
Case Study - Aircraft Assembly

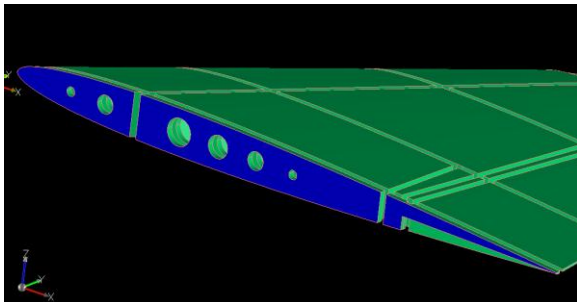
CHALLENGES:

In an effort to reduce final assembly time on expensive fighter jets, a deliberate gap is designed in between the wing assembly and the fuselage. When the components (wing assemblies and fuselage) are positioned in the final assembly fixture, a production worker takes a series of gap measurements between each wing and the fuselage with a tool similar to the one used to measure spark plug gap in your car engine. The measurements are logged on a paper form and a second worker produces a redundant form. The results are then compared, signed off, and routed to the CAD department where a custom CAD models are created for shims to fill the gaps.

The wing outline, complete with final cut-off tabs and break-away joint lines, is stored as a 2D DXF file in a library.

The primary challenge is the amount of delay time in the final production of a \$30M aircraft - sometimes as much as two days to get a custom shim designed and machined.

Our customer purchased an inexpensive CNC mill to machine the shims in a cell adjacent to the final assembly area, but needed a way to compress the time to get the CAD model developed. Another challenge was that the production workers on the shop floor are union workers whereas the CAD programmers are salaried, and having a union worker doing salaried "programming" work is not allowed.



DESIGN GOALS:

The customer wanted the following capabilities:

- Rapid creation of custom shim models without involving the CAD department.
- Avoid violating any union labor rules.
- Simple, foolproof software that could be classified as a "production aid".

SOFTWARE COMPONENTS:

The "System" we developed to meet these goals consisted of a program that runs within SURFCAM CAM software as an Add-In and a stand-alone utility for toolpath management. For discussion purposes in this write-up we'll call them:

- **ShimMaker** - A tool for creating custom shims.
- **CutLibrarian** - A utility for storing and retrieving standard machining processes.

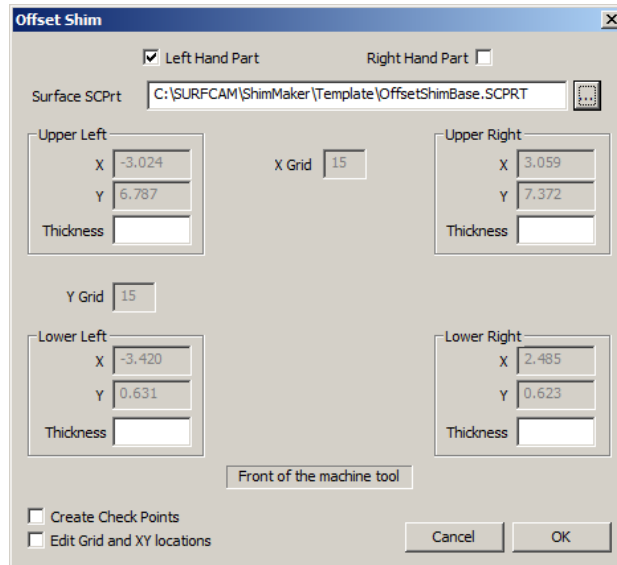
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ShimMaker

This AddIn creates a custom shim CAD model directly from the gap readings input by the production worker on the shop floor. The user browses for the correct wing outline (DXF file), indicates the type of shim (simple bevel along X or Y vs. 3D "potato chip" surface), and the software automatically positions the shim outline to fit standard stock size, rotating the CAD data into the correct position prior to applying the desired thicknesses.

There are several shim types and corresponding dialog boxes that allow a "non programmer" to simply fill in the required fields to create the desired shim type. Understanding all the shim types reduce the functions to simple checkbox and field fill-in

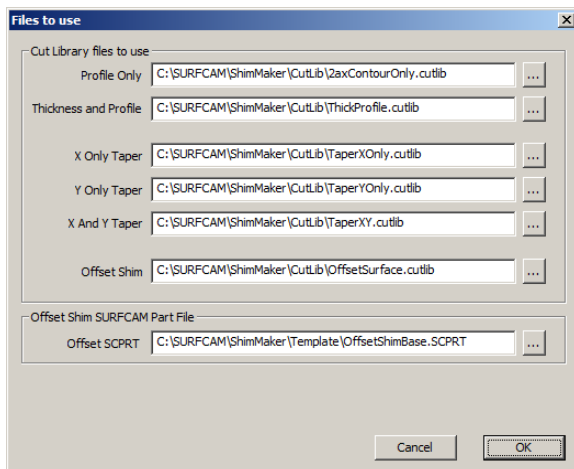
The dialog box to the right controls this process for an surface shim type:



helped activity.
offset

CutLibrarian

This utility retrieves the machining steps that are pre-programmed and stored in external files as shown below:



When retrieved, this causes the SURFCAM system to generate

the several toolpaths required to produce the active shim type. The customer is in complete control of the contents of the cutlib files such that no software changes are needed to alter the automated machining processes.

RESULTS:

A process that formerly took up to 2-days is now done in as little as 15 minutes. CAMcad Technologies specializes in automating redundant, tedious programming tasks that have saved aerospace manufacturers countless hours of production time.