



ASC ENGINEERING FACT SHEET

... AN ENGINEERING SUCCESS STORY

F-15 Nose Gear Shimmy During Takeoff



DESCRIPTION

F-15 SPO engineers pulled together and led a multi-faceted technical team assembled from around the country with key players from Ogden-ALC, Warner Robins-ALC, Boeing Co., and Air Force Research Laboratory. This team, led by ASC/ENF engineers, adopted a two-pronged approach in an effort to assure a total system solution rather than "band-aid" fixes. First, based on initial

SUMMARY

PROBLEM:

- Over the years, the F-15E fleet has been plagued by nose gear shimmy during takeoff. Shortened maintenance intervals and increased overhauls were used to keep the problem manageable. Inexplicably, the problem has worsened in recent years, causing great concern with the warfighter.

SOLUTION:

- A USAF/Contractor team led by EN engineering developed a cost effective, simple mass damper, tested both in the lab and on shimmying F-15Es in the fleet.
- The design has been put into production and efforts are now underway to manufacture and install them on all USAF F-15E aircraft and offer kits to Israel and Saudi Arabia for their F-15I and F-15S jets.

findings, the team sent out Interim Operational Supplements to F-15 maintenance technical manuals to provide immediate guidance on nose strut repacking and steering actuator hydraulic bleed procedures – somewhat extending time between shimmy occurrences.

They laid out a master plan beginning with a laboratory study to characterize and understand the shimmy phenomena, to develop practical solutions, and ultimately to demonstrate fixes with F-15 test aircraft. The team worked through a myriad of contracting and funding obstacles to proceed with laboratory testing of the design. The nose gear from a chronically shimmying F-15 was obtained from the field and a special test fixture was built at the landing gear lab at Wright Patterson AFB.

Working through several possible design concepts, the team settled on a mass damper as the preferred solution. The mass damper design demonstrated dramatic success in delaying the onset of nose gear shimmy in the laboratory. It is also a very simple and low-cost design with no moving parts, thus making it very attractive for fleet incorporation.

Boeing was tasked to build four prototype mass dampers for field testing on F-15E aircraft with existing shimmy problems. Airworthiness for the device was demonstrated on a test F-15 jet at Boeing, St. Louis. Air Combat Command approved the use of operational jets for proof of concept testing. EN and contractor personnel installed three prototype dampers on Nellis AFB jets. They provided base maintenance information about the dampers and witnessed the first few flights on the selected chronically shimmying jets. The tests have proven

to be 100 percent successful. One jet, known as "the HUD Shaker," has never had a recurring shimmy problem. After nine months of operational flights on four different jets, each with prior documented chronic nose landing gear shimmying anomalies, no evidence of shimmy has recurred.

Current efforts are proceeding to retrofit the fleet of 218 F-15E aircraft with a production version of the damper. ENF engineers found the scarce funding for development and production to make this happen. The soon-to-be-realized final solution to the historic F-15 nose wheel shimmy problem is a simple, low-cost mass damper mounted on the nose landing gear fork, requiring virtually zero maintenance. It will significantly reduce F-15E maintenance costs and structural wear and tear of the landing gear for the remainder of the fleet's life.

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