

Preventing FOD in Yak-52s



Yak community responds to NTSB report

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The Yakovlev Model 52 is an amazing airplane: inexpensive to operate, wide performance envelope, and tougher than nails! First exposed to the Yak in the course of my business as an aviation insurance broker specializing in warbirds, I purchased a 1983 Yak-52 in February 2003. The aircraft fit my mission and budget. I've now flown more than 150 hours and dedicated approximately 1,000 hours to performing restoration and maintenance operations on the aircraft since then.

The March 2004 issue of Warbirds published a National Transportation Safety Board report (NTSB ID: DEN03FA034) of a Yak-52 accident that occurred due to the fouling of the elevator controls by a foreign object. The Yak-52 aircraft is susceptible to foreign object damage (FOD), in part because of the confined nature of the fuselage and the placement of certain critical flight control mechanisms.

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But FOD concerns have been well documented and alleviated in the aircraft's Eastern Bloc homeland. Precautions and procedures were created in Russia to manage the problem. These same precautions and procedures are now widely adopted in the West, where the aircraft has become extremely popular. The Yak-52 community has gone to great lengths to successfully eliminate FOD danger.

Proper maintenance of foreign military aircraft presents unique challenges. In some cases access to service, maintenance, and parts manuals is limited. Good general service practices are the first step in the maintenance cycle, and access to suitable parts is next.

Historical Context

The Yak-52 was specifically designed by the Yakovlev design bureau as a basic trainer for the former Soviet bloc countries. All but a few prototypes were produced by Romanian company

S.C.Aerostar, and built to different standards than we have here in the West. For example, the certification for load limit and ultimate load limit are calculated differently, the aircraft systems are all pneumatic versus hydraulic, and the life and overhaul limits of the airframe and engine are different.

The cockpit layout and many of the instruments in the Yak-52 are common to the Aero Vodochody L-29/39 and MiG aircraft series. This provided continuity for pilot training, as the Yak-52 produced more military jet and world champion aerobatic pilots than any other aircraft. It fills both roles well.

The Yak-52 was also designed to be operated under an entirely different system of continued airworthiness than Western general aviation (GA) aircraft. These design differences make the Yak-52 one of the finest warbird and aerobatic values available today, but they can also lead to some safety issues.



TOM SMITH



PHOTOS TOM JOHNSON



Digital images of Yak-52 tail and examples of commonly used tools that can become purveyors of FOD.

Fear of Foreign Objects

Damage or loss of an aircraft as a result of foreign objects is not new to the Yak-52. It is an issue that applies to all aircraft in both civil and military service. Foreign object damage can come from a bird in flight, a piece of safety wire ingested into an engine, loose baggage inside an aircraft compartment, and even animals taking refuge inside the aircraft's vital control areas.

This risk of foreign objects is particularly important to the Yak-52 because of its multi-purpose role as a GA, warbird, and aerobatic aircraft. In this way it requires some pilot and maintenance technician training not normal to the warbird and GA community. Its aerobatic role means that it should be treated more like a Pitts than a T-6 Texan.

"How often have you seen a warbird pilot carefully remove all foreign objects from his or her pockets?" asks George Coy of Gesoco Industries (www.gesoco.com), one of the most respected Yak importers

in the United States. George has been importing and flying Yaks for longer than I've held a pilot certificate. His business provides importation, assembly, maintenance, sales, and training.

George recommends removing pens, pencils, loose change, keys, and other items from open pockets before climbing in the cockpit. Required items such as wallets and pens should be zipped safely into a flight suit.

Defending Against FOD

I use a blended defense against FOD in my aircraft.

1. Careful maintenance and regular inspection (more details below) is the first step of the anti-FOD program.

2. Installation of a FOD barrier in the tail of the aircraft to prevent fouling of flight controls.

3. Maintaining a clean and "sterile" cockpit area by securing loose objects like maps, small tools, and candy. Every object that isn't bolted down needs to be secured, especially when the aircraft is used in the aerobatic role.

4. Flight suits are extremely useful for the zippered pockets where cell phones and wallets can be securely stored.

5. Briefing and sterilizing riders in the aircraft is critical to prevent them from leaving potentially dangerous "gifts" behind after a flight in the Yak.

6. During the "walk around" preflight inspection, the Russian whacking trick can be used to detect dangerous objects in the tail. By vigorously smacking the lower fuselage skin in the tail cone, small and large objects can be detected as they bounce off the heavy sheet metal skins. If objects are detected, they must be removed before flight either through the rear inspection panel or through the cockpit.

7. Additional preflight duties involve double-checking cockpit security and visual inspection.

8. Be especially cautious after any third party has performed maintenance on your aircraft. This goes for all aircraft, not just Yaks. Perform a thorough inspection for misplaced tools, rags, and equipment. According to the rules, if

you find it, you get to keep it.

These types of procedures are commonly part of the preflight inspection for aerobatics and are necessary when the Yak-52 is used in the aerobatic mode. They require a higher degree of vigilance and care than when you are simply going for that \$100 hamburger. The next flight may be an aerobatic flight, and that battery that fell out of your noise-canceling headset may wind up killing someone. Adhering to FOD prevention and detection practices becomes even more important if several different people use the aircraft.

Using Technology to Fight FOD

I have developed a periodic FOD inspection procedure that involves inserting a high quality digital camera and flash into the access hole in the tail of the aircraft. Photos can also be taken from the cockpit back into the tail cone. Once the pictures are captured in the camera, you can use the small screen of the camera and zoom into anything that looks out of place. I have found this valuable as a first step.

I then bring the pictures home and upload them to my computer and use a simple photo-editing program to accurately review the entire picture. The digital photo can be zoomed and manipulated to spot small objects that are hard to see with only a flashlight and inspection mirror. I use the picture method on a monthly basis to purge every small object from all areas of the tail cone. I label and store each picture so I can look back at previous inspections and spot any new material, signs of corrosion, or other faults.

Dennis Savarese of Elmore, Alabama, developed a more permanent preventive measure consisting of a fabric cover that protects the aft-most frame in the fuselage and the elevator bell crank area. This simple but effective Savarese FOD Prevention Cover accommodates movement of flight



Dennis Savarese's FOD Prevention Cover (looking back and up into the tail).

controls in normal, inverted, and high-g flight. Once installed, it will help keep foreign objects from rolling back into the aft-most compartment where the elevator bell crank is located.

Made from a rugged, durable fabric, the Savarese FOD Prevention Cover is unaffected by atmospheric changes. It is completely removable when inspection of the aft-most compartment is required, as during the annual condition inspection, and reinstalls in less than one minute. For more information on the FOD cover, call Dennis at 334/285-2141.

Maintenance Philosophy

There is a widely held belief in Western countries that Russian-built aircraft use cheaper parts that require regular replacement prior to failure. Having spent a considerable amount of time learning about the inner works of this relatively simple aircraft, I can attest that nothing could be further from the truth.

Russian aircraft, specifically the Yak-52, are designed to be operated "in the field" for a period of five years or 500 hours with little or no maintenance. They are then returned to a central overhaul facility for what we would call an extensive annual inspection. The entire aircraft is then inspected and returned to service. Rubber hoses and seals are changed automatically at the five-year/500-hour interval. Engines and life-limited components are overhauled, and all service bulletins are brought up to current production standard.

This maintenance cycle is similar

to the way our own military treats its aircraft. The Yak is designed to a military standard considerably higher than our GA aircraft standards, lasting longer without field maintenance than our GA aircraft normally do. If you look at the innards of a Yak-52 and compare them to the innards of most of the U.S.-built aircraft, you will find the Yak-52 about three to five times stronger and designed to allow easier maintenance and inspection. For example, virtually every attachment bolt, including wing attachment bolts, is stressed in shear and not in tension. This eliminates the need for specific torque values on nearly all bolts and nuts in the aircraft, which greatly simplifies field maintenance practices.

Several years ago, Dennis developed an insurance-approved Yak-52 Safety and Maintenance Course. These two-day classes are held at hangars throughout the country using the student's own aircraft to teach Yak-52 aircraft systems and how to properly maintain them. Students also learn the basics of maintaining the M14P radial engine.

"Upon completion of the syllabus," Dennis says, "The student will be armed with adequate knowledge of his aircraft to assist his airframe and powerplant (A&P) mechanic with the aircraft's annual condition inspection in accordance with scope and detail of FAR 43 Appendix D." Dennis teaches the course to Yak-52 owners, pilots, and mechanics throughout the United States and internationally as well.

Russian Support of Exports

The cited NTSB report noted that: "the Russians just do not seem to care about what happens to these machines." I find this materially inaccurate, a sentiment shared by most Yak owners.

The Romanian Yak-52 factory is still in operation, and in the last decade there have been more than 70 new aircraft imported into the United States. Although the parts support could be better, and many of the importers are working with

the factory to improve parts support, it is certainly better than the parts support available on most U.S.-produced warbirds.

The engines and airframes are still in production, and there is a good amount of innovation in the product line. An example of innovation is the new Yak-52 Tailwheel, which addressed the U.S. demand for a tailwheel version of the product. There is also substantial development in the engine department including a new 400-hp and 450-hp version of the venerable 360-hp M14P. European instructors with a lifetime of experience in the aircraft regularly visit the United States to give flight instruction.

The basic problem is that the Eastern Bloc manufacturers do not understand that a large parts supply is necessary. They had been operating under a system where they only built spare parts to a government order. They did not make spare parts for inventory. Thus if we need something that is not a standard Russian part applicable to many aircraft, it has to be built, and that takes time. This is part of the problem that has caused many former Eastern Bloc aircraft manufacturers to fail in the Western market.

Conclusion

Accidents resulting from foreign object damage are completely avoidable by incorporating the practices and equipment discussed above. Proper maintenance practices are now well known and will reward the community with fewer maintenance-related losses. Prices for the Yak-52 product range from \$50,000 for a stock aircraft to \$140,000 for brand new 2004 model year tricycle gear or tailwheel versions. Insurance continues to be reasonable for this class of aircraft. Many consider the Yak-52 to be the best warbird value in the United States.

Author's Note: This article was compiled by Tom Johnson with extensive input from George Coy, Dennis Savarese, and the entire Yak operating community in the United States and abroad. ✈

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