Aerostar SA Yak-52, G-BVMU

AAIB Bulletin No: 3/2002	**Ref: EW/G2001/08/23**	**Category: 1.3**
Aircraft Type and Registration:	Aerostar SA Yak-52, G-BVMU	
No & Type of Engines:	1 Ivchenko Vedeneyev M-14P piston engine	
Year of Manufacture:	1994	
Date & Time (UTC):	17 August 2001 at 1700 hrs	
Location:	Little Gransden	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	On the ground - 1 serious
Nature of Damage:	None	
Commander's Licence:	Private Pilots Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	647 hours (of which 2 were on type)	
	Last 90 days - 3 hours	
	Last 28 days - 2 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and Ground Handler	

Yak 52 engine starting

In common with other radial engines, a hydraulic lock can occur when the aircraft has been standing and oil/fuel has seeped into the lower cylinders. If the engine is started in this condition, serious damage can occur. To guard against this it is the usual practice to turn, or 'pull through' the propeller blades by hand; '10 to 16 blades' is normal. During this process the front cockpit magneto switches should be OFF. If the aircraft is being flown solo, it is common practice for the switches in the rear cockpit to be left ON. If the engine has been recently run and the cylinder head temperature (CHT) is high, the propeller should not be turned by hand as the engine may start due to compression alone. This is most likely to happen through pre-ignition caused by hot spots (normally incandescent carbon deposits) but these will lose their energy fairly quickly; the most critical time is within a few minutes after engine shutdown.

Once the blades have been pulled through and the area around the propeller is confirmed clear, the engine may be started. When the Start button is pressed, compressed air is directed to the cylinders via a distributor and high intensity sparks (known as the "shower of sparks") are directed to the plugs via the left magneto system. When the engine is running the magneto switches should be switched to BOTH.

History of the event

Between 1445 hrs and 1715 hrs, the pilot flew two type conversion training sorties with the Instructor. The aircraft landed at Little Gransden and the pilot taxied to the refuelling point, but the Instructor took control and repositioned the aircraft. The pilot stated that he could not recall the Instructor calling "switches off in the front" after shutdown. The aircraft was then refuelled for a flight to Shipdham Airfield. This was to be the pilot's first solo on the type.

The pilot reported that the Instructor had offered to assist with the start but that he had initially declined his offer. He had "configured the cockpits" and was in the front cockpit ready to prime the engine and pull through the propeller when the Instructor again offered to assist. This time he accepted the offer and told him that the magneto switches were ON in the rear cockpit. The Instructor reported that he acknowledged this but reminded the pilot to make sure those in the front were OFF. The pilot then primed the engine and the Instructor called "Brakes ON:Air ON:Mags OFF". The pilot confirmed these settings and the Instructor began to turn the propeller. After 'pulling through' about six blades the engine fired and continued to run. The propeller struck the Instructor's right hand causing a serious injury. When the pilot realised what had happened, he shut down the engine and vacated the aircraft to offer assistance.

Conclusion

The pilot could not be certain what had happened but he listed some possible causal factors:

1. The front cockpit magneto switches had been left ON when the aircraft was shut down prior to refuelling.

2. He had switched the front cockpit magnetos ON rather than OFF in his check. He was used to American switches which are turned OFF anticlockwise whereas the YAK52 switches are turned OFF clockwise.

3. The engine had fired due to compression while still hot from the previous flights

Note: The Instructor thought it unlikely that the CHT was more than about 70°C.

The Instructor reported that he heard the Starter solenoid open as he was turning the propeller. The implication of this is that the pilot had commenced the starting sequence and had pressed the Start button. This would have initiated the "shower of sparks" mechanism, however the magneto switches would have had to be ON for the engine to continue running. However, the pilot was adamant that he had not pressed the Start button.

It was not possible to determine which mechanism caused the engine to fire as the propeller was being pulled through. However, once it had fired, the engine could only have continued to run if both the front and rear cockpit magneto switches were ON.