



At the pointy end of the aerobatic totem pole—the Unlimited category—winning is measured in micro-points, and this week's killer competition airplane is next week's also-ran. It's an increasingly brutal arena in which the dance steps demanded by the choreographer would leave old Count Aresti breathless with astonishment. And it doesn't appear likely that the trend toward extreme performance from both the airplane and the pilot will let up anytime soon.

The recent drive to design aircraft that clearly outdistance the pack has forged a razor-edged competition between the various airplanes that are expected to successfully compete (read that as "win") in Unlimited competition. At the same time, an unlikely market has developed just outside of competition in which pilots who have the wherewithal to own the most recognized, butt-kicking aerobatic bird will buy one just like their hero flies even though they have no intention of ever competing in it. It is this group that actually forms a market base wide enough to support the development of a new airplane, and it is a market Walter Extra, he of the airplanes of the same name, knows well. He has created a small empire by understanding that, if he builds a winning airplane flown by well-known champions, he will sell many more of the nearly identical airplane to serious pilots who just want to own the best aircraft available.

# The Extra 300SC

Walter Extra's New Unlimited Contender

*Budd Davisson*



Bonnie Kratz

The Extra 330SC is a definite departure from previous designs. The small canopy and redesigned tail are noticeable changes.

The operative word in the foregoing equation is “winning airplane.” He knows well that the adoration and financial attention will quickly shift focus once one design has been eclipsed by another. It wasn’t until his airplanes began to lose favor, and Kramer Upchurch of Southeast Aero in St. Augustine, Florida, and champion competitor and air show performer Mike Goulian laid it on the line to him, that he took up the challenge to update his Extra 300 series.

“Walter is an extremely creative guy,” Upchurch says. “But the company was focused on their corporate aircraft, the 400 and 500, and the 300S began to lose ground to the CAP 232 and the Edge 540. Serious competition pilots always buy the very best there is, and quite a number of top-level pilots left the Extra for a CAP or Edge.”

Upchurch and Goulian visited Extra in 2005, and Walter, himself a winning competition pilot, responded by diving into his 300S, working down the items that were on the Upchurch/Goulian wish list.

Pilots such as Mike Goulian had flown and competed in just about all of the existing Unlimited airplanes, and there was a wide consensus of opinion that the 300S was still a fine airplane. But if it was going to win Unlimited, some areas had to be addressed.

“Everyone wanted more roll rate,” Upchurch says, “which, considering that it already rolled at 330-350 degrees per second, shows just how demanding the competition market has become. However, it was more than just roll rate the pilots were looking for. They wanted the airplane to have more all-around maneuvering capabilities, particularly at lower airspeeds in the 60-knot range.”

“Pilots also wanted more vertical performance,” says Upchurch, “which sounds a little crazy considering how far it would go vertical already, but there were airplanes with more vertical performance, so, if Walter wanted to keep selling airplanes, his had to go higher for longer and still be rolling well when coming to a stop at the top.”

The competition guys were, in point of fact, becoming just a little spoiled and a tad blasé. With airplanes such as the Edge, Sukhoi, CAP, and Extra, the performance bar had been raised so high that incremental improvements were going to come slowly to an airplane such as an Extra

300S, but they expected it and they were willing to pay for it. And then the air show and freestyle parameters were stirred into the mix.

Kramer points out another wish list item that’s new to this generation of aerobatic pilots.

“The ability to tumble easily, predictably, and for longer periods of time has become an issue in recent years,” says Upchurch. “Where in the past any tumbling maneuver was just a novelty, they are now an aerobatic staple, and pilots—and audiences—expect them. Walter had to redesign his tail to make the airplane more aggressive in the way it tumbled.”

The concept of intentionally tumbling an airplane isn’t something that’s taught in aerodynamic classes. Not even in graduate school. In fact, tumbling is the antithesis of what an aeronautical engineer strives for. He wants smooth flow, stable handling, and, until very recently, couldn’t computer-model (or even imagine) what the forces were—and where they went—in an airplane that was being made to act in a dynamic fashion that was anything other than aerodynamic: Tumbling often reverses the forces on the airframe but in ways that still aren’t totally understood. Plus, a traditional engineer is going to have next to no experience—practical or theoretical—in what you have to design into an airplane to make it better at tumbling.

Much of what the engineering community knows about tumbling is empirical: Pilots figured out how to tumble the airplane in various ways and, when they broke something, the engineers had another data point to work with, which helped them in their design work. However, there aren’t many engineering types out there like Walter Extra who can tumble an airplane with the best of them. He came at the tumbling problem, as well as the other wish list improvements, from an entirely different perspective: He, more than most tech types, understood exactly what the market was saying it wanted and knew how to deliver it.

Walter had lots of ideas about how to attack the wish list, but central to everything was improving the power-to-weight ratio. That meant more motor and less weight. He had already begun using the AEIO-580 with 330 hp on tap. However, to put the horsepower to work in the

330SC, as the new design was called, he used a new prop from MT that was specifically designed to give more low-speed thrust. It had fatter, wider blades that were more efficient at putting the ponies on tap to work.

“When it comes to weight,” says Upchurch, “Walter is fond of saying you lose it a gram at a time rather than pounds and kilos. But in this case, the grams removed total up to nearly 150 pounds lower than a 300S.”

When shaving weight off of an aerobatic airplane, you don’t just start using smaller this and lighter that. It must be done while keeping the ultimate strength in mind at all times. Nothing can be compromised. In the case of the 330SC’s evolution from the 300S, the weight came off through the use of technology and careful planning. All push-pull tubes in the control system, for instance, are carbon fiber. The same carbon fiber concept is used on the wing ribs: Where once they were plywood, they are now carbon fiber. The firewall was lightened using titanium. The final airframe is rated at plus-and-minus 10 Gs, but loads to destruction show its limit actually exceeds 24Gs. Everywhere you look in the airframe there are new, state-of-the-art components.

The roll rate issue was tackled in a very non-Extra sort of way. The ailerons are hinged so that, when deflected past a certain amount, the leading edges protrude a sizable distance above or below the wing. In so doing, to those of us in the cheap seats, it appears that rather than acting like regular ailerons that generate lift by changing the camber of the wing, these create a slot effect. At large

deflections, this effect makes the aileron act as if it is a separate surface that generates lift on its own, independent of the wing. This is probably where the increased roll rate (430-450 degrees per second) gets its start.

Although the new trapezoidal planform of the ailerons has to be pointed out to be noticeable, the unusual shape also helps in the roll rate department. Rather than being rectangular, as is traditional, the tips are quite a bit wider than the roots. It’s our guess that by moving the center of pressure of the aileron outboard, it gains leverage and can, with less effort, more quickly move the wing. It’s also worth noting that there isn’t even a hint of an aileron shovel to be seen, although Upchurch indicated that for European Aviation Safety Agency certifications, the shovels will go back on.

An even more subtle change is seen in the taper of the wing. At the tip, the chord is much shorter, which, when combined with the new aileron, achieves the desired roll performance.

The art of tumbling is one thing. The art of figuring out how to make an airplane flop end over end in a more predictable manner has to be something of a black art, part of which includes making the airplane snap outside better. This Walter knew how to do, but some of those changes, notably the new horizontal tail, helped in both areas.

He went to slightly thinner airfoil sections with less radius on the nose. This made them more critical, so he could get them to stall more predictably. The span is shorter and the elevator balances are noticeably different.

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From nose to tail, the new Extra 330SC incorporates changes that make it lighter and more maneuverable. Mechanically adjustable foot pedals and carbon fiber push rods save weight, while trapezoidal ailerons and new geometry on the tail improve rolling and tumbling maneuvers.

Photos by Budd Davisson and Craig VanderKolk

# “Extra Extra! Read All About It!”

## ONE MAN'S OPINION OF THE EXTRA 330SC

Carl Pascarell

**D**oug Vayda, chief pilot for Southeast Aero, launched me in the SC with uncharacteristically subdued advice: “Don’t have too much fun and don’t hurt yourself too badly.”

When you first approach the airplane, you get a sense of its performance while still 50 feet away. Simply put...big motor, little airframe. This is no doubt gonna be a monster. But no ogre this—oh no. The '580 is so elegantly cowed, the rest of the airplane just seems to flow back from it. The fit and finish are first-class, consistent with the established Extra tradition. This particular SC, with its Mirco Pecorari custom-designed paint scheme, dripped with performance potential and raw sex appeal.



Entering the cockpit is typically Extra: foot step on fuselage, stand up on seat, and wiggle your feet forward under the instrument panel and onto the rudders. Rudders on the SC are not electrically adjustable as on the other Extras. (Remember the weight thing?) Fortunately, the seat is three-way adjustable, allowing Patty Wagstaff-sized pilots as well as Doug Vayda-sized pilots an easy fit given two minutes and a couple of “pull pin” seat adjustments. To me (5 feet 10 inches, 180 pounds), the cockpit felt just about perfect: a definite “wearing the airplane” sort of impression without feeling cramped or jammed and just enough headroom to allow for the “negative G” stretch.

Several “consumable” but less than ideal ergonomic features were noted, however. For instance, when at idle, the throttle is located too far aft to reach easily. A bit awkward initially, but once the throttle is advanced at all, this ceases to be a factor. Secondly, the aileron push-pull tubes pass directly under the pilot’s knees/calves and actually rub against those areas when the stick is pushed side to side. This is an issue for most average-sized individuals. Having said that, when in flight and particularly during maneuvering, it is scarcely noticeable and presents no impediment to control feel or response.

Finally, there is an electric pitch trim toggle switch located on the upper instrument panel. It’s not convenient, and Doug assures me that on this and future examples the trim will be relocated to the stick, as with military fighters. Fortunately, because the airplane flies as if balanced close to the “neutral point,” very little trim is required throughout the normal range of speeds. Still, I would prefer good old-fashioned manual trim in an airplane like this.

Engine start is straightforward and welcomes you with a jumping rumble under the hood reminiscent of a top fueler “nitro idling” on the starting line. The big '580, with its six-into-one exhaust, sends pulses of power through the airframe and into your body, adding to the airplane’s already formidable presence. The taxi to the runway was expeditious in part due to the wide-blade MT dragging me along but also because of my eagerness to get airborne and explore this thoroughbred’s awesome capabilities. The wind was light and variable with the temperature at 79 degrees, and the airplane was loaded with full “aerobatic” fuel: 25 gallons and empty wings.

Take-off acceleration was consistent with the current crop of high-powered competition machines, which is to say...exhilarating. I let the airplane fly off tail low and rotated to a truly ridiculous attitude in an attempt to hold what I figured was the best angle. Passing through 1,000 feet 14 seconds after liftoff—that’s right, 14 seconds—I turned west out of the pattern only to realize I was still only halfway down the runway! As you might imagine, 3,000 feet came pretty quickly, and the flight to the practice area was 190-knots quick.

I have to admit, my initial impression was that the ailerons were heavier than I would have preferred. The very next flight I changed my mind. It was as if the ailerons got lighter. They didn’t, of course, and upon reflection I think my sense of what I expected the airplane to be may have colored my assessment. I decided further that the airplane is meant to be flown aggressively. When flown as such, the roll axis seems just about right. In fact, the more aggressively one flies the airplane the more harmonized the controls seem.

Roll accelerations are extraordinarily high, generating rates in excess of 440 degrees per second with virtually no ramp-up. It’s like...Move aileron...Get roll...Right now! Here’s the kicker. A lot of airplanes roll like crazy. It’s not that tough a thing to get them to do, but not all of them can be well controlled. Frankly, this has been an issue for me with many of the Extras I’ve flown. The ailerons are just too “bobbly” for my liking: no real center and, on some, an almost negative stick force gradient that makes precise roll control a chore until you get used to them. Well, fear not. The SC has set a new standard of roll control and authority for the Extras. In fact, with the possible exception of the old '230, it has the finest ailerons of any existing Extra. Crisp stops and lightning-fast starts are well controlled with very little practice. Four-point rolls up, down, or anywhere in between are a head-banging, gear-shaking, bang, bang, bang, bang affair. Would I like them to be a bit lighter? Probably, but I’m likely just being picky.

Overall, I felt the airplane’s basic handling qualities were pretty well managed. Stick forces in pitch were fairly light. Somewhat lighter pulling than pushing, but that suits me just fine. Things such as rolling turns suffer just a bit because of it, but only at first. The difference, as they say in test pilot parlance, is “consumable”—that is, adequately manageable.

Snap rolls are quick and precise. Inside or out, up or down, single or multiple. This, I confess, I gleaned from watching the pros fly. Champions Patty Wagstaff and David Martin, each with virtually no time in the airplane, were snapping it as well as anything they’ve flown—as much a testament to their ability as the airplane’s.

The subtleties of snap rolls and rollers are one thing, but to me, the truly impressive nature of the airplane is evident in the “wow” maneuvers. You know the “wow” maneuvers—10-roll torque rolls, double and triple nose-over-tail tumbles, knife-edge spins that you can barely hold onto, and tiny “micro loops” at 60 knots. These are the “YEE HA!” things that make the airplane so exhilarating and so memorable.

Having quickly gained confidence in the SC, my second flight was in the low-altitude practice box at the St. Augustine Airport in Florida. My flight was a chaotic mass (or *mess* as some would have it) of one-after-the-other, body-punishing attempts to do all I could in 20 minutes.

Vertical performance was exceptional, and I’m almost embarrassed to admit I actually pulled power from time to time to stay down in the box and keep from exceeding the 3,500-foot box ceiling and/or the 220 knot redline. Now that’s precisely the type of problem I enjoy having in an airplane. I particularly liked the stability the airplane exhibited when stuck in the vertical. It was almost as if the airplane was flying with an “attitude hold” engaged. Once stuck there, very little attention was required to maintain the vertical. This was in part due to the low, off-speed trim requirement and was generally true for all lines and angles.

I tended to concentrate on vertical and point maneuvers if for no other reason than they are so well done by the SC. Vertical four points up, inside, outside, inside triple vertical eights or “snowmen,” and the “how long is this gonna go on” torque

rolls were pushing me over the “too much fun limit” Doug had warned me about.

All high-alpha maneuvering was as well behaved and controllable as any aerobatic plane I’ve flown, the “micro loops” in particular. Starting at 60 knots and flown in full buffet with almost full aft stick, the roll and yaw axis throughout the loop were completely controllable with conventional control input, so much so that from the ground it was not apparent any buffet existed at all.

All maneuvers were thrilling to say the least, but it was the knife-edge spins that captured my attention more than any other maneuver. Entry into the “knife” from a hammerhead was easily accomplished, even when the hammerhead pivot was sloppily flown. The pitch rate from the onset was eye-popping and almost beyond my ability to adequately hang onto. Three turns was the most I could hang onto, and even at that, I landed with the G-meter pegged on the negative end.

My 20 minutes were up in short order and, taxiing back after landing, I recalled again what Doug had said about having too much fun. I knew what he meant. And I didn’t listen. With +9Gs and -6 Gs on the meter, I dragged myself out of the airplane sweaty, bruised, and exhausted, huffing and puffing as if I’d just run 5 miles. I’m no stranger to high performance and generally not easily impressed, but man was that fun! It’s going to be interesting to see how the airplane’s future develops in the hands of true competition professionals.

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Bonnie Kratz

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At the same time that Extra was looking for better performance, he also included some changes that gave the airplane greater utility. Specifically, the aerobatic header tank is now 26.7 gallons, which is almost twice what it used to be. Inasmuch as there can be no fuel in the wing tanks while doing hard aerobatics, that used to make the trip to the practice area and back a little dicey. The bigger aerobatic tank also adds a modicum of safety and peace of mind to aerobatic practice. There are 31 gallons in the wings, giving a total of 57 gallons usable, which gives a solid three hours of cruise at more than 190 mph with a wide reserve margin.

Is the 330SC the perfect airplane and is Walter happy with it? Probably not. No designer is ever totally happy with the final product, especially since an airplane is nothing but a bunch of compromises from the beginning. That's the character of the beast. However, what is important is whether the competition community is happy with the changes that have been made and whether the airplane can regain its crown. The jury is still out on that score, and we're at the end of the competition season. The debate will have to wait until spring to be settled. With all the new hardware showing up in the box, the coming competition season promises to be the most exciting ever. 



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