Training in the Icon A5

Amphibious LSA

Does the pilot training program match Icon Aircraft's ambitious goals? **AIN** travels to Vacaville to find the answer.

by Matt Thurber

The Icon A5 light-sport amphibious airplane promises adventure, and that is indeed what this unique light-sport airplane (LSA) delivers. **AIN** was invited to experience full immersion in the A5 world, and I recently spent four days at Icon Aircraft's headquarters in Vacaville, Calif., learning how to fly the A5 and earning my LSA seaplane rating.

For Icon Aircraft, which markets the A5 as the ultimate fun device for the adventure sports fanatic, a significant challenge is balancing that sporty attitude with helping buyers, especially those new to flying, develop a strong dedication to safety while still having fun. The company does this through Icon Flight Centers (IFCs, two of them so far, in Vacaville and Tampa, Fla., with a third slated to open in Texas this year, likely in the Austin area). The IFCs train new Icon pilots and those who are adding a seaplane rating to their tickets, and they offer multiple ways to experience the A5, from a demo flight to ab initio LSA training for new pilots and LSA seaplane transition courses for existing floatplane pilots or pilots with no water experience. Having never flown a floatplane or amphibian, I went through the course for those with no water experience.

Until production ramps up later this year, the IFCs are the place where buyers can experience what it's like to fly the airplane they want to own. Once checked out and properly certified, pilots can rent A5s from the IFCs, although experience

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within the past 30 days is required, and a check-out will also be necessary when renting from a different IFC for the first time. Rental rates are $250 per hour for A5 deposit holders and $300 per hour for non-buyers; there is also a monthly fee of $50 to cover insurance and, for non-buyers, a $500 initiation fee.

The IFC flight line is populated by the first A5s built at Icon's Vacaville headquarters. At the time of my training in December, 16 A5s had been completed and half a dozen were in various stages. Five had been deployed to the Tampa IFC.

Cirrus built the major airframe structure for the initial batch of A5s under contract, but Icon has elected to build a factory in Chihuahua, Mexico, to manufacture composite components. The first parts are scheduled to ship from Mexico in May for final assembly in Vacaville. Icon expects the production rate to reach 10 per month by year-end, eventually ramping up to 30 or 40 per month to fill a backlog of orders for 1,800 aircraft secured by $2,000 deposits. An A5 costs about $250,000 with typical options.

Icon Aircraft founder and CEO Kirk Hawkins flew F-16s in the U.S. Air Force, and the two FTC instructors with whom I flew are former military aviators. Greg "Groucho" Zackney flew AV-8B Harrier IIs in the Marine Corps, and Shane "Sully" Sullivan, a Navy P-3 and F/A-18 pilot, is director of the Vacaville IFC.

I had flown the A5 for the first time with Hawkins at the EAA AirVenture show in 2015, and I was impressed by the airplane's handling qualities and the built-in safety in what Icon calls a spin-resistant airframe design. At the time, Icon promised a comprehensive and safety-focused

The A5's Rotax 912 engine produces 100 hp and gives the two-seater a maximum speed of 95 kcas. The most prominent feature on the instrument panel is an angle-of-attack indicator, in the center of the pilot's field of view. Its prominence fits well with the instructors' military backgrounds.

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training program, and now I was curious to see if the company met those expectations. I also wanted to learn more about the performance of the A5 and how its systems work.

The quality of the Icon training program is impressive. Rather than the lackadaisical, unstructured and non-standardized general aviation flight training that I have experienced at many small airports, the IFC provides focused, comprehensive, safety-oriented instruction, along with plenty of fun in the process. Spending time training in the A5 with military pilots who have flown nap-of-the-earth at 400-plus knots or hovered a Harrier means that fun is going to break out sooner or later, and indeed it did.

PREP MATERIALS

Before I headed to Vacaville, FTC flight operations coordinator Ariel Andrus sent me a package of training material and set me up with an account in the online Icon learning management system (LMS). I wanted to evaluate the LMS, so I started at ground zero with the Icon Sport-Flying Academics course, which a new student pilot would have to study as part of the LSA course work.

The online course replicates the printed book, making it easy to move between them, although the printed version doesn't have the quizzes that the student must take after each module. The LMS is well designed and it gives students who prefer learning online easy access to the material. After finishing the academics, I moved on to the meat of what I needed to learn, the Sport Flying Operations book, which gets into detail on amphibious seaplane operations in the A5. Because I was traveling, I brought the books with me for surefire access on long flights and in hotel rooms with dubious Internet connectivity.

There's a clear focus on making the subjects easy to understand for new students, with explanations that give all the information necessary without overwhelming the student with endless discussions of general aviation arcana. The writer of these manuals did a great job, especially the explanations of basic aerodynamics and the description of lift as equal to angle-of-attack (AOA) plus airspeed.

The A5 is equipped with an AOA indicator, and this is a big part of flying the airplane that is well covered in the training material. I was impressed not only that Icon gave AOA a prominent role in the A5 panel, but also that the company teaches AOA right from the beginning of the training program. This fits well with the instructors' military backgrounds, given that AOA has long been at the core of military aviation.

Users can easily fold the wings of the Icon A5 to transport the amphib. Folding the wings (a manual process) takes one person two minutes. When you get to the lake the amphib's trailer unloads like a boat, says Icon.

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THE A5 DESIGN

From outward appearance, the all-composite Icon A5 looks fairly simple, with a boat-hull fuselage topped by a 100-hp Rotax 912iS four-stroke four-cylinder engine turning a pusher propeller, a T tail, retractable landing gear and a strong-looking wing with a distinct leading-edge profile change about halfway across the span.

That is just one element of the extraordinary design detail that went into the A5 *(see box at right)*, and the wing plays an important role in the A5's spin-resistant airframe (SRA) design. The big difference between the A5 and a more traditional airplane is what happens at the stall. The A5 can be stalled, but three key design goals dictate what happens at the stall. First: it must be resistant to spinning. Second: it must be controllable in a stall. And third: it must have a descent rate during a power-off full stall low enough for a crash to be survivable.

In Icon's SRA video, the A5 is shown flying near a Cessna 150. Both pilots make the same inputs to slow their airplanes, stall, then kick the rudder. The 150 quickly enters a spin while the A5 just burbles along straight without any wing drop. It's a dramatic demonstration of the newer airplane's spin resistance. What this means for the new pilot and even experienced pilots is that the A5 doesn't react to a stall by suddenly dropping a wing, even when stepping on the rudder, so the pilot is in a position to recover quickly from the stall before losing control.

The A5 is equipped with an airframe parachute, and Icon recommends using it in case of a midair, engine failure over hostile terrain or a loss of control, for example after an unrecoverable IMC encounter. As an amphibian and an LSA, the A5 offers many more options for landing in case of an emergency, so popping the parachute might not be the first choice, but it is part of the SRA design and thus required equipment.

DESIGN FEATURES

The Icon website presents the A5's design features in a series of professionally produced videos that showcase the industrial designers' skills. For example: all boats have a way of tying up to a buoy or dock, and so do amphibious airplanes. But where most manufacturers would select a dead-standard circular ring, that wouldn't do for Icon. Instead, the A5's shapely bow ring doubles as a handle for moving the nose around in the water or on the ground.

The landing/taxi lights, too, demonstrate this attention to design detail. Most aircraft manufacturers choose aircraft parts for this function; after all, the incandescent GE 4509-size landing-light bulb is a long-time standard, now replaced by 4509-sized LED lamps, but still a round bulb that no one would think needs to be changed. For the A5, Icon's designers selected LEDs, but they realized, as have many automotive designers, that individual LED bulbs can be patterned to create lighting that not only best suits the task but also contributes to the A5's "differentness." The landing light has five LEDs in the top row shooting a bright, narrow 10-degree beam; below that are three LEDs providing 180 degrees of light for taxiing. The total output is 4,800 lumens while using only 4.8 amps, and they should last far longer than incandescent bulbs.

One way to save weight and simplify an airplane is with a castering nosewheel, and the A5's can move through 360 degrees to make ground handling easy. But this presents an engineering challenge: how to straighten the wheel for the seven-second retraction cycle. An Icon video shows the solution to be a small spring strut that rides on a cam; when the nosewheel leaves the ground, the cam rotates the wheel to the aligned position.

The landing gear uses wheels and brakes by French manufacturer Beringer, and they weigh three pounds less than competing brands, according to Icon. The parking brake—a lever next to the left seat—acts in an unusual temporary manner, locking the brakes when it is applied, but eventually bleeding off so a locked door doesn't keep ground crew from moving the A5 if necessary.

The doors that cover the landing gear are part of the hull structure, which is tough enough to allow beaching with the landing gear retracted. One problem with the gear doors is the gap where the door is hinged to the hull, an area that easily catches stray seaweed and other debris. The Icon designers placed small shark fins in front of the doors to deflect debris.

The gear system must have lights, but because the A5 is amphibious, a blue light indicates gear up (safe to land on water) and an orange light with a landing-strip icon shows that the gear is down (safe to touch down on land). The pilot can also view the landing gear in mirrors mounted onto the extended leading edge panel on the outboard wing section.

As much as buyers might wish that the wings would fold and unfold electrically and automatically, that would have been costly and probably too heavy for such a small airplane. To unfold the wings, one person simply grabs a tip handle on the trailing edge near the wingtip. It takes about 33 pounds of pressure to release the holding pin that keeps the wings in the folded position. Then slide the wing back about 18 inches and walk it forward and to the side, rotate the leading edge down, then push the wing smoothly in toward the root. A locking handle holds the wing in the flying position via two pins, and an indicator in the cockpit confirms that it is properly secured.

The seawings have two clever features. Their tips are easily replaceable in the field by the pilot/owner, held on by just one bolt and four pins, in case they get damaged bumping into something. But when the tips are removed, the Icon with folded wings will fit into a standard shipping container. *—M.T.*

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MATT THURBER

Thurber, an experienced landplane pilot, completed the company's four-day course for pilots with no water or floatplane experience.

TRAINING BEGINS

Because I had no previous water-flying experience, to get my seaplane rating I would need the full TX-L course (transition land): three days of training and a proficiency ride on the fourth day.

I started out on a Monday with Zackney. Like any good training organization, Icon begins flights with ground school and a detailed briefing on the planned flight. All water training is done at nearby Lake Berryessa, a huge body of water that even in windy conditions has calm coves and sheltered areas that allow training to continue. Outside the protected zones, there are plenty of opportunities for practice in rougher water, and only on the windiest days is much of the lake unflyable. It takes 12 minutes to fly from Nut Tree Airport (VCB) to the lake.

On the first morning, Zackney went over all the ground training modules in the sport flying operations textbook that we would be applying in the A5 and made sure I understood them thoroughly before the flight lesson. My first flight that afternoon was with Sullivan. I was happy to discover that Icon doesn't leave anything to chance; every flight is overseen by a crew chief who warms up the engine and loads the fuel needed for the lesson. The crew chief also meets every returning flight to fix anything broken right away and puts all the airplanes inside at the end of the day.

On the first flight, Sullivan and I performed the normal Rotax engine burping process before checking the oil level, checked the fuel level with a dipstick and looked for water in the fuel using a syringe to suck some fuel from the bottom of the tank, but the crew chief usually does this. The 20-gallon fuselage-mounted tank isn't fitted with drain valves in the bottom of the fuselage, so the only way to check for contamination is by using the syringe to suck some fuel from the bottom of the tank. It wouldn't make sense to mount a drain valve down low where it would be subject to hydraulic pressure from water operations.

Sullivan demonstrated the preflight inspection by following the checklist and pointing out some slight changes to the A5 airframe resulting from operating experience. Unlike ordinary landplanes, the A5 lacks a squat switch for the landing gear, making the airplane more reliable. In addition, such a switch isn't necessary because there are no systems that rely on landing-gear position as on a more complex airplane. This reminded me that landing-gear position in an amphibian is entirely up to the pilot; there is no warning horn to alert the pilot that the gear is up when landing on a runway or that the gear is down when landing on water.

The Icon factory and IFC is located just off the northeast end of Nut Tree's Runway 02/20, and the prevailing wind normally favors taking off and landing on Runway 02, so it's a fairly long taxi to

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the active runway. With no nosewheel steering, the A5 relies on brakes for steering. The rudder pedals are adjustable since the seats are fixed. On the ground it feels like I'm sitting fairly low, but the seat is comfortable and the visibility from the cockpit is fantastic, with little to impede the forward view. The A5 can be flown with the side windows removed, in which case small air deflectors must be mounted.

Normal takeoffs are made with flaps zero. The takeoff checklist is short (this is a relatively simple airplane), but I appreciated Sullivan's diligence in making sure I followed it. Pushing the console-mounted throttle full forward got the A5 accelerating smartly and we lifted off in just a few hundred feet. There was no need to carry the extra weight of full fuel, so we were loaded with half a tank (10 gallons), plenty for our lesson and a reserve; the Rotax burns only four to six gph. Max takeoff weight is 1,510 pounds, and our flights started at about 100 pounds below mtow.

It is a little strange to think about retracting the landing gear on a light sport airplane, but it soon becomes second nature, just another part of the climb checklist. I turned left slightly after takeoff and headed for Putah Creek, which drains the overflow from the dam that contains Lake Berryessa. All inbound A5 training flights fly at 2,500 feet along the creek, while outbound aircraft stay at 2,000 feet. We also used a common frequency to broadcast our intentions to other aircraft flying around the lake. On the way to the lake, I did some maneuvering to get the feel for the A5 and then slow flight and power-on and -off stalls. Sullivan demonstrated a power-on stall using full power and how the A5 continued climbing while stalled. During the pre-lesson briefing, Sullivan had said the A5 "is pretty easy to fly and forgiving." He was right.

We spent the rest of the lesson flying splash-and-goes and full-stop landings, practicing idle turns and faster plow turns, maneuvering on the step and getting me familiar with the Lake Berryessa environment. The weather was perfect that day, with blue sky and calm wind, and it was hard to assess wind direction from the air, so we landed in the middle of the lake and allowed the A5 to weathervane into the wind. We practiced a deck-angle drill, where I set up the A5 close to the water with the AOA in the yellow, then used power to climb and descend while holding that AOA. This helps get the new A5 pilot comfortable with flying at low altitude using AOA and power to maneuver in confined areas precisely. Sullivan demonstrated a confined-area landing on the lake, and it was impressive how little space is needed.

Returning to Nut Tree, I did a normal, soft- and short-field landing. For the last landing, I purposely came in high and slipped to lose altitude. The A5 slips smoothly, with nary a burble. Hawkins later told me that this wasn't a design goal, but the ability to slip smoothly makes the A5 much more flexible and will instill confidence in pilots learning how to do that maneuver.

DAYS 2 AND 3

I flew twice on the second day; the first lesson was with Hackney. We discussed emergency procedures during the briefing, including proper use of the bilge pump when the "purge bilge" indicator illuminates; the fuel pressure light, which can indicate a clogged fuel filter; power-off landings, which can be done gear-up on a soft surface such as grass; electrical malfunctions; use of the parachute; checklist flows; and water takeoffs and landings.

After a short-field takeoff with flaps set to 15 degrees, as we neared the dam the fun started when Hackney pulled the throttle over Putah Creek and told me to glide to a landing on the water just beyond the dam. Hackney showed me how to draw an imaginary sight line between the side window latches, and how the A5 can glide to any place below that line.

I established a glide, setting the AOA on the white line for best glide, then ran the landing checklist, making sure the gear indicator showed

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blue for water. The water was calm, almost glassy, and as I flared and held the A5 level, I watched the AOA gauge climb to the top of the yellow as the hull kissed the surface of the water then rapidly slowed the A5 as I pulled the stick all the way back. The A5 settled into the water gently, decelerating smoothly and using very little length of water for the touchdown.

We spent some time trying different landing techniques: more power-off touchdowns, step turns and more deck-angle drills. Although it was fairly calm again, step-taxiing was challenging as I found I had to add a lot of power to get the A5 planing on the step, then carefully reduce power to maintain 25 to 30 knots groundspeed (as indicated on the Garmin 796's GPS-based instruments). Of course, the difficulty of this maneuver varied depending on the roughness of the water, as I was to find out on day three. Hackney demonstrated some more aggressive on-the-water maneuvering by applying full rudder in a step turn, something that is not possible in a floatplane. We also tried some turning takeoffs and landings, which work fine in the A5 and are useful in confined areas.

We then flew some formation (with Hackney at the controls) with another A5 over the lake before practicing a glassy-water landing. This is a maneuver where the assumption is that the water is so smooth that it is impossible to judge height just by looking at the surface, and it is generally considered an emergency. Icon advises A5 pilots to seek out ripply water elsewhere rather than try to alight on glassy water.

The glassy-water landing relies on setting up an approach that gives a 100- to 150-fpm descent (as seen on the Garmin 796 because there is no VSI in the A5), and then flying right onto the water but focusing primarily on the instruments and not fixating on the water's surface. It took me a few tries to understand the importance of setting up the approach over a close visual reference such as a peninsula or island and also not to turn below 200 feet. The procedure works well, but it feels strange not to flare while the A5 finds its way to the surface, then pulling the power back to complete the landing.

During the afternoon flight with Sullivan, we flew some accelerated stalls on the way to the lake, then reviewed the glassy-water landing procedure, practiced spot landings and flew around searching for a suitable place to practice beaching.

Sullivan took plenty of time to explain how he selects then approaches an area suitable for beaching and always makes sure he has an escape route if there are any problems. We overflew a spot that Sullivan had used before and landed nearby. As we

MATT THURBER

The A5 has a water takeoff distance of 1,470 feet (840-foot water run) and a water landing distance of 2,140 feet (700-foot water run).

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neared the spot, Sullivan opened the canopy and we unhooked our seatbelts. Sullivan likes to practice abandoning the approach to the spot at least once before committing, so we turned away then headed back in. Once close to the beach, I switched the engine off and we floated in, with Sullivan walking the rudder to give us a little push. He then jumped out and pulled the A5 slightly onto the shore while I shut off the master switch, secured the cockpit and stepped off onto the beach. It was strange to have flown in an airplane to this remote spot without a runway—a great demonstration of an amphibious airplane's capabilities.

During this flight, Sullivan surprised me with a simulated engine failure while I was flying low over the water. This is great practice and something that can be done only in an amphibian or floatplane, and it tests the student's recognition of the need to push the nose down quickly to maintain best glide speed. The first time this happened, I reacted the wrong way and pulled the nose up, which slowed us, and Sullivan pushed the power and stick forward to keep us from stalling. "The tendency is to pull up, the water is coming," he said. "You have to trust the AOA. And you've got to push right away or you won't have enough energy."

My final training flight the next day, again with Sullivan, revealed a lake transformed from the calm and almost glassy surface that had greeted my first three flights. The wind was blowing at 12 knots, whistling along from the northwest and roiling the water into near whitecap conditions. When whitecaps are visible, that's pretty much the limit for the A5, which can handle up to 12-inch waves. Fortunately, Lake Berryessa has lots of protected areas so we could practice all the maneuvers to prepare for the next day's proficiency check and do some rough-water flying.

Getting on the step and staying there was much harder in the rough water, and the stronger wind demonstrated the difficulty of turning on the water from upwind to downwind. During the rough-water landings, I could feel the waves smacking the hull, although this dissipated quickly in a full-stop landing. If the water is too rough, it's a simple matter to go around after touching the surface and seeing what it's like. Taking off in rough water results in a skipping action as the hull bounces off the waves, and it's important to hold the nose steady until the A5 lifts off. You just can't force it off the water.

We tried sailing with the engine off, using the rudder to manage our direction of movement, but the water was too rough to open the canopy, which is typically done while sailing.

Lake Berryessa was still too low—this was before the steady rainstorms that deluged California during the winter of 2016/2017—so we couldn't try a ramping, where the A5 is taxied onto a boat ramp or smooth beach. One disadvantage of a boat-hull amphibian such as the A5 is that its wings sit rather low, so when docking or ramping, it's critical to assess the area to make sure the wingtips won't hit anything. Docking, too, was out of the question because of the strong wind.

We did practice evaluating potential ramping areas by flying the minimum-radius-turn maneuver. This is done at high power and in about a 60-degree bank with the AOA in the yellow, but at low altitude, usually about 200 feet. The A5 is rock steady in this configuration, and if it nibbles at the stall, there is no tendency to diverge; all that I would have to do is move the stick forward slightly or shallow the bank, while remaining in the turn. This is a dramatic—yet safe—maneuver, and it looks like the wing is pointing straight down.

PROFICIENCY CHECK

The wind had calmed for my final flight, the proficiency check with Zackney. This was a no-pressure review of all the maneuvers I had done so far, capped by a thrilling low-level flight along the northwest end of Putah Creek where it feeds into the lake. We flew along the right side of the creek

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at about 2,000 feet, then I turned left and pushed the nose down, picking up speed in the descent and leveling off about 50 feet above the water.

I kept the power in as I followed the creek's course and descended below the level of the bare drowned trees that lined the banks. As the creek widened where the lake took over, I pulled up to climb well above a bridge topped with unmarked power lines to give us plenty of margin. This is something I wouldn't do in a landplane, but in an amphibian flying low along the river felt comfortable and safe; there were many places where I could have landed if there was a problem with the engine.

The entire A5 training experience was uniquely fun, especially the last flight. All of the Icon instructors are keenly focused on safety and professionalism, and it shows in their training practices, but they also like to make the experience enjoyable.

TRAINING BUYERS

The Icon training is well tailored to the product, but the company faces a challenge in matching a safe training environment to the sporty attitude it projects in its marketing.

"This is recreation," Hawkins acknowledged. The military has the advantage of screening for pilots from a group of young people at the peak of their performance. Icon obviously wants to sell as many airplanes as possible while ensuring that buyers fly safely. "It's harder for us," he added. "We want to make it fun, palatable and easy but safe."

Doing this involved writing the training manuals in a way that engages students without throwing a bunch of what Hawkins calls "tech geeky pilot talk" at them, although Icon does provide a supplemental manual with a deeper dive into aerodynamics for those who are interested. The other big factor in making the Icon experience safe is the airplane itself. "The airplane is better than we contemplated," he said. "It's easier, safer, fun and aesthetically better than we imagined. We're proud of that."

Hawkins is aware that the A5 looks like a cute little LSA that is simple to design and build, but it is the culmination of a lengthy and almost obsessive design process, with extended debate about what might seem to be minor items such as the shape of a needle on a gauge. The effort was worthwhile, and in the case of the AOA gauge it established a clever wing-shaped needle as well as other subtle features.

The entire A5 development process, Hawkins said, involved "people at the top of their game who put in their heart and soul for the pure love of making it great. It was a massive design project, a symphony of parts, each instrument starting to play together to make great music." ❑

Icon conducts its training at nearby Lake Berryessa, which has calm coves and sheltered areas to allow training even in windy conditions.

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