L3Comm systems integration team relishes benefits from AGPS on the S.O.F.I.A project

Background

NASA and the DLR, German Aerospace Center, are working together to create SOFIA — a Boeing 747SP aircraft modified by L-3 Communications Integrated Systems to accommodate a 2.5 meter reflecting telescope. SOFIA will be the largest airborne observatory in the world, and will make observations that are impossible for even the largest and highest of ground-based telescopes.

For more information please visit http://sofia.arc.nasa.gov/

Partner

L-3 Integrated Systems is a leader in the global Intelligence, Surveillance and Reconnaissance (ISR) market. IS is also a leader in integration services and modernization of key, special purpose fixed and rotary wing platforms and programs.

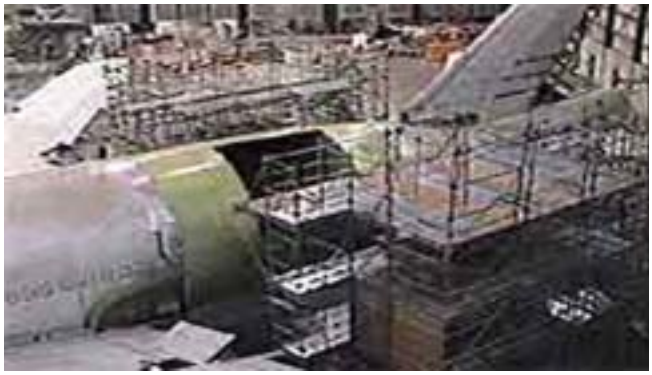
L-3 Communications Integrated Systems, a principal player on the SOFIA team which is responsible for the aircraft's modifications will provide design engineering, airframe structural modification, telescope design integration and flight test activities to deliver a FAA-certified SOFIA Observatory.

L3Comm's airworthiness endorsement of the SOFIA vehicle proved to be as large a task as certifying a new aircraft. In our business accuracy and reduced cycle times from a design, testing, manufacturing and customer satisfaction standpoint mean everything to us. In this endeavor, the largest challenge in simulating the behavior of the 747-SP with aft fuselage modifications, was to accurately loft a model of the entire aircraft to the level of detail required for our aeroelastic, structural, and fluid dynamic studies in allotted time. With this challenge, we expected our engineering optimization task to involve iterative surface definition design studies, easily requiring hundreds of thousands of analysis runs, related geometry modifications, and wind-tunnel model creation.

In the past we could expect 2-4 weeks for creation of a single surface definitions accurate enough for analysis. Instead of using precious development time refining external geometries for our strict level of quality we started from a better place**….** We knew as our SOFIA baseline model grew to an optimum shape, we could rely on the Aero-Grid Paneling System's (AGPS™) unparalleled modeling mathematics to define a surface model and also leverage its real-time programmability to automate and transfer our design philosophies to our processes. This flexibility made our overall design process efficient and much more reliable.

Starting from scratch, AGPS's unique capabilities were used to precisely loft realistic surface geometry from drawings, by creating conic definitions of the Boeing 747-SP vehicle. The aft cavity was then seamlessly integrated using AGPS's modeling commands to ensure that the geometry was truly grafted to the underlying geometry. We were able to proceed with confidence to the next step of computational modeling assured of accuracy because of AGPS mathematical entities that ensured the underlying geometry was always precisely mapped to our data and could be altered in real-time as design changes were made.

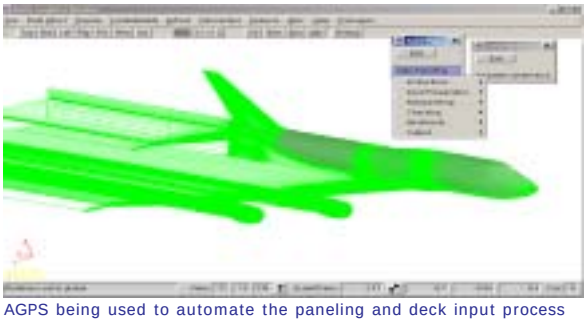
During creation of analysis computational and experimental surface representations we were able to use AGPS to apply our design rules into autonomous routines for extraction of point networks describing the aircraft definition for our TRANAIR panel codes, NASTRAN codes, and nodes for wind-tunnel models.



A Boeing 747-SP being integrated with SOFIA module.

We were able to reliably reduce development time by removing interactions usually required for tasks such as ensuring proper abutments at intersection points. The automated AGPS routine was intelligent enough to check all our necessary requirements and allow us to create, what were finally a million surface definitions at minutes apiece.

The only shortcomings we experienced with AGPS, were at the time it was not commercially available and we could not share geometry, tools, and shortcuts we utilized. This kind of collaboration would have been invaluable in this sort of multi-enterprise venture. We could have easily exported working automated applications for grid generation and surface manipulation that would have saved tremendous team efforts and allowed a new management scheme never before possible.



AGPS being used to automate the paneling and deck input process for TRANAIR.

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