

From Design to Production at **Flying-S**

Eleven years ago, David Shaw and his wife Penny launched Flying-S Inc. (Palestine, IL) as an aeronautical consulting firm. David, who like his father is an avid pilot, had earned his private pilot's license when he was 16 and studied aeronautical engineering with an eye to being involved with the aviation business. Along with Penny, who had studied business, David founded the design firm which has grown from a one-man shop designing parts for the James Webb Space Telescope for NASA into a 16,000 ft² (1486-m²) manufacturing facility with a workforce of 30 people. Today, the company designs and manufactures aerospace parts like wings for unmanned aerial vehicles (UAV), as well as components for NASA.

Fixturing trims set up for aerospace carbon parts.



Carbon trim fixture with Carr Lane clamps is placed inside the Haas VF-6 vertical machining center. The irregular pattern of the receiver bushings of the Carr Lock system allows Flying-S to put fixtures in several different configurations depending on the workpiece that needs to be trimmed. The operator simply loads the fixture and parts, selects the appropriate CNC program and is up and running in just a matter of minutes.

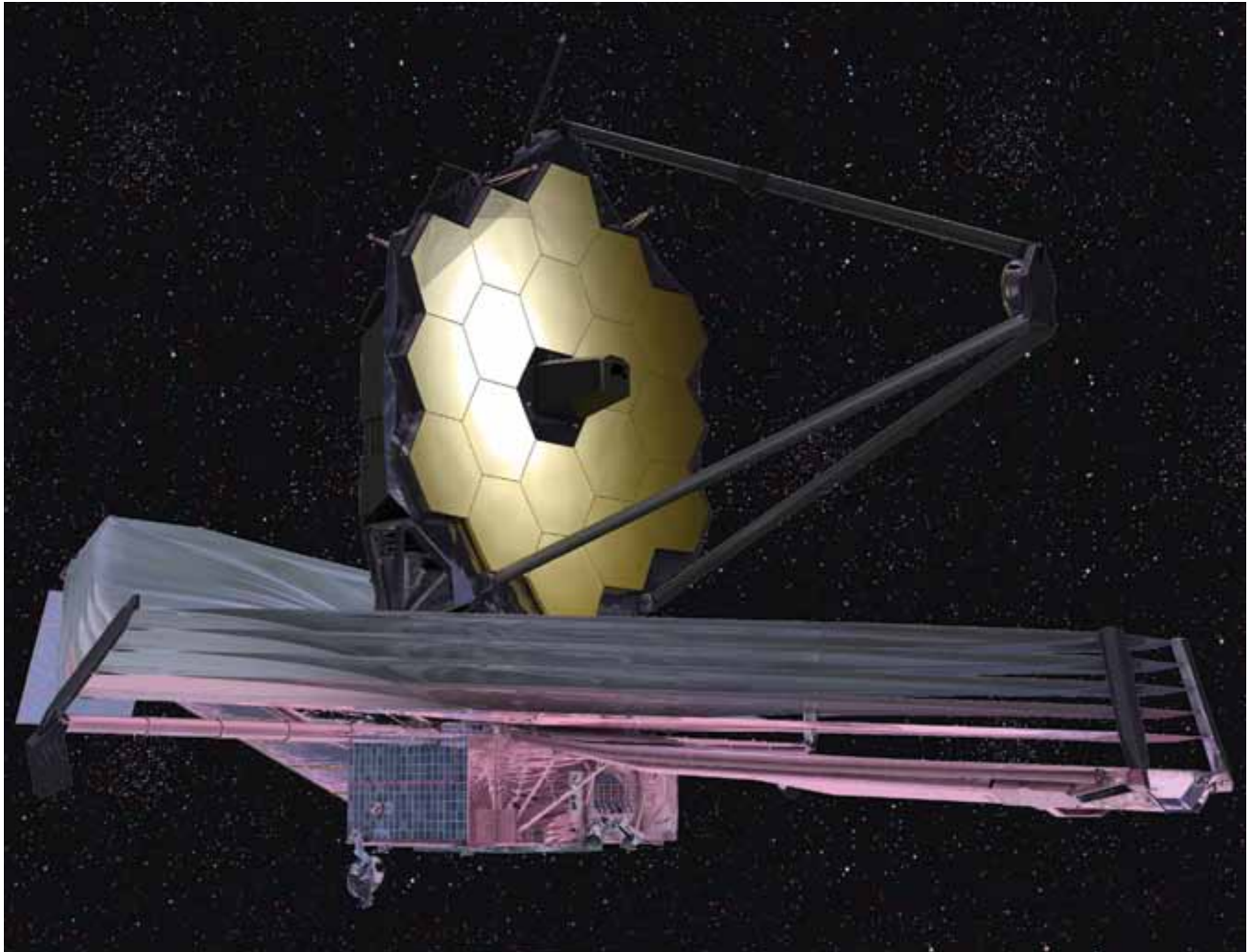
“Ten years ago, Flying-S began as a home-based design consultancy. We then expanded to the garage with a couple of technicians fabricating various prototypes that David would design. When the team grew to half a dozen people and a job site trailer two years ago, we knew we needed a different facility with room to expand into more manufacturing designs. A year ago, we built a new facility and now our team of 30 people has outgrown that. Right now construction crews are almost done completing an addition to double the size of the facility,” said Penny Shaw.

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“The most recent challenge facing the Flying-S is making the transition from prototype to production on an important UAV project,” said Peter Bowman, production manager/manufacturing engineering. “We’ve developed elaborate fixturing for carbon-fiber trim of all shapes and sizes with vacuum integration to help us in our CNC trimming. Our programming is working wonderfully, and we’ve invested in the proper tooling as well to deal with the difficulty of cutting carbon fiber. The issue was that we didn’t have a proper way to quickly locate and secure all the tooling that we had designed and built. What we found ourselves doing was leaving our trim fixtures set up on a large gantry-style table as much as possible and then having to tear everything down when a large part came along to make way for it. This was terribly inefficient and tied up one of our most valuable spindles. Dust collection was nearly impossible, and changeover and setup times were totally out of control,” said Bowman.

Flying-S was a customer of Carr Lane Manufacturing Co. (St. Louis), purchasing clamps, Go/No Go gages, so Bowman visited the Carr Lane booth at IMTS for workholding advice. “Colin Frost, Carr Lane special projects manager, demonstrated how Carr Lock zero-point technology could be used to combine 80% of its fixtures into just one fixture plate using just two ½” [12.7-mm] Carr Lock pins,” said Bowman. “The result was excellent locating ability and improved clamping. Our setup times have gone from an average of about 25 minutes to literally 30 seconds, and we’ve been able to keep our carbon trimming contained in a much smaller enclosed machine with better dust collection. We’ve also benefited from improved tool life because tooling can be set up longer without having to be removed for other operations. Finally, our assembly department has been very happy with the increased quality of what we trim and with our ability to do just-in-time work for them when needed.”



Flying-S began 10 years ago as a one-man shop creating parts for the James Webb Space Telescope for NASA, producing “composite molds with mirror quality finish” and “manufacturing intricate titanium shapes,” according to the company Web site.



Flying-S owners Dave and Penny Shaw stand near a lineup of Haas CNC machines in the machine shop.

On the shop floor, the Carr Lock technology works in conjunction with a Haas Automation VF-6 machining center that is completely dedicated to carbon trimming of the UAV components and other carbon projects. The machine operator installs Carr Lock clamps on a carbon trim fixture inside of the VF-6.

The irregular pattern of the receiver bushings in the Carr Lock system allows Flying-S to put fixtures in several different configurations if necessary depending on the trimming requirement for the workpiece. The CNC control contains all the trim programs correlating with

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“For a particularly long UAV part, set up was brutally long and locating was always a challenge,” said Bowman. “With locating features permanently attached to the fixture subplate along with clamping, the whole assembly can be located with a part clamped in about 30 seconds. Each fixture has a primary and secondary bushing pressed in that the clamp passes through for locating. Installation of the bushings is very simple and converting all of our existing fixtures, originally not designed for Carr Lock, were easily retrofitted and put back into use,” Bowman said.

those positions and the operator simply needs to load the fixture, load the parts, select the appropriate program in the proper position and be up and running in just a matter of minutes. “We’ve also reduced the tools needed for all the trimming that we do to a tool library that fits within the capacities of the machine,” said Bowman. “This means that we never need to set up tools for a job. We also love the flexibility of our subplate and the fact that we have virtually unlimited placement options using Carr Lock technology.” ➔