INDEPENDENT

AVIATION SOLUTIONS

SportCruiser Systems and Operations Supplement

Contents

Section 1: Systems

Airframe

The sport cruiser is a single engine, low-wing aircraft with an all metal construction. The skin of the airplane is aluminum and features a semi-monocoque structure. The use of aluminum allows for a longer life and lower maintenance cost for the airframe.

Landing Gear

The aircraft is equipped with tricycle landing gear. The nose gear is constructed of steel and is free castering. The main gear is composite construction. The main gear on the aircraft is equipped with Matco hydraulic disc brakes. The hydraulic fluid is Milspec5606. The brake fluid is pink in color. The color can be seen in the clear brake fluid lines that run down the main landing gear. All tires are tube type 500X5.

Propeller

The propeller is a three blade Sensenich Carbon Fiber type with metal leading edges to prevent erosion. The blade angle is fixed in flight but ground adjustable by a mechanic. All propellers at Thrust Flight are adjusted for the best combination of climb and cruise.

Engine

The engine is a Rotax 912 ULS2. It is horizontally opposed, 4-stroke, 4-cylinder, with liquid cooled cylinder heads and ram air cooled cylinders.

- ✓ Liquid cooling is a 50/50 mixture of distilled water and ethyl glycol
- ✓ Uses a dry sump forced oil lubrication system

- ✓ Dual contactless capacitor ignition systems are installed on the engine, these are magneto like devices

- ✓ Equipped with a reduction gear box.
  - o The gearbox allows the propeller to spin at a slower speed than the engine.
  - o Operating the engine at a higher RPM allows the smaller engine to generate more horsepower.
  - o The smaller engine allows for more useful load and greater aircraft economy.

- ✓ The engine is equipped with 2 carburetors, one for the left cylinders and one for the right cylinders.
  - o The carburetors have floats allowing for automatic fuel mixture control based onaltitude.
  - o It is common that the engine will run slightly rough when an imbalance in the carburetors has taken place below 3000 RPM. This is not a cause for concern but should be reported so maintenance can address the issue.

- ✓ Max RPM 5800 with an output of 98.6 horsepower for 5 minutes
  - o Continuous power setting is 5500 RPM (95.8 horsepower)

- ✓ A typical cruise setting is between 4900-5400

Fuel

The Sport Cruiser has two metal wing tanks; one on the left and right wings.

- ✓ Maximum capacity of 30.12 gallons
- ✓ Usable fuel is 29.86 US gallons
- ✓ Engine driven mechanical fuel pump that runs off the engine gear box
- ✓ Electric fuel pump is installed in the event of a mechanical fuel pump failure
- ✓ A fuel return line is installed that allows excess fuel to be returned to the left tank.

At Independent Aviation Solutions we use 100LL exclusively

Note: The Rotax engine can run on Mogas (automobile fuel)-91 Octane. It is acceptable to mix 100LL and pump gas. Mogas is straw colored.

Electrical

The Sport Cruiser is equipped with a 14 volt 20 amp AC generator. Overvoltage protection is provided through circuit breakers and circuit breaker switches.

Aircraft battery

- ✓ Mounted on the right side of the firewall;
- ✓ 12 volt;
- ✓ Can provide power to the system for 45 minutes

The MASTER BAT switch connects the battery to the electrical system.

The MASTER GEN switch connects the generator to the electrical system.

It is very common for the regulator/rectifier unit to fail on the SportCruiser. The most common indication of this is when a CONTACT GEN LOW red warning message is illuminated on the EFIS. Students must be taught what this warning message is indicating and to use the checklist in section 3 of the Emergency procedure section of the POH when this happens. Generally, the issue can't be fixed in flight and dictates that electrical load must be reduced. It is important to teach your students the specifics on how to reduce the load in a SportCruiser as it is not obvious. Both EFIS screens and the Garmin 796 are equipped with a backup battery. For this reason, the Garmin 796, EFIS one and two should be turned off with the switches. A message will illuminate that "power lost press any button to use battery power" on both the 796 and the screens. Press one of the soft keys to run each of the screens on its battery power. This will save the firewall battery for other necessary components like the intercom, radio, and flaps. All lights should be turned off. This will also allow you to turn on the second display in the event the first battery is depleted. The EFIS screens can be turned on with battery power by holding the far-left soft key down. This can be accomplished whether or not the main battery is on or off, and even after the "press any key to stay on" message has disappeared and the screen has gone black. The two systems are completely independent.

Avionics

Dynon Avionics are equipped standard across the Independent Aviation Solutions' SportCruiser fleet.

HDX: touch screen capable

The HDX has updated knobs and has the capability of displaying an "engine bottom band" on the lower half of the screen. The basic operation remains the same and switching between the two should not interfere with a student's ability to operate the aircraft systems. Each EFIS screen is equipped with a backup battery will operate the individual screen for approximately 60 minutes.

The aircraft is also equipped with a Garmin 796. The Garmin 796 has a battery that will last several hours.The Dynon system is equipped with a GPS/ADSB antenna on the left side of the fuselage directly in front of the canopy. The Garmin 796 has an either one or two antennas mounted on the center of the glare shield. If the aircraft is equipped with two antennas the aircraft has XM weather capability. Each SportCruiser is equipped with one or two Air Data Attitude Heading Reference System (ADAHRS). The ADAHRS is a two-part system composed of the Air Data system and the Attitude Heading Reference System.

The air data systemgets information from the pitot static system and the outside air temperature probe. The pitot tube is located on the left outboard wing. The static port is located on the pitot tube. The temperature probes are located on the right side of the aircraft belly behind the right main landing gear. If the aircraft has two temperature probes it indicates that the aircraft is fitted with two ADAHRS units, it the aircraft has only one probe it is only equipped with one ADAHRS. The Air Data system uses sensed information to compute airspeed, altitude, vertical speed, outside air temperature, true airspeed, winds, and density altitude. The Attitude Heading Reference System uses solid state sensors consisting of an accelerometer, magnetometer, and inclinometer.

Section 2: Performance

The performance section (Section 5) of the POH is very limited in available information comparatively to a certified aircraft operating manual. With the information available we can calculate most requirements for flight training.

It is important to expand on the takeoff and landing data information with your students. The POH only gives two takeoff distances and two landing distances. One figure is for grass field takeoffs and the other on pavement. All figures only factor for zero wind, sea level, max gross weight, on a standard day. It is important that students understand that typical distances will be far greater than those listed. It is important to incorporate training that includes shortening the distances for headwinds and increasing for greater density altitudes.

Section 3: Weight and Balance

The Sport Cruiser is limited by the maximum weight allowed for sport aircraft.

- ✓ This max weight is 1,320 lbs
- ✓ When calculating weight and balance, make sure each flight is dispatched with this max weight considered

To calculate the forward and aft CG limits the cruiser uses a percentage of MAC or Mean Aerodynamic Chord. The formula is in the POH and on the Thrust Flight weight and balance sheets.

It is important to note that the useful load is limited on the SportCruiser. It may be necessary to leave flight bags and unnecessary equipment behind. This is very important when calculating weight and balance for a check ride. It is better to leave the 15 pound flight bag behind and take more fuel.

<u>It is not acceptable to fly the SportCruiser overweight</u>. The aircraft will perform very well at Max Gross. The limiting factor for the 1320 weight limit is a result of the LSA and ASTM rules that govern the Light Sport Category, not the aircraft structure. The aircraft has been tested to a much higher weight and G loading.

Section 4: Required Equipment

The SportCruiser does not follow the regulation for required equipment 91.205. The student should not quote ATOMATOFLAMES acronym. Students must know the minimum equipment required refenced in section 2 of the POH. That list is a minimum equipment list of the equipment that must be operational prior to conducting a flight in the SportCruiser but should not be confused with a traditional Minimum Equipment List that is approved by the administrator.

Section 5: Pre-Flight

Following the pre-flight checklist instructors and students will systematically inspect the aircraft and determine the airworthiness before each mission.

- ✓ Verify the certificates, documents and inspections
- ✓ Inspect each document - it is necessary to verify all the documents are not only present but accurate and legal
- ✓ A requirement for a flight to be dispatched is the issuance of a dispatch release and verifying that all test and inspections are up to date and legal - this is accomplished by using the dispatch sheet and verifying the validity of the aircraft documents before each flight.

The inspection should begin with the interior following the checklist and flow in counter-clockwise direction around the outside of the aircraft checking for anything that would cause the aircraft to be un-airworthy. The checklist must be used during this process as a refence.

Unless a previous lesson prevents an instructor from being present the instructor is required to observe and periodically test the student on his or her knowledge and abilities as it relates to the preflight. Testing knowledge on certain components and the operations of systems is necessary for proper flight instruction throughout all ratings not just private. It is never acceptable for an instructor to be relaxing or performing non work-related activities while a student pre-flights. If an abnormality is detected a detailed picture(s) and description of perceived problem should be sent immediately to the chief or assistant chief.

The only oil used in all SportCruisers is Aeroshell Sport Plus 4.

- ✓ Oil is added 100mL at a time
- ✓ Instruct students on the proper procedure for adding oil
  - o The range for the flat portion on the dip stick is approximately ½ liter.
  - o Traditional aircraft dipsticks have several markings that indicate quarts.
  - o Oil can easily be overserviced because the pilot did not understand the range on the dip stick.
  - o Before adding oil it is necessary to "burp" the engine multiple times especially is cold weather operations to get an accurate reading.
    - ▪ To most effectively burp the engine pull the propeller slowly through the compression strokes as it will burp faster than pulling it through quickly.
  - o The desired oil quantity is half-way up the indent on the dipstick.
  - o If the aircraft requires oil before the flight an authorized instructor or dispatch will retrieve it and notate it on the oil log.
  - o If taking an unopened bottle along for a long crosscounty (over 5 hours) sign it out and if unused one line your name off of the log upon return.
- ✓ When cleaning the windshield prior to flight only use Prist and a microfiber cloth. The canopies are a plastic composite and glass cleaner will cause fine cracks and scratches.

add SC pre-flight checklist here

Section 6: Normal Operation

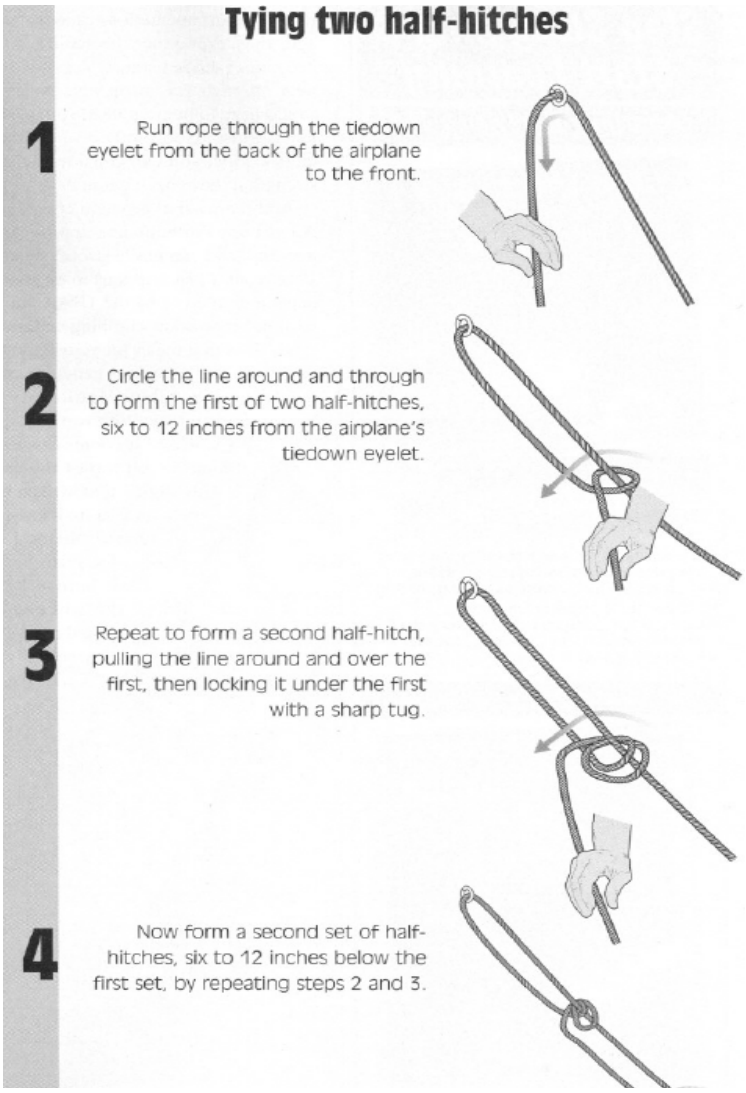
FUEL

The sport cruisersare fueled to 9 gallons per side for local operations and according to the weight and balance limitations for the aircraft each flight. Fuel reserves should be no less than 1 hour according to the school's rental agreement(5.5 gallons). The tanks are forward of the CG. As fuel is burned the CG moves aft. This is unique as compared with most conventional aircraft. The fuel tanks are long and skinny. When there is

less than 4.5 gallons of fuel in the tank, it will appear empty because all the fuel has pooled near the wing root as a result of the dihedral in the wings. Fuel caps should be verified on and locked by instructor prior to flight. Historically we have lost a lot of fuel caps because they were not properly secured on the aircraft.If planning to get fuel outside of Creve Couer, a set of chocks must accompany the aircraft on the flight.

TIE-DOWNS

The aircraft will be chocked on each main wheel and tied down while not in use on the ramp. If unable to put the aircraft in a spot with tie-downs it will be stored in the hangar. When using ropes as tie downs the tie down will be tied in two half hitch knots. DO NOT allow the rope to slap the airplane when it is pulled through the tie down loop. This causes major damage over time. It is necessary for the instructors to tie down the aircraft with the student to ensure that the aircraft is properly secured and knots and properly tied. It is never acceptable to have a poorly secured aircraft. You are responsible for the actionsof your student.



HANGAR

Students are not permitted to move aircraft in or out of the hangar. Instructors when moving aircraft must have at a minimum one spotter on while repositioning the aircraft. A student is permitted to function as a spotter. While aircraft are in the hangar students shall not step onto aircraft unless an instructor is present. Aircraft are often parked very closely together in the hangar. For this reason, no student is permitted to step on the aircraft. This can cause damage to other aircraft parked behind because of the close proximity.

ENGINE START

Prior to starting the engine instructor or student will conduct a passenger brief. This brief will consist of the following: Seatbelts will be worn at all times, air vents location, (during winter how to operate the heater),

emergencies, how to exit the aircraft, sterile cockpit procedures, positive exchange of flight controls, and are there any questions. Do not start the engine without the EFIS screen up to verify both fuel flow and upon starting oil pressure and temperature. It is possible to turn the screen on with battery power by holding the left soft key down. This will accelerate the boot up process. This should only be used in a dual flight scenario only.

TAXI

The free castering nose wheel is not connected to the rudder pedals like on other traditional aircraft. Turning the aircraft can only be done using the brakes except at higher speeds. In the non-movement area taxi speed will be no faster than a walking pace. Whiles taxing in the movement area a brisker but safe taxi speed can be maintained. On days with higher surface area it is necessary to taxi at ta slower speed. In the ramp area do not turn any plane around or position for parking with the engine running.Prior to taxiing to an active runwaythe student or instructor will provide a taxi brief.The brief should consist of the active runway in which you are taxiing to, the hotspots you will encounter along the way, and the direction of the wind. Flight controls should properly be deflected with consideration of the surface winds. An electronic or paper taxi diagram will be available for Addison and all airports of intended landing.

RUN-UP

The student or instructor will conduct the “Before Takeoff Run-up” checklist. If any abnormalities are encountered student or instructor may request assistance from the Chief or Assistant Chief. The plane will be taxied over to the maintenance facility on “S” or back to the school on “R” if unable to continue the scheduled flight.

TAKE-OFF

Before takeoff, the emergency takeoff procedures must be briefed. Prior to takeoff,the aircraft will be configured in a no-flap or flaps 12° configuration. When taxiing onto active runwaystudent and instructor will verify runway, final is clear of traffic, engine instruments are in the green, and continue the takeoff checklist.

CLIMB OUT

The crosswind turn will begin no sooner than 400’ AGL. If operating in Addison class “D” airspace, all flights will depart no higher than 2,000’ MSL unless otherwise instructed by ATC.

MANEUVERS

The practice areas are defined in the Standard Procedures and Practices. While practicing maneuvers such as: slow flight, stalls, steep turns, chandelles, lazy eights, and emergencies they will be conducted 2,500’ AGL or higher. Ground reference maneuvers(turns around a point, S-turns, and eights on pylons) are done 600’-1000’ AGL according to the ACS and PTS.

AIRPORT OPERATIONS

TOWERED AIRPORT

- When flying to towered airports, students and instructors will initiate communications with the tower no less than 10NM from the airport.

NON-TOWERED AIRPORT

- When flying to non-towered airports students and instructors will begin communicating on the CTAF frequency within 10NM and announce their intentions. A follow up call announcing intentions will occur again 5NM from the airport. Approved traffic pattern entries include: left midfield 45°, teardrop, and crossing over runway at TPA

and turning directly into the downwind. It is never appropriate to perform strait in or base entry landing except in emergency situations.

ATC

When calling regional approach,students and instructors will use appropriate language articulated in the AIM. When first establishing contact wait a few seconds to make sure there is an opening in the flow for ATC to accurately hear you. When opening communication, the call should go as follows: “regional approach, sportcruiser 492SC, 2,500 with information Juliet, 5 miles north of Rockwall”. This gives regional approach all of the necessary information to sequence the traffic into Addison. If approach is busy it may be necessary to initiate communication by simply saying “regional approach sportcruiser 492 SC”. When switching from regional approach to Addison tower, students and instructors should pause for at least 5 seconds prior to initiating a radio call to avoid “stepping on” another aircraft communication.

PARKING

When parking a cruiser always use a towbar or pull the aircraft by the propeller.It is never acceptable to push on the cowling or the spinner of any aircraft. Never push the tail down on any aircraft at Thrust Flight to repostion the aircraft. When leaving the plane after a flight the aircraft must be tied down using the appropriate method discussed above, chocked and gust locked with seat belt. Wings must be directly over the tie down straps. Examples of unacceptable parking jobs.

Section 7: Sport Cruiser Familiarization

At Independent Aviation Solutions we require our students to be well versed on the aircraft they fly. Below are some common situations that occur while flying the cruiser and the way to handle them effectively:

1. Entering and exiting the cruiser should be done with care. Explaining where and where not to step when on the wing is important. The flaps are very easily dented if weight is put on them. No one should jump on or off the wings at any time. When getting in or out of the seat make sure the center “T” handle is used when needing to put weight on something. Do not step on the seats whenever possible this causes extra wear and tear. Instructional videos “do’s and don’ts”

2. The canopy on the cruiser is prone to cracking if it is mishandled. When closing the canopy never allow it to drop down. Close it gently as if your fingers were sitting in the jam. If inside the cruiser and the latch is having trouble this can be caused by a few different things.

    a. The canopy may be misaligned. Push up from the metal handle and gently pull it to the right or left and see if the lever will close.

    b. The lever may be stuck, the joint behind the seats can over centerand become stuck. Simply push it towards the aft of the aircraft and the lever will work. Make sure to check both sides.

    c. DO NOT slam the canopy to help get it to latch. This will cause it to crack.

3. It is critical to make wide sweeping turns in the SportCruiser and always center the nose gear prior to stopping. We have a high tube failure rate because students and instructors perform turns that are too tight or exit the runway at too high of a speed utilizing the brakes. Excessive power is necessary to move the aircraft when the nose gear is not centered on a stationary aircraft. This places great strain on the nose gear and the innertubes.It is also important to not ride the brakes. While taxiing throttle be set to idle, and differential braking only used when necessary to steer.

4. When coming to a stop while on the ground make sure that the nose wheel is straight. This can be done by pulling forward a few more feet until the plane is no longer pulling to either side.

5. It is possible for the parking brake to become stuck in the on position. To release the valve, from the left seat, the valves wires run towards the front of the aircraft near the pilot's right leg. The valve is small and connected to the parking brake cable. It will have a brake fluid line running from both sides of valve. Once the valve is located it can be manually reset by pulling towards the aft of the aircraft

6. The gascolator is the absolute lowest point in the fuel system. It is designed to twist up and drain fuel. When suping fuel it is possible for it to get stuck in this open or drain position. This will cause the fuel in the sump to drain out. If this happens during the engine start checklist and the fuel pump switch is turned to the on position you will hear a loud banging noise while running and should not see any positive fuel pressure on the EMS. Simply untwist the gascolator sump and return it to the closed position.

7. While in the run-up area on warm days the cylinder heads have a tendency to overheat. We have several methods to help keep the engine cool while in the run-up area. Set the RPM at 3000RPM when dealing with high cylinder heat temperatures. The water pump circulates more coolant at this RPM than at idle.

    a. Position the SportCruiser behind another aircraft behind so that the airflow helps to cool the engine.

    b. Position the SportCruiser into the wind to allow cooling.

    c. Momentarily shutdown the aircraft. Using the shutdown checklist. Leaving the MASTER BAT on, this will allow you and your student to still monitor the radio. If this is for prolonged periods of time the Master Bat should not be left on.

8. Engine roughness may occur in the 2000-3000 RPM range. This happens because Rotax has 2 carburetors and maintenance balances both carburetors. When they are unbalanced you feel the

roughness in these ranges. Once your flight is complete please notify maintenance so they can be re-balanced.

9. CANOPY Considerations: There have been a high number of aircraft accidents and deaths attributed to the SportCruiser canopy. It is the most common cause of accident amongst the fleet. It is imperative that emphasis is placed on ensuring the canopy is closed prior to takeoff.
    a. Ensuring that both latches are closed
        i. verify no light can be seen through the rear of the canopy near where the hooks attach. Note: It is possible for only one hook to latch on the SportCruiser. One hook will keep the canopy shut in flight. A canopy has never come open in flight with one or both hooks latched.
    b. Unlatching the canopy in flight should never be attempted except in an emergency situation on short final. Instructors should make the students aware of the emergency checklist that refences unlatched canopy in flight.
    c. The Sport Cruiser flies very poorly with the canopy open. As airspeed is increased the canopy opens further.
    d. <u>Closing the canopy should never be attempted</u> and <u>strict adherence to the checklist should be followed</u>.
        i. Checklist MUST be committed to memory. This should be periodically tested through out training.

Section 8: Emergency Procedures

Students should separate emergency procedures into two basic categories.

- Engine failures/emergencies above 1500 ft. AGL
- Engine failures/emergencies below 1500 ft. AGL

Engine failures/emergencies <u>above</u> 1500 ft. AGL: There is ample time to perform an emergency checklist when above 1500 feet. Examiner feedback from previous check rides shows that student traditionally perform a flow checklist when above these altitudes, often time skipping items or doing them out of sequence, and then use the checklist poorly and rarely completing. Checklist usage is critical, instructors must verify strict checklist

adherence in all phases of flight including emergency operations above 1500AGL. Remember to always reinforce that the BRS system is always an option assuming a normal landing cannot be made. The higher the parachute is pulled the safer the deployment will be

Engine failures/emergencies below 1500 ft. AGL: When below 1500AGL it is necessary that a flow be used rather than reading off a checklist. It is necessary to focus on the most fundamental engine failure tasks with students as examiners see consistently poor performance on check rides. Students should first pitch for best glide. This does not involve pulling up the nose to pitch for best glide but by simply allowing the speed to decay to best glide. The difference between allowing the speed to decay and pulling the nose up results in a 300ft deficit on average when pulling the nose up. Students should next identify an appropriate field keeping in mind wind direction. If no field or suitable landing spot is available it is perfectly acceptable to simulate a parachute deployment. Remember the golf courses and new residential develops with no house built are great options. Special consideration to how wet or dry a field is should be discussed and weather it is most appropriate to land on a hard or soft surface when the option is available. After the first two are complete a restart procedure can be initiated if time allows. The canopy should not be unlatched until on very short final as the airplane performs very poorly with the canopy open. This should be briefed to the passenger as should tightening the seat belt and bracing for impact. It is also necessary for the student to simulate declaring an emergency only if time allows. Above 1500 feet the student should read directly from the checklist not perform a flow..

Section 9: Resources

Czech SportCruiser POH:
https://www.thrustflight.com/wp-content/uploads/2019/06/Sportcruiser-POH-July_2019.pdf

Dynon System:
https://www.dynonavionics.com/includes/guides/SkyView_HDX_Pilots_Users_Guide-Rev_E_v15_4.pdf

Garmin 796:
http://static.garmin.com/pumac/190-01194-00_j.pdf