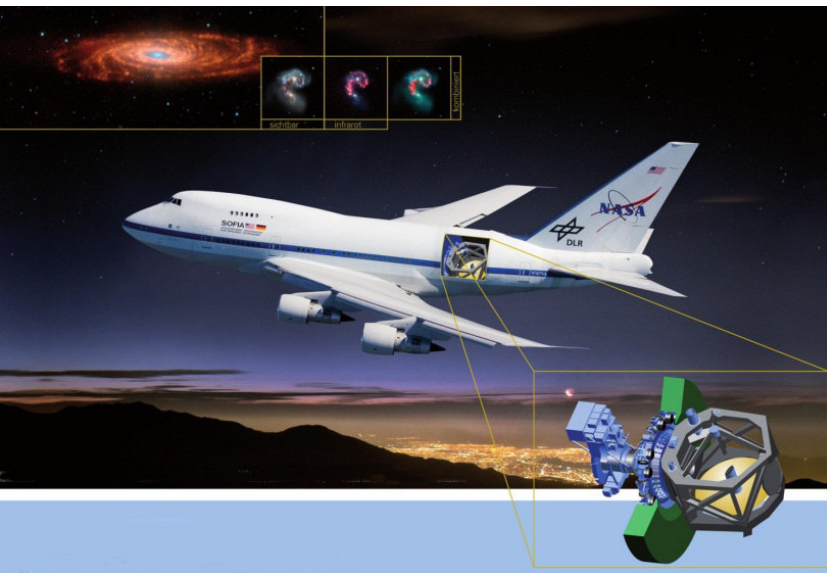


Reckonic

MOTION UNDER CONTROL

R&D ASTRONOMY

Application: Stratospheric Observatory for Far-IR Astronomy



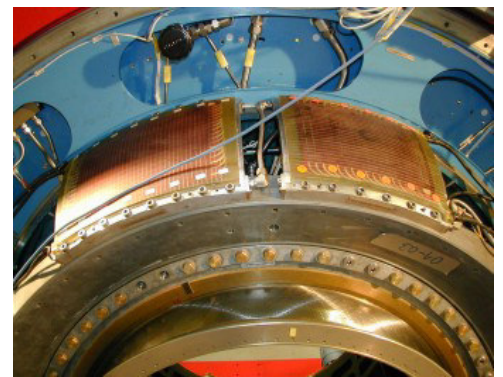
The Stratospheric Observatory for Infrared Astronomy (SOFIA) is a joint project of NASA and the German Aerospace Center (DLR).

SOFIA is based on a Boeing 747SP wide-body aircraft, that has been modified to include a large door in the aft fuselage that can be opened in flight to allow a 2.5 meter diameter reflecting telescope access to the sky. This telescope is designed for infrared astronomy observations in the stratosphere at altitudes of about 12 km. SOFIA's flight capability allows it to rise above almost all of the water vapor in the Earth's atmosphere, which blocks infrared wavelengths from reaching the ground. At the aircraft's

cruising altitude, 85% of the full infrared range is available.

Project: SOFIA Fine Drive

In order to isolate the telescope from the movement of the aircraft during flight, it is mounted at the end of a beam, which in turn is supported on a hydraulic bearing. There are 24 curvi-linear motor segments with a diameter of around 2m, fitted around this bearing system. Together they constitute the "Fine Drive" system of the telescope, which can produce torque directly in all 3 axes of movement. 8 segments are responsible for the generation of torque in any one axis; each segment not only producing torque but also allowing for the orthogonal motion being caused by another axis of motion. The Fine Drive motor has a peak torque of 1,000Nm in all directions of rotation and allows for motion over a cone of $\pm 3.5^\circ$. This is sufficient for the stable observation of a star or galaxy for up to 40 minutes, while the aircraft is flying at normal cruising speed and following the curvature of the earth.



RECKONIC contribution

For the SOFIA project RECKONIC designed, manufactured and supplied the 3D Fine Drive motor and its controls as well as the SPS, a Spherical Positioning Sensor to observe the spherical motion of the Fine Drive joint. This sensor feedback supports motor phase current commutation and further provides velocity and end-limit control. RECKONIC was also contracted to supply the Coarse and Balancer Drive motor systems as well as a number of auxiliary drive systems.