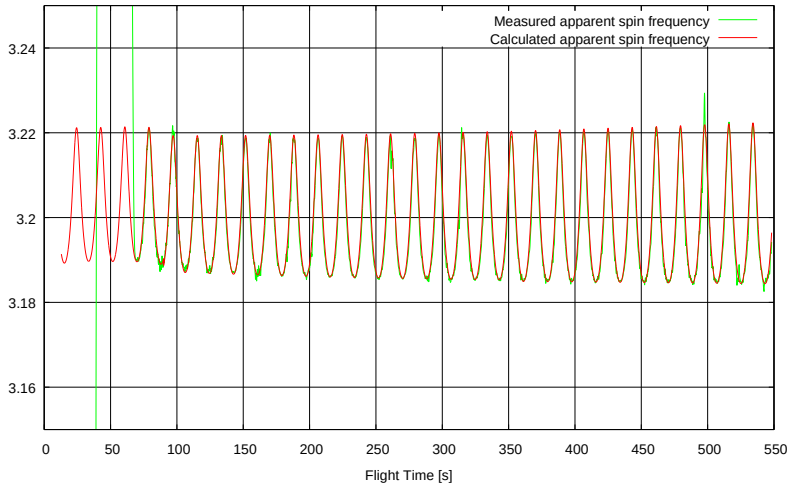

Figure 2: The ICI3 apparent spin frequency of the magnetometer Y and Z axis.

The payload longitudinal axis orientation is plotted in figures 3 and 4.

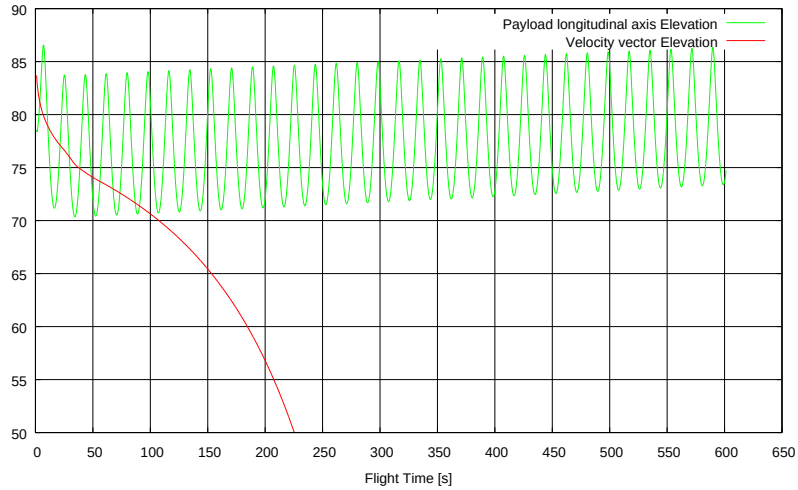

Figure 3: Longitudinal axis elevation plotted together with velocity vector.

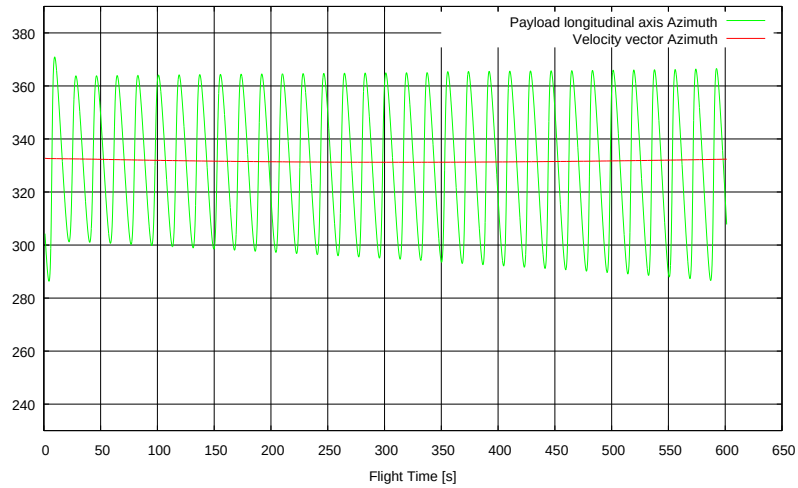

Figure 4: Longitudinal axis azimuth plotted together with velocity vector.

3.2 Calculated attitude, residuals

Figures 5 - 7 contains plots of the residuals of calculated magnetometer spin axis aspect angles to the magnetic field.

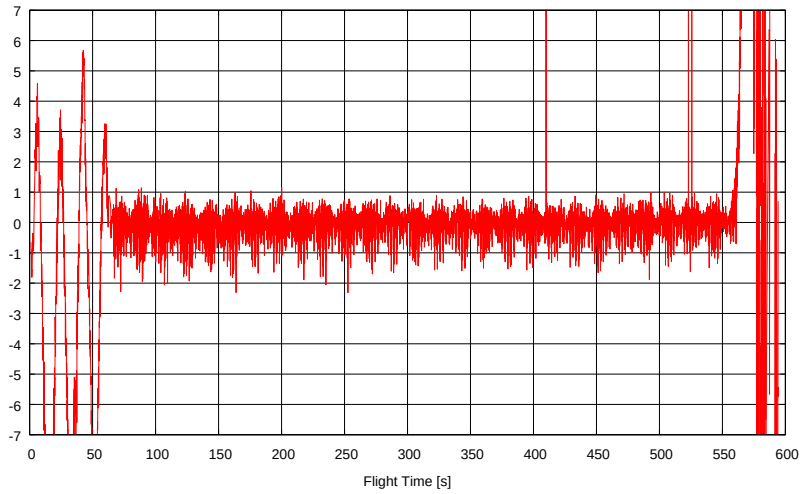

Figure 5: Magnetometer X-axis residuals, given by the difference between calculated and measured aspect angle to the magnetic field vector.

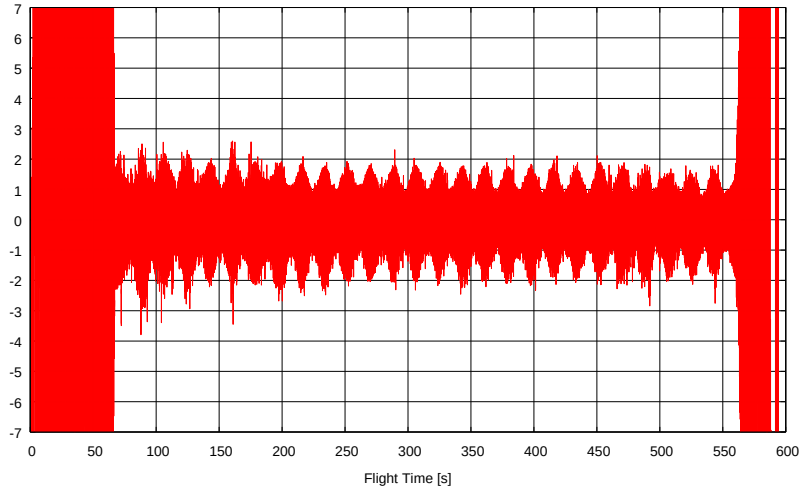

Figure 6: Magnetometer Y-axis residuals, given by the difference between calculated and measured aspect angle to the magnetic field vector.

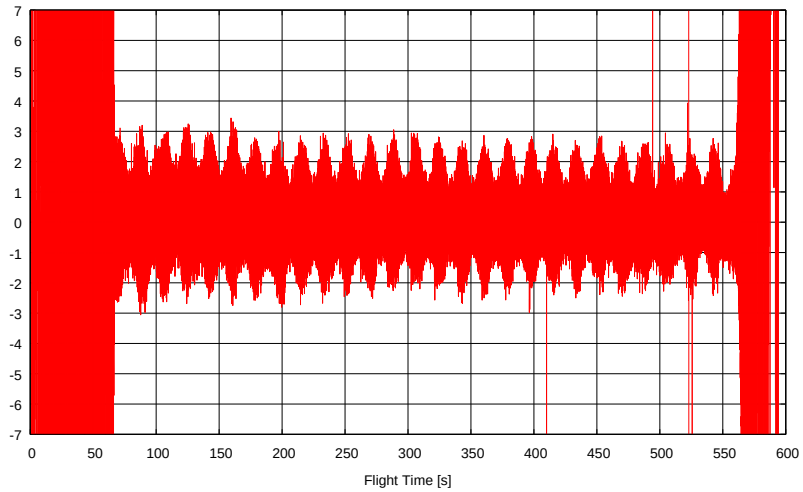

Figure 7: Magnetometer Z-axis residuals, given by the difference between calculated and measured aspect angle to the magnetic field vector.

4. Conclusion

We can from the figures 5 - 7 conclude that during flight time 66 up to 560 seconds, the calculated spin axis orientation for ICI4 typically differs with less than 4.0 degrees from the measured values.