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COMMENTARY

Flexible Markets

Maker of little-noticed cables reacts to recession and competition

What product is essential for flight controls but a mystery to some aeronautical engineers? With allowances for scale, a dentist or surgeon might recognize it.

If your answer is flexible shafts you obviously have a knowledge of how thrust reversers, flaps and slats work. Or, maybe, you've just had a lot of cavities.

S.S. White Technologies' roots are in medical devices, even if aerospace represents half its income. Samuel Stockton White was a dentist with an inventive streak who started a tooth factory in 1844. Over the next century, his company filed hundreds of patents, including the first for a flexible shaft to run a dental drill in 1874. Speedometer cables for cars came along in 1911 and various industrial applications followed, including the company's move into aviation in World War II making shafts for tachometers and to control aileron and rudder actuation systems.

When the 2008 recession hit, S.S. White had about $30 million in revenues—half in aerospace, of which 70% is for commercial aircraft. Its domestic operations suffered erosion in industrial and automotive sales and the ongoing budget crisis is putting pressure on its defense contracting base. Though commercial aviation accounts are healthier, the company says its best chance for expansion is to broaden into systems development while concurrently confronting low-cost overseas competition on their own turf.

Of its 100 employees in Piscataway, N.J., 20 are engineers. Its plant in Milton Keynes, U.K., has 25 employees dedicated to aerospace, and it is investigating automotive and industrial contracts in China. The company recently opened a 50,000-sq.-ft. factory in Gujarat to pursue Indian automotive accounts. Revenues are now about $25 million overall.

Flexible cables, also called flexible shafts, look like wire ropes and use rotary motion to transmit power around bends and over curves. Composed of high-tensile strength wire, mostly carbon steel or 17/7 stainless steel, the cables are common on aero-engines, wings and fuselages. Besides synchronizing control actuators for flats and slats, the shafts open and close thrust reversers, vary engine bleed air to prevent low-pressure compressor surges, and drive scavenger pumps that drain engine oil. They open and close fighter canopies, turn the rescue hoist translating drum on a Bell Boeing V-22 Osprey and drive a precision encoder for the phased-array radar antenna on the Joint Surveillance Target Attack Radar System aircraft.

Shaft sizes and shapes can differ dramatically. Left- and right-side systems on an aircraft typically vary just enough that they require disparate part numbers. Diameters run from 1.25-0.004 in. and lengths can run from 100 ft. to open valve wheels on an oil tanker to just 6 in. to control a gas turbine bleed valve. Yield points—the point at which the shaft will not return to its original shape—can be as high as 400 in./lb. of torque. And the shafts can be called upon to achieve dramatic speeds, as high as 48,000 rpm for an auxiliary power unit's bleed valve system.

For all that, they are so common in aviation Vice President Brian Parlato says aeronautical engineers often know little about them. "I talk with aerospace engineers all the time and they have never heard of them," he says. "But once you explain them, engineers come up with all sorts of innovative uses."

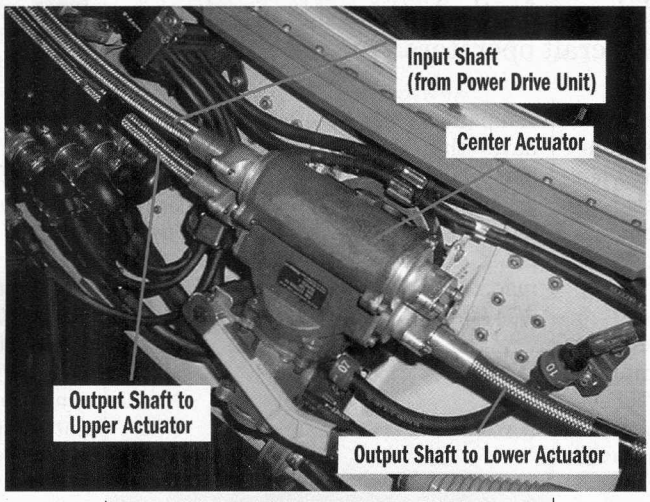
The company views itself as aerospace's largest flexible shaft supplier, although it is not without competition, including from the likes of Elliott Manufacturing in Binghamton, N.Y.

S.S. White President/CEO Rahul Shukla, a computer programer, created Perflexion—a modeling tool with a 90-95% accuracy rate for shaft performance—by adapting a Ph.D thesis from one of the company's engineers, Adam Black.

"For a seemingly simple-looking product, [shaft performance] is remarkably complex," says Parlato. "The computer model is unbelievably valuable for design, especially for the aerospace market."

As Tier 1 suppliers seek weight savings, hydraulic control systems are giving way to lighter electric ones. S.S. White shafts transmit power to one of the pioneers—the thrust reverser for the Airbus A380.

As defense budgets shrink, the company also is exploring ways to provide whole systems. Its shafts are already being sold with Parker Aerospace's actuators as a system and it is pursuing similar arrangements with brake manufacturers. Making acutators for general aviation is on its wish list.



S.S. WHITE TECHNOLOGIES

S.S. White flexible shafts drive the actuators on the Aircelle electric thrust reverser actuation system for the A380.