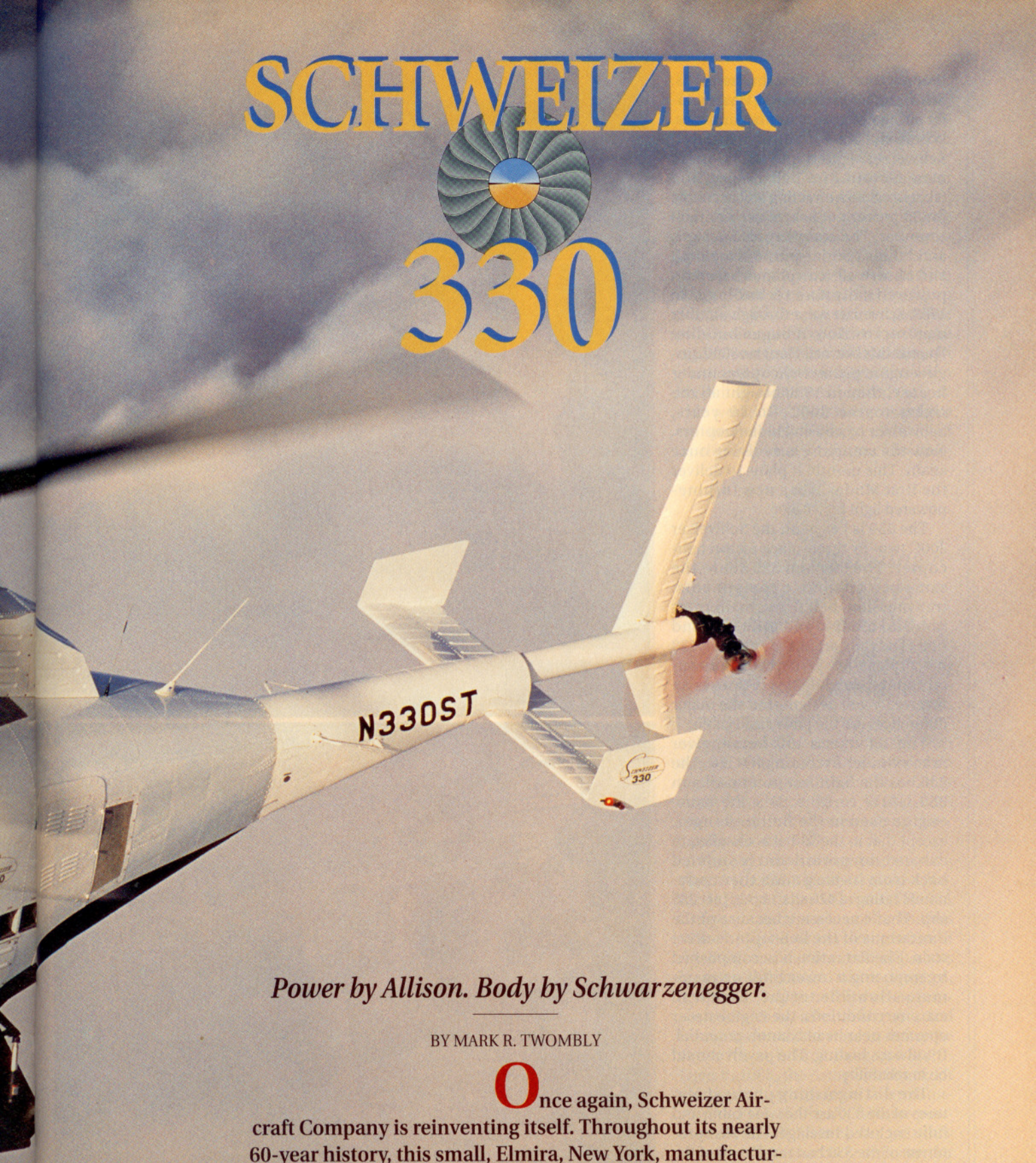
SCHWEIZER 330



Power by Allison. Body by Schwarzenegger.

BY MARK R. TWOMBLY

Once again, Schweizer Aircraft Company is reinventing itself. Throughout its nearly 60-year history, this small, Elmira, New York, manufacturer has rolled with aviation's punches to persevere and prosper. Its roots and reputation grew from sailplanes—by the time it ceased making them a decade ago, Schweizer had manufactured more than 90 percent of all sailplanes produced in the United States since World War II—but

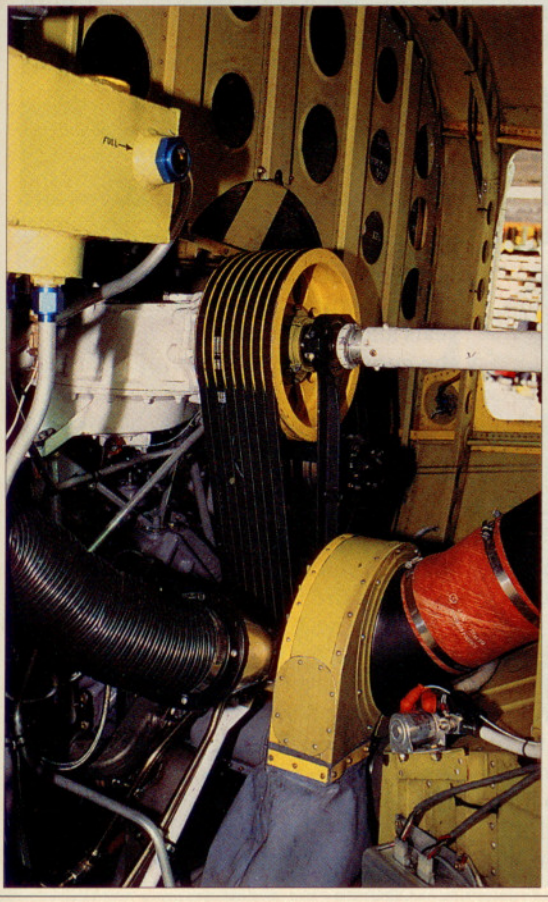
PHOTOGRAPHY BY MIKE FIZER

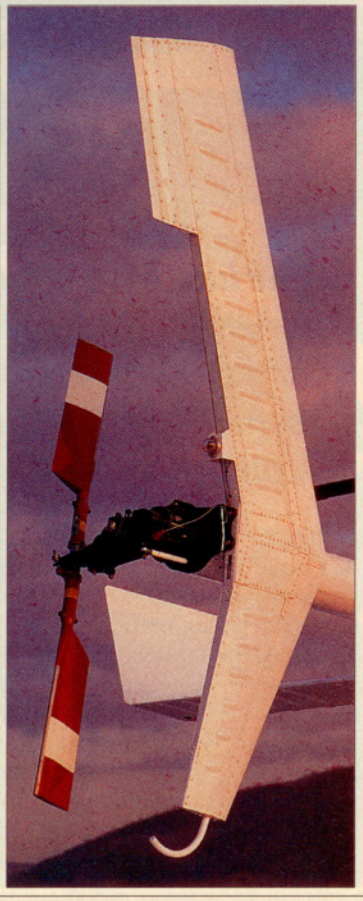
that was only the start. In the 1970s, Schweizer's main business was manufacturing AgCat agricultural airplanes. When the ag business withered, Schweizer segued into subcontract manufacturing for Bell, Boeing, and Sikorsky. Subcontracting still accounts for 30 percent of Schweizer's annual revenues. The company also designs and builds special-purpose training and observation airplanes based on powered sailplane technology. In 1983, Schweizer went through another major transition. It began building Hughes/McDonnell Douglas 300C single-engine piston helicopters under license, then in 1986 bought all the rights to the 300C. In 10 years, Schweizer has built 450 helicopters. Now the company is evolving once again. This month, it plans to deliver the first Model 330, a new turbine-powered light helicopter.

The 330 is based on the Schweizer 300C two- or three-place piston helicopter. The 300 and 330 share the same basic dynamic components: transmission, belt drive, main rotor hub and blades, and tail rotor and hub. The tails are different—the 330 has airplane-like vertical and horizontal stabilizers while the 300C uses an inverted V-tail design—but the major differences are the power and cabin.

The 300 uses a 190-horsepower four-cylinder Lycoming IO-360. The 330 has the light but potent Allison 250-C20W turbine. It's the same engine used in the Bell JetRanger, except that in the 330, it is installed to exhaust downward and is spooled back from its maximum thermodynamic rating of 420 shaft hp to just 235 shp. That's necessary because of the limitations of the helicopter's drive train. The flat rating is accomplished by imposing a lower limit on maximum allowable torque. Except in extreme conditions, the engine never operates near its maximum potential. It's always loafing. The payoff should be in reliability.

The distinguishing physical features of the 330 are the wide cabin and fully enclosed fuselage. The first prototype of the 330 had no skin aft of the cabin. Where the 300C has a spare, utilitarian attractiveness, the 330 prototype was downright homely. The fat bubble threw off all the proportions. No longer—the production cabin is as commodious as before, but the aluminum skins soften the transition





from wide cabin to skinny tailboom. The short, stocky body, faired skid struts, and huge, lower-right-side exhaust pipe give the 330 a muscular, athletic look.

The 330 cabin is 16.5 inches wider than the 300C's. It can be configured for three- or four-abreast seating, with the middle passenger or passengers up 5 inches higher and 8 inches farther aft than those in the right and left seats. Three of us went flying in Schweizer's demonstrator, and we rode in limousine comfort. I sat in the catbird seat in the middle and thought it a wonderful perch to observe both the goings on in the cabin and the outside world. Back on the ground, we enlisted a fourth volunteer, and all of us climbed into Schweizer's leather-

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upholstered four-seat mock-up, with the two middle passengers scrunched together on a small bench seat. Obviously, it's a much tighter fit than with just three, but it seemed plenty comfortable for short hops.

The high-low seating geometry is a clue to the 330's genesis. Since 1964, the U.S. Army has used the TH–55A Osage, a military version of the Hughes 269 series (the model designation of the 300C and earlier versions) as its primary helicopter trainer. Hughes, and later McDonnell Douglas, supported the Army's fleet with parts, and Schweizer looked forward to doing the same when it took over the 300C. Then in 1986, the Army announced it planned to switch from the piston-powered TH–55A to the turbine-powered Bell UH–1 Huey for primary training. It was a costly decision for the Army, according to Schweizer. The Huey can be six times as expensive to fly and maintain as the TH–55A. (The Army used some of its Osages as target drones and sold the rest to municipalities, so Schweizer still gets some support business.) Bowing to the eco-

nomics, the Army agreed to consider proposals for a more efficient next-generation helicopter (NGH) trainer.

The U.S. military's current philosophy is to buy FAA-certified, off-the-shelf trainers. In recent years, for example, the Air Force and Navy have bought Citations and Beechjets for various training roles. Army Aviation is taking the same approach. Its new trainer will be a turbine-powered civil helicopter with some modifications for the military role. Schweizer, Enstrom, Bell, and Eurocopter all have built NGH prototypes and entered bids. The Army has flown them all and is supposed to announce its pick very soon. As many as 157 helicopters may be ordered.

Even though Schweizer began developing the 330 in response to the NGH program, the company says it will build and deliver 330s to civilian customers regardless of the outcome of the Army competition.

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One of the interesting things about Schweizer's NGH design is that it calls for three sets of controls: three cyclics, three collectives, and three pairs of antitorque pedals—complete controls for each seat. Sound like a setup for a disaster? (Question: What could be worse than having two pilots on the controls? Answer: three.) Obviously, Schweizer doesn't think so. The idea is to put a student in each of the side seats and have them alternate time on the controls without having to land and switch seats. A Georgia Institute of Technology study cited by Schweizer says that the nonflying student gets most of the value of hands-on flying, and the two students learn crew coordination from the get-go. The instructor sits high in the middle saddle to monitor the flying and take over if need be. The Army gets more bang for the training buck—1.7 hours of quality training per one hour of flight time, according to Schweizer.

The civilian 330 will be offered with triple controls as an option. One restriction on their use would be that one seat must be occupied by an instructor pilot.

Military requirements benefit the

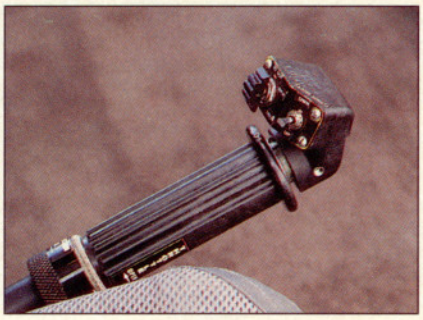
civilian ship in other ways, including crashworthiness. Although the civilian 330 probably would not be offered with the Army version's expensive stroking seats (which absorb inertial energy in a vertical impact), other features are built in. The fuel bladder mounted above the engine and behind the cockpit is made of reinforced rubber designed and tested to withstand rupture and puncture when dropped from 50 feet. A wraparound frame member in the overhead cabin structure provides roll-over protection for occupants, and the seat pan is designed to crush under heavy G loads to protect passengers from instantaneous, spine-bending deceleration.

Though the 330 springs directly from the 300C, the differences in performance are significant. For one, there is a horsepower advantage. The Allison is rated in the 330 at 235 shp for takeoff, 220 maximum continuous hp. We departed Schweizer's ramp in the 330 with three aboard and climbed at 1,000 feet per minute up to and over the historic Harris Hill gliderport just to the south of Chemung County Airport, Schweizer's base. The Allison's power enables the 330 to cruise easily at high indicated airspeeds, with turbine smoothness. Normal cruise at maximum gross weight is 94 KIAS. V_{NE} is 105 KIAS. The 300 isn't quite so eager to loiter in the upper reaches of its airspeed envelope because the Lycoming has to work pretty hard.

Flat rating the Allison means the engine can deliver full power even in very hot and high conditions. Hover ceilings, both in and out of ground effect, also benefit.

The airfoil shape of the 330's cabin smooths out the rough spots in the 300C's handling. The shudder felt when accelerating through translational lift in a 300C is barely discernible in the 330. In cruise flight, the 300C adopts a distinct nose-down attitude that becomes more pronounced the faster you fly. The 330 flies in a mostly level attitude regardless of airspeed.

The effects of the cabin's width and shape on handling are most evident in an autorotation. Split the needles in a 300C, and the helicopter will pitch down and yaw. The 330's reaction is more benign. The pitching and yawing reactions are far less abrupt and pronounced. There's plenty of time for the brain to come up to speed on current events and command feet and hands to manage the situation.



A throttle governor correlates collective and power. Three 330s (left to right): three seats, two controls; three and three; and the four-person luxo version.

The lifting action of the 330's aerodynamic bubble also contributes to a slower autorotation descent and a bit more float after flaring, all of which makes for a safer, less stressful event.

The sight picture from the left or right seats is unusual because of the wide cabin, especially if someone is seated above you in the middle seat. The impression is that the helicopter will not lift off level, and therefore, lateral cyclic will be needed. That isn't the case, although we flew with three aboard and thus an even weight distribution. Some imbalance may be noticeable when flying solo.

As in the 300C, the 330's controls are light and responsive. The helicopter is very steady and stable in hover and reacts immediately to control inputs and power adjustments. Antitorque pedals are effective for making comfortable 360-degree constant-rate turns. The 330 sits lower to the ground than the 300C and most other helicopters, so you have to shave a few inches off your mental depth finder when settling back to the ground from a hover.

Schweizer's prototype first flew in the summer of 1988 before invited guests and press. The final configuration was certified by the FAA last September. The time between the two events was filled with challenges for Schweizer. The project took longer and cost more than anticipated. The original plan was to create the 330

through STC modifications—done in the field, even—of the 300C: Fit a new bubble on the airframe, and switch out the Lycoming for an Allison. It turned out to be a much bigger deal. For one, the wide-cabin/bare-boom airframe couldn't pass FAA stability requirements until Schweizer added the skinning. Schweizer had hoped to use a much lower cost turbine engine that Allison said it was going to develop, but Allison abandoned that effort. The only alternative was to use the pricier 250-C20W.

Despite the problems, the 330 is remarkably mature considering its youth. That no doubt is due to Schweizer's relying on time-tested 300C dynamic components for the 330. The only complaints I got from Tim McAdams, an experienced helicopter pilot who accompanied me on the visit to Schweizer and who flew the 330, were concerning the trim system and the collective. McAdams flew from the left seat, and his arm kept hitting the door frame whenever he pulled more than about 50 percent of the collective lever's throw. Schweizer said it is aware of the problem and will lengthen the control arm on production machines and also dampen out vibration in the lever. Schweizer uses pilot-controlled electric trim in the 330; McAdams says he prefers hydraulically boosted controls, which don't require trimming.

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Schweizer hopes to begin delivering 330s this month and send 21 out the door in 1993. As with the 300C, the majority probably will go to overseas customers. In the United States, law enforcement agencies are prime customers, as they are for the 300C. Along with a choice of seating configurations, Schweizer will offer a variety of instrument panels: a standard VFR helicopter panel; a smaller version intended to go in observation helicopters, so occupants have maximum visibility; and an IFR trainer panel with extensions on either side to accommodate instruments and avionics. Base price of the 330 is $433,000. Equipped, the helicopter will retail for between $450,000 and $460,000.

Schweizer insists the 330 will not replace the 300C. In fact, the company believes the two models will complement each other in the marketplace. Schweizer argues that it will be more efficient to operate a mixed fleet of 300Cs and 330s than unrelated pistons and turbines because of parts and service commonality inherent in the Schweizer helicopters.

For such a small company, Schweizer has displayed remarkable moxie in adapting to changes in the general aviation market through the years. Now that the 330 is primed to go, what will Schweizer do next? How about a few spin-off models like a piston version and a five-seater? Keep your eyes on Elmira. □