



SAFETY NOTICE SN025

August 31, 2022

## MAIN TRANSMISSION GEAR FAILURES

As the Safari has been constantly improved, they are being flown more hours than ever before. This has gradually revealed a problem that we have spent the last 2 years working to solve. Because the issue has not been related to flight hours, it has been challenging to determine the source. After an extensive review of the design of the legacy transmission, we have determined what was happening and a solution.

The two “clam shells” of the cast aluminum transmission case may flex under load, allowing the primary gears to become misaligned. We designed a six-part billet case to provide perfect alignment of the primary gears. This case includes an internal, gear driven oil pump to lubricate the transmission output and pinion gears and bearings.

The second major change is in the type of bearings being used to align the primary gears in the helicopter. Integral bearing carriers make the design pre-load easier to “dial in” to the exact pre-load required. We were able to work with our primary gear supplier and engineers from Timken Bearings to choose the correct bearing type, sizes and assembly procedures

This information is being shared with Safari owners as a Safety Notice because there are safety concerns with gear failure in the transmission. The results of gear failure can cover a wide range. It may be as simple as pitting on the gear teeth causing a chip detector light to come on and a hasty landing. It may be as serious as the transmission locking up, shearing the main shaft from the transmission to the rotor head, and a hair-raising auto-rotation. It may be as catastrophic as the transmission locking up, and a failed auto-rotation.

Depending on the age of your helicopter, the upgraded transmission may run as much as \$24,000USD at this time. If the upgrade is done while your primary gears are still in good condition, the upgrade will cost approximately \$19,000 if you choose to re-use the primary gears. If your main transmission drive shaft is of the current design and not worn or scratched, the upgrade can be done for \$13,500. If you have the current clutch shoes and keys, the cost is reduced to \$12,000.

Included in the transmission upgrade:

Billet transmission top case

Billet transmission bottom case with internal oil pump

Transmission bull gear and pinion (if needed)

All internal bearings and seals, including those in the mast bearing housing

Transmission output overhaul including gears and bearings

Main transmission drive shaft

Upgraded clutch shoes and keys (if needed)

The current design of the main transmission shaft relocates the bull gear keyway further from the shear line machined into the shaft. The keyway is also cut with a radius, rather than sharp corners to avoid reducing the tensile strength of the shaft. Older shafts have the keyway very close to the shear line. Our concern is that in the event of a shear, the keyway may also break out, preventing a clean shear of the shaft and interfering with auto-rotation. For this reason, we will not re-install main shafts of the older model.

If you have the Schweizer over-running sprag clutch used in the very early Baby Belles, no action is needed other than normal maintenance. If you have the automotive sprag clutch that replaced the Schweizer clutch, it will need to be replaced with the current, much more robust version in conjunction with the transmission upgrade. If you have any question about the model you have, email pictures of the sprag with the clutch shields in place to [gm@safarihelicopter.com](mailto:gm@safarihelicopter.com) and we can tell you which you have. The clutch replacement cost is between \$4,100 and \$4,900 depending on the condition of your clutch parts.

The function and size of the automotive sprag clutch is not adequate to withstand the torque to which it is subjected. When the clutch engagement fails, the main rotor is no longer driven by the transmission. Without immediate action to initiate auto-rotation, disaster follows. Due to the danger posed by the automotive sprag version of the clutch, we will not re-install one of these clutches on the upgraded transmission. If you choose to continue to fly this clutch, it will need to be removed before sending the transmission to the factory for upgrade.

In the future, Safari will no longer inspect, repair or overhaul legacy transmissions.

We understand that this represents a significant cost to Safari owners. Safari operates "lean" to keep our costs down, and provide Safari owners with the best service and pricing possible. We also value your life, and must give you the information you need to make good decisions.