FRAM analysis on two spacecraft accidents
- The equivalence of failures and successes -

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We applied FRAM analysis to two spacecraft systems: X-ray astronomical satellite "ASTRO-H" of JAXA and experimental autonomous rendezvous/docking satellite "DART" of NASA. The analysis identified the navigation subsystem design unique for each astronomical satellites and rendezvous satellites. The biggest difference in each system's navigation design philosophy comes from the methodology to incorporate main navigation sensor into attitude/position determination. The analysis revealed that both designs were optimized for each mission, but at the same time, both designs respectively caused the loss of satellite. The comparison between the two systems will show one of the most important principles of FRAM: The equivalence of failures and successes. Each cause of accident (failure) is the design feature which is necessary to achieve each mission (success).
In this presentation, we will explain the results of FRAM analysis in the navigation system of these satellites, and how to identify risks from success factor.

- "ASTRO-H" is astronomy satellite developed by Japan Aerospace Exploration Agency (JAXA) to observe black holes, clusters of galaxies, etc. ASTRO-H lost its attitude control and was destructed by excessive rotation rate due to main attitude sensor incorporation logic.
- "DART" is earth orbiting satellite developed by National Aeronautics and Space Administration (NASA) to test autonomous rendezvous technology. DART chaser satellite collided to its target satellite and depleted the fuel due to main position sensor incorporation logic.