Hobbico SuperStar-EP 4-Channel Upgrade
By Frank Granelli

The Hobbico SuperStar-EP was one of Sport Aviator's first review aircraft. It was also the first electric powered RTF basic trainer produced. We liked the original SuperStar-EP, both in its RTF and ARF formats. The original SuperStar-EP review article is still available in the "On The Flight Line Section" of Sport Aviator. The original SuperStar-EP used three channels for flight controls. Throttle was managed by the electronic throttle controller while servos controlled elevator and rudder. There were no ailerons.

From the first publication of this review, model pilots sent in requests about converting this aircraft to aileron roll control. One creative pilot even managed to install ailerons in the SuperStar-EP's wing. We dutifully forwarded these requests to Hobbico as they arrived. The company must pay attention to its customers' needs as they have just introduced the new SuperStar-EP with ailerons.

The Aileron equipped SuperStar-EP is currently available only as an ARF kit. But by the time this is published, Hobbico will also have the "Select" version available. In Hobbico's name scheme, "Select" means the aircraft is a "Ready-To-Fly" complete with installed radio and power system. Actually, even the ARF version features a factory installed motor, but the builder must install the included electronic speed controller.

Except for the wing, both the original SuperStar-EP and the aileron version are identical. Since we already had the original SuperStar-EP three channel aircraft built and flying, we decided just to install the new wing. For complete fuselage and tail construction details, see the original SuperStar-EP article.

Photo 1 Photo 2

Phot0 1 shows all the new items designed for the aileron version. Photo 2 shows one of the wing setups and the two different adhesives required for this project. The five, or twelve-minute, epoxy is used to glue the aileron control torque rods into the ailerons and to strengthen the aileron servo

tray mount. The wing assembly still utilizes the metal spar/rear pin system of the original “Select” version, so wing construction remains a simple task.

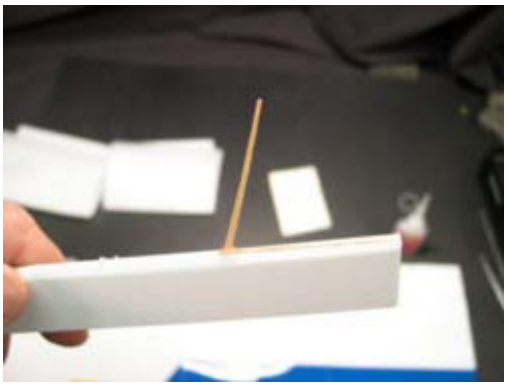
Photo 3


Photo 4

The first step is to mount the ailerons. This requires using both adhesives. Since the ailerons are controlled by a center torque rod (factory installed), this torque rod must be installed into the aileron as it is assembled to the wing. You might want to test fit teach aileron first, both hinges and torque rod, without using adhesive.

NOTE: The ailerons have a small taper, on one side only, near the wing tip. This side goes UP so that the aileron tip blends into the wing tip. Once you are ready, re-insert the flexible aileron hinges into their respective slots. Then apply the epoxy into the torque rod hole in the aileron (photo 3). A flat toothpick makes a great epoxy applicator tool.

Then install the aileron onto the wing (Photo 4). Make sure the torque rod is inside its respective hole and all hinges in their slots. It is easy to miss one hinge slot and not notice until too late, so check carefully.


Photo 5


Photo 6

Press the aileron tightly against the wing and hold it there. Then check that there is at least a one-half inch movement both up and down. Our wing allowed almost a full inch of aileron movement in either direction, so this should not be a problem. If all checks out, hold the aileron tightly into the wing again, apply full deflection and glue the hinges in place using thin CAA (photo 6). Apply the CAA to both the top and bottom of each hinge. If you have not done this procedure before, read “Installing Mylar Hinges in ARFs” in Sport Aviator’s Flight-Tech Section.


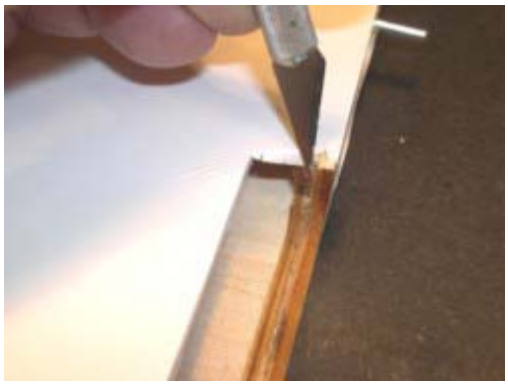

Photo 7 Photo 8

Once the ailerons are installed, it is time to build the servo tray for the aileron servo. The tray is just three simple pieces of plywood. First, be sure to gently remove any wood burrs using a file (photo 7). Use a sharp hobby knife to remove any wood burrs or excess factory construction adhesive from the tray mounting points in the wing (photo 8)

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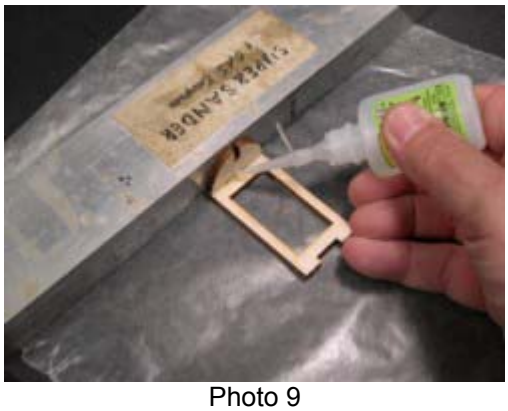

Photo 9

Then use a square when assembling the two sides to make sure the tray is perfectly straight and rigid (photo 9). Once in place, glue it together using thin CAA. It is a good idea to run a small reinforcing bead of thick CAA along the inside joint for extra strength (photo 9). When the tray is assembled, glue it in place on the right wing half, using epoxy for extra strength (photo 10). There is a lot of rotational strain on an aileron's mounting system, even in an electric trainer, and epoxy resists such torsional strain better than does CAA.

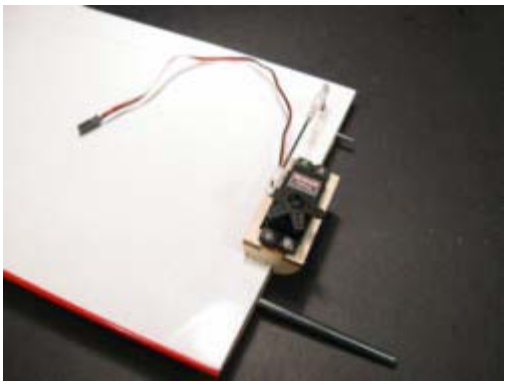


Photo 10 Photo 11

Slide the wing halves together on the metal spar (photo 11). Make sure the rear anti-rotation pin is in its slot. Once the wing halves are assembled, use the included white adhesive tape to hold the wing halves together while hiding the wing's center joint. The aileron control rods are pre-made at the factory. Just install them as in photo 12 to complete the wing's construction.

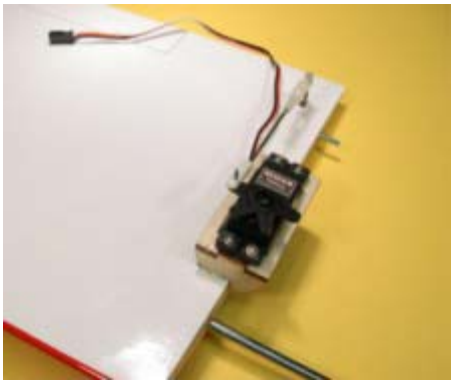

Photo 12

From this point onwards, the aileron and original SuperStar-EP construction is exactly the same, so be sure to check the original article. But there is one construction step not found in the original review because the need for it developed only over time.


Photo 13 Photo 14

The SuperStar-EP and the Hobbico Avistar 40 Select we tested exhibited a small problem after numerous flights. The vertical fin mounts in place using two threaded rods (photo 13) that pass through the balsawood stab (photo 14) holding it in place as well. After a while, the balsa around

these rods weakens, allowing the holes to elongate. The larger holes then permit the stabilizer tips to move forward and backwards. To prevent this, “harden” the balsa holes in the stab by applying a drop of thin CAA into the two holes and let dry before assembly.

If you examine photo 11 you will note that a standard size Futaba servo was used. The original SuperStar-EP Select uses this size servo for both elevator and rudder control. So it seemed appropriate to use the same size servo in the wing. However, this servo is Futaba’s new S3151 digital sport servo. This servo has better centering and control authority. But it was also the only standard-size Futaba servo I had available.

The S3151 comes standard with Futaba’s new 7AC computer radio that will shortly be the subject of a Sport Aviator review. We also “borrowed” the standard size receiver from this excellent radio system to guide the upgraded SuperStar-EP. Although the fully programmable, 7-channel computer radio system is a bit of overkill for this basic trainer, its flexibility made setup simple.

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Flight Time

Photo 15

Photo 16

The completed 4-channel SuperStar-EP weighed 3 lb. 5 oz. (53 oz.) including the flight battery. This is 5.5 oz. (11.6%) heavier than the original SuperStar-EP Select we tested. There was some concern that the extra weight, and additional current draw of the one digital servo, might reduce flight performance.

Photo 17

Well, yeah, it did a little. The 19.8 oz/sq. ft. wing loading, up from 17.1 oz./sq. ft., reduced the aircraft’s climb performance a little. The glide and landing speeds remained about the same. The

airplane also remained a docile trainer with no bad habits. The aircraft could still easily perform those great slow, nose-high landings that were a trademark of its 3-channel cousin.

The reduced climb didn't matter too much, but the flight time was also reduced. A little more power was needed to maintain level flight. The extra climb time at full power also used more battery. In the end, flight time was reduced to around four minutes.

Photo 18 Photo 19

But the performance improvement was impressive. The 3-channel version will not roll from level flight. If down elevator is applied to hold the nose up when inverted, the roll stops. This is not a problem with the aileron SuperStar-EP. The roll is gentle but firm and takes about 3 seconds to complete. There is no sign of adverse yaw, even at stall speeds.

Photo 20 Photo 21

Photo 22

Even some knife edge flight was possible as photo 22 shows. The SuperStar-EP also did some gentle spins, when forced under power. Regular level or steeply banked power-off stalls never showed a hint of falling off on a wing. All the stalls were straight ahead, even from a steep bank.

But full power and full aileron/rudder did force a slowly rotating spin that ceased immediately once the controls were released.

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In short, the aileron equipped SuperStar-EP performed about the same as any other .25-sized basic trainer except it did it more quietly. There was no engine fuss and it did not require cleaning after the flying session was over. With so great a performance, there had to be some way to increase flight time. Four minutes is not enough air time for most students.

Just substituting Lithium Polymer batteries for the supplied 2,100 mAh Nickel Metal Hydride (Ni-MH) battery doesn't work. The Ni-MH battery has seven cells yielding 8.4 volts. Li-Poly batteries come in increments of 3.6 volts. Two Li-Poly batteries supply only 7.2 volts, not enough for full motor power. Three Li-Polys provide 10.8 volts; too much for the motor and speed controller. While these items could be changed, that is not really an easy, nor an inexpensive, option for a new pilot.

So the only answer was to try reducing weight. Thanks to modern electronic miracles, there are many excellent micro-servos available that have the same torque as standard size servos at half the weight. These mini-marvels do cost about 50% more, but when needed, they can be ideal.

We used Hitec's HS-85BB+ mini-servos for this improvement project but Futaba also makes great mini-servos with the same performance. The HS-85BB+ servo has 45 in. oz. of torque, more than enough for the SuperStar-EP. This equals the standard sized servos we originally used. But the HS-85BB+ servo weighs only 0.7 oz. as opposed to around 1.8 oz. for a standard servo. The equivalent Futaba servos have almost identical specifications and weight savings.

We also removed the 2.5 oz. receiver and substituted the Hitec Electron 6 FM mini-receiver. This saved even more weight. The smaller flight pack weighed four ounces less than the full size one.

Photo 23

While the receiver was an easy substitution, the servos required about an hour to install. The new servos are considerably smaller while the mounts are designed for the larger servos. The trick here is to reduce the mount size while maintaining the same height of the output wheel.

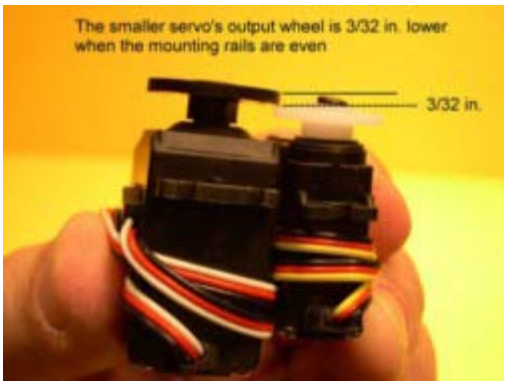

Photo 24 Photo 25

Measure the length and height difference. When measuring height, put both servos on a mounting rail and then measure the output wheels' height difference. In this case, the smaller servo's output wheel was 3/32 in. lower. This means that the new mounting rails need to be 3/32 in. higher than the old. By a happy coincidence, hobby shops sell 3/32 in. plywood. Or you can, as I did, combine a piece of 1/16 in. plywood and some 1/32 in. ply. Either method works.

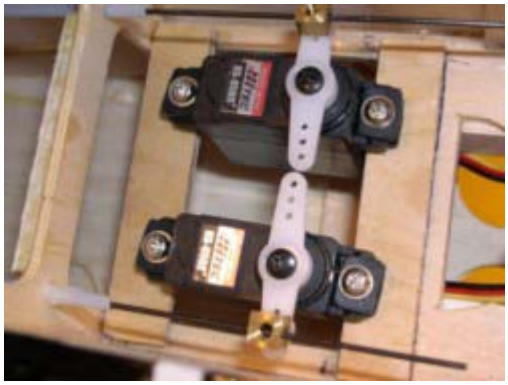

Photo 26 Photo 27

Measure the current opening as in photo 26. As I wanted to cover the entire rear mounting rail with the 3/32 in. ply, I included this measurement in the total. Since the servo was .45 in. shorter, the rails had to be .22 in. closer on each side to keep the servo output wheels in the same position. Measure this distance in from the front and rear of the current opening and mark it. Then install the rails at these points and glue them in place with thick CAA and install the servos. The entire assembly should look like photo 27.

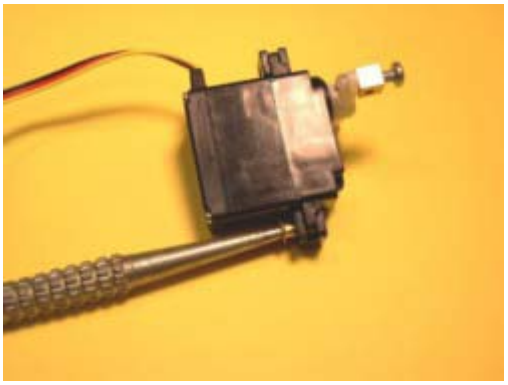

Photo 28 Photo 29

If you have problems putting the brass grommet liner into the servo grommet, don't just leave it out. Without the brass liner, tightening the servo screws crushes the grommet, removing its vibration isolation ability. This shortens servo life, even in an electric powered model. Use a 2/32 in. nail set to install the brass liners (photo 28). It is easy to do and the taper end allows the nail set to be easily removed without pulling the grommet liner back out with the tool.

Make sure that the control rod is installed in the servo output wheel exactly the same distance from center as it was originally (photo 29). If this distance is changed, the amount of control surface movement changes. Don't count the holes, as servo output arms have holes at different distances from center. Measure and match the distance, not the number of holes, out from center. Use the same procedure on the aileron servo as in photo 30.

Photo 30

The last thing to check is the Center of Gravity (CG) location. Since the servos are close to the CG, there was no measurable change in its location. There must have been some change towards the nose as the servos are lighter. But the receiver is also lighter and located slightly ahead of the CG, removing a little nose weight. Either the two changes balanced out or the net change was so small we couldn't find it.

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Flying Results?

Photo 31

Photo 32

The new SuperStar-EP weighed in at 49.5 oz for a total weight savings of 3.5 oz. This was only 1.5 oz. heavier than the non-aileron SuperStar-EP. Would a 6.7% weight reduction have any effect? While 3.5 oz. doesn't seem like much, it is actually the equivalent of taking a full half-pound of weight out of the average 40-size trainer. We all know that saving that much weight in a 40-size aircraft makes a big difference.

So, was there a difference? Happily, there was more than a little difference. The climb was about the same as the non-aileron equipped model. The aircraft would get to 300 ft. without using extra power. Flight times at half throttle, best for training purposes, went past seven minutes. Loop size increased back to original size. Stall Turns 3 minutes into the flight were still possible. The rolls required less down elevator to complete and the aircraft regained its ability to roll on a straight line without first having to raise the nose.

Photo 33 Photo 34

Approach and landing speeds slowed even more. The ailerons made approach control more precise than it had been with rudder only. It was even possible to slip the aircraft in, correcting for any light crosswind. But the SuperStar-EP's low approach speed, under 15 mph, reduced slipping to a "just for fun" maneuver as it wasn't really necessary.

Photo 35

The ailerons on this aircraft change its entire nature; from one of an OK trainer as long as the pilot desires electric power, into a truly practical and accomplished aircraft for any pilot. With the light weight on-board radio system, this aircraft makes a great basic trainer.

For more information, please go to www.hobbico.com or to www.greatplanes.com