



Images courtesy of L-3 and NASA

CUSTOMER:
**L-3 Communications,
 Integrated Systems**

INDUSTRY:
Aerospace

PROJECT NAME:
**747SP Aircraft Ground
 Vibration Test for the
 Stratospheric Observatory for
 Infrared Astronomy (SOFIA)
 Program**

CUSTOMER LOCATION:
Waco, Texas

OVERVIEW

A Boeing 747SP aircraft was modified by L-3 Communications Integrated Systems to accommodate a 2.5 meter reflecting telescope as part of the SOFIA program. SOFIA, which will be the largest airborne observatory in the world, is a collaborative effort of NASA and DLR, the German Aerospace Center. This flying observatory is being developed and operated for NASA by a team of industry experts led by the Universities Space Research Association (USRA).

One of the crucial steps in preparing the aircraft for flight was a ground vibration test (GVT), which characterizes the dynamic properties of the aircraft. This was required because major structural modifications had been made to the aircraft to accommodate the telescope and all of the supporting equipment. L-3 performed detailed finite element analysis of the modified aircraft to allow dynamic analysis and flutter studies to be performed, and ATA was brought in to conduct the GVT of the aircraft in support of the L-3 analysis efforts. ATA provided all of the instrumentation and data collection and analysis systems required to conduct the GVT and worked side by side with L-3 analysis engineers in comparing test and analysis results in preparation for final flight certification.

Further testing allowed dynamic interaction between the aircraft and the telescope assembly (TA) to be studied so that the TA vibration isolation system performance could be evaluated. ATA's data system allowed all aircraft and telescope responses to be monitored while the TA control system was actuated. In addition, local components (telescope cavity doors, aperture, bulkheads, etc.) were studied in a number of configurations to observe dynamic interaction with the aircraft.

ATA SUPPORT INCLUDED:

- ▷ Coordinated sensor location selection with L-3 and other team members.
- ▷ Conducted complete GVT of the 747SP SOFIA aircraft for eighteen unique configurations.
- ▷ Provided detailed test results to L-3 analysis engineers during and at the conclusion of the GVT program.
- ▷ Evaluated the telescope assembly isolation system characteristics and collected overall aircraft and telescope data during telescope assembly drive system excitation to assess servo-elastic properties.
- ▷ Studied local component modal behavior including telescope cavity acoustic modes and evaluation of tuned-mass damper behavior.
- ▷ Coordinated final test results with L-3 engineers for model updating activities.

