

Pilot's Report – Sopwith 1 ½ Strutter N5539 flight 7/3/2020

Background information

Aircraft is an accurate reproduction of a Sopwith 1 ½ Strutter, built using original factory drawings (dated 1916-1917), original materials and methods, and fitted with a new production Gnome 9b rotary engine (copy of 1915 original engine) which would have been fitted to such an aeroplane when in service at the time. Over 5,400 aeroplanes of this type were produced by Sopwith and its' licensees, and examples remained in service until the early 1920's. There are a number of original examples residing in museums, but only one original example flying in France, a reconstruction completed several years ago. Any other examples listed on the flying records of various countries are non-original type construction, powerplant or other elements and these aircraft would have their own unique characteristics when compared to an original aeroplane or one made exactly to the original drawings and specifications.

The Strutter's fuselage is an engineered truss structure constructed primarily of ash (longerons) and spruce, with metal fittings and bracing wires, and with aerodynamic features created by formers and stringers. Wing spars are spruce, with ribs constructed of aircraft grade plywood with spruce cap strips, with wood leading and streamlined tubing trailing edge. Turnbuckles and hardware are all AN standard in lieu of original (a variety of metric and British standards). The whole is covered with linen, woven to the original 1916 Royal Flying Corp specification, using period correct methods.

The crankshaft of the aeroplanes' rotary engine is attached to the front engine mounting/firewall and rear engine bearer, the propeller to the crankcase. The engine/propeller rotate together, spinning around the crankshaft at a relatively low 1,150-1,250 rpm, but the great amounts of torque and thrust generated is unique to aero engines of this period. There is also a significant gyroscopic effect which affects handling, with right hand turns noticeably slower than left hand turns. There is no carburettor fitted to this type of engine, and therefore no throttle, only a tampier valve to adjust mixture. Thus, the engine is either "off" or "on". Once the engine has been started by hand and the tampier set to achieve maximum rpm, it is necessary to "blip" or cut the ignition, by means of a switch affixed to the joystick, in order to reduce engine rpm sufficient to pull the wheel chocks. On take-off and throughout flight, the engine is full "on" until the "blip" switch is once again used to slow engine rpm for landing. Operating the "blip" on the ground or in the air generates a significant amount of torque and rocking of the aeroplane. Petrol is supplied to the engine by means of a pressurized fuel tank. Pressure is manually pumped up prior to each flight, then switched over to a Rotherham air driven pump shortly after takeoff. The engine has a full loss lubrication system and consumes approximately 1.5 gallons of castor oil per hour.

The large wing area in relation to the relatively light weight of the aeroplane provides for a very light wing loading of less than 2.5 lbs/sf. The ailerons are very effective, but due to the light wing loading, their constant use is required to maintain wings level in all but the most benign conditions. The horizontal stabilizer and elevator are substantial, and the stabilizer incidence is adjustable for varying load condition, but is usually set before takeoff, as operation in flight is rather awkward. Vertical stabilizer and rudder area are perhaps two thirds of what we would expect of a more modern aircraft, providing marginal control at relatively low airspeeds. The aeroplane is equipped with airbrakes, which function effectively, especially for long descents (it is not advisable to "blip" the engine for long periods of time). However, it is necessary to retract the airbrakes for landing, as their deployment affects the already marginal rudder control at low airspeeds. Airfoil shape is thin by modern standards and airspeed

builds quickly, once the nose is dropped. Aeroplanes of this time are relatively tail heavy, with normal loading resulting in a CG of approximately 40% of MAC. Stalls are not recommended or practiced, as there is significant chance of non-recoverable tailspin. The aeroplane is not equipped with an electrical system, nor any method of radio communication/navigation equipment or brakes (a tailskid serves to slow the final stages of the landing run, but provides almost no directional control even when firmly down). Flight operations are only conducted in situations of favorable weather and winds, and when temperatures are below 85 degrees.

Several weeks prior to this flight, we had made minor adjustments to a number of flying and landing wires, the wires connecting upper to lower ailerons on both port and starboard, centralized the rudder cables and adjusted others to provide additional positive elevator control. These adjustments are performed on an as-needed basis, as the aeroplane is affected by changing temperature, humidity and airframe settling due to flight operations. All adjustments are done as per the original Sopwith Rigging Instructions.

Flight information

This was test flight #23, scheduled to be a short test flight to confirm flying and landing wire deflections, and flight control synchronization while under air loading, and to perform an aerial reconnoiter of the potential obstacles at the approach end of the N/S runway. A second crewmember, Bruce Kimme was also on-board, responsible for monitoring cable deflections and vibrations, and control surface positions during flight (ie; drooping aileron, elevator or etc.) and communicating with the ground crew via cell phone text.

Pilot performed pre-flight inspection (we have developed and use a four page checklist which covers pre-flight, pre-start, start, and post-flight operations). Castor oil tank had been topped off (due to over engine location, it's kept full to provide most forward CG), fuel level was just a little over 3/8 full (approximately 15+ US gallons, sufficient for at least 70 minutes of engine operation). Temperature was approximately 80', with SSE winds of 0-2kts.

The aeroplane was positioned and chocked on the runway centerline for an easterly takeoff, with approximately 1400' available. With pre-flight inspection already completed, the crew boarded and secured in their cockpits. I completed the pre-start checklist before advising the ground crew that we were ready to begin the starting procedure (as per checklist and with the assistance of the ground crew). Engine started easily on the first pull and developed full power, systems and switches checked and were operating properly. I "Blipped" the engine to reduce rpm, then waved as a signal for ground crew to pull wheel chocks. Once I'd observed both chocks had been successfully pulled and were clear, I gave the second wave for ground crew to release the wings. With ground crew clear, I released the "blip" switch. As the aeroplane accelerated forward I confirmed that the engine had returned to full power before easing forward on the joystick to raise the empennage. Rudder started to become effective around 25-30 kts and we quickly accelerated. As the aeroplane reached 45 kts, I applied a gentle back pressure on the stick and we lifted off at approximately 09:30 after a ground run of approximately 500'.

Continued climb on runway heading, stabilizing at around 55 kts and 200' AGL before entering a gently climbing left hand turn. After rolling wings level, I glanced back over right shoulder to confirm function of Rotherham air pump, before switching source selector from "off" to "air". Pressure gauge confirmed

steady petrol tank pressure, so I entered another left hand turn to downwind and climbed to approximately 800' AGL. Came back around and made a pass over the airfield from west to east and then entered a left hand turn to gain an aerial view of the north approach end of the N/S runway. Made a series of left and right hand turns, and checked the operation of the air brakes in the area to the north and northwest of the airfield, all the while the aeroplane and engine were performing normally as expected.

I entered a left hand turn from base to approximately 3 1/2 mile final. As I moved the joystick smoothly to the right to bring wings level, there was no noticeable resistance and the stick continued until it had reached it's maximum travel (firmly pressed against my right leg, with handle nearly touching the side of the cockpit). I immediately recognized this as a failure in the lower aileron circuit, as a failure of the upper circuit would have left some roll control via downward deflections of the lower ailerons. Not knowing the exact location or cause of the failure, I maintained the joystick at it's far right extent and waited for the effects of dihedral to slowly bring the wings back to level, all the while maintaining marginal control with slight back pressure on the elevator and a little right rudder to keep the nose from falling off. The aeroplane eventually settled wings level with a slight nose down attitude on a northeasterly heading at approximately 350' AGL and 75 IAS.

Realizing that due to the light wing loading, there was a very high chance of non-recoverable upset the longer the flight was continued, and that significant course corrections came with a similar risk, attempting a landing at our originally intended destination or even another nearby airfield would come with significant risk to crew and persons on the ground. We were already at a low altitude and pointed towards an open cornfield, so I decided that the best chance for crew survival was to put the aeroplane down in the cornfield, with as little forward motion as possible, hoping a very low speed stall just above the corn would might not result in the aeroplane flipping over.

After judging the best angle of descent, I closed the tamper valve to shut off the fuel to the engine, then switched off the ignition to reduce the risk of fire, all the while aiming for a low spot in the hedgerow between two fields. As the aeroplane passed over the hedgerow at approximately 30 kts IAS and an altitude of approximately 20', the left lower wing lightly brushed a tree which spun us lazily in a counterclockwise fashion. The aeroplane settled in a nose down attitude from about a 12' altitude, coming to rest pointed nearly due west, the impact mostly taken up by the right lower wing, undercarriage, and the forward underside of the fuselage. Time was 09:43.

I called out to my other crewmember and asked his condition, and he replied "unharmd". The operating lever of the tamper valve had been forced forward due to the impact and was causing a fuel leak, however I was unable to shut the valve due to damage of the operating linkage. I once again confirmed switches off, then reached behind and loosened the filler cap to depressurize the petrol tank. I then exited the cockpit, now with an obviously broken left ankle. After gaining a footing on the left lower wing, I informed my other crewmember of the condition of my ankle, and with his help we were able to get clear of the aeroplane. We both immediately contacted the ground crew via cell phone to inform them of the situation and our location. Bruce then used a piece of cornstalk to temporarily plug the leaking fuel line, later replacing it with a .40 round borrowed from a first responder.

Due to the location of the crash site, it was about fifteen minutes before the first individuals showed up to offer their assistance. I removed my belt and directed them to splint my ankle with pieces of the

broken propeller. Pilot was transported via Care Flight to Medical Cities Plano, second crewmember was able to walk away unharmed.

Post incident

Lou Vargo (FAA) informed me early in the evening that someone from the NTSB had already examined and taken photos of the site, and had released the aeroplane, as per my request. Our ground crew returned to the site shortly thereafter, to find that vandals had already taken the pilot's goggles, removed the instrument panel from the rear cockpit and had made an unsuccessful attempt to set the aeroplane on fire.

The crew carefully documented the site and made preliminary examinations before disassembling the aeroplane and transporting it back to its' Bessonneau (hangar) at 66XS over the next two days. No failures have yet been found in the aileron circuits or cabling outside or within the wing structure. Detailed examination of the aileron controls within the badly damaged lower forward fuselage have not yet been completed at time of this writing. Post flight failure analysis is being performed by Bruce Kimme, the second member of the aircrew, who is intimately familiar with the aeroplane's construction and operation.

Written by Kip Lankenau, pilot

7th July, 2020