

BAE Systems Eurofighter Typhoon - Foreplane Stage Reduction

The Eurofighter Typhoon has a foreplane/delta configuration, which is intentionally aerodynamically unstable to provide extremely high levels of agility, reduced drag and enhanced lift. The unstable design cannot be flown by conventional means and the pilot controls the aircraft via a computerised digital Fly-By-Wire system that offers fully carefree handling.

The original foreplane manufacture was a multi-stage production process. Each stage required the part to be located in a stage fixture, manually adjusted before each machining operation. This was repeated 3 times on 3 different fixtures, requiring removal of the part from the machine bed each time. There were also mid-process CMM checks. During any of these operations a single error could scrap the part machined foreplane.

BAE Systems approached the experts at MSP to assist with development of the process. MSP worked along side the team to advise on probing, machine tool performance and formulate a solution based on software fixturing using MSP's NC-PerfectPart.

The foreplane measures 2.2m x 1.1m and is machined from a formed titanium blank. It is machined in a production cell built around Henri Line GICAMILL 24 LS/5, measuring 3.2m x 2.0m x 1.5m in size, which is a 5 axis machine of Head/Head configuration and is equipped with a Renishaw MP700 probe. The machine has a Fanuc 16i controller through which NC-PerfectPart probing and part alignment data is exchanged.

After initial work the team decided these techniques could be used to reduce the number of manufacturing stages by designing a versatile vacuum fixture fully exploiting NC-PerfectPart's capabilities. The result is that four stages were reduced to a single operation with the additional benefit of the removal of some CMM checks. The results have been excellent with significant time saving, cost saving and reduced scrap rates.

NC-PerfectPart's simple browser interface guides the machine tool operator through the process of fixturing the part in software, and with its built-in fail-safe checks results in the elimination of any possible errors. The process tolerances can be adjusted, and the machining tape files can be run. The system has been running since 2006, and with NC-PartLocator, a module of NC-PerfectPart, foreplanes can be fixtured in minutes as opposed to days with the original procedure.

The introduction of NC-PerfectPart greatly enhanced the creative possibilities for the team by removing the constraint of accurate fixturing, leaving them free to think laterally and achieve considerable time and cost savings as a result. So just as "fly by wire" allows the Eurofighter Typhoon to be more agile, so NC-PerfectPart has the same effect on a machine tool.

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“BAE Systems wanted to reduce their manufacturing time, failure rate, and part setup times by using machine tool probing. However their probing trials showed the problem was far more complex than first thought.”

Peter Hammond

Technical Director
metrology software products ltd