

# AeroComposites Advisory Notice

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**AN-2**

**Date: 9/22/07**

**AN-Number: 2**

**DATE:** September 22, 2007

**SUBJECT:** Propeller Operating Temperature

**DISTRIBUTION:** AeroComposites Propeller Owners

**BACKGROUND:** (Blade Installation)

(Refer to AeroComposites Propeller Operator Manual OM-1)

After AeroComposites (ACI) propeller composite blades have been molded, an external polyurethane collar is molded onto the base portion of the blade (figure-1), in a secondary manufacturing operation. This molded polyurethane collar is then machined to dimension.

The base portion of the blade, shown in figure-1, has been manufactured for use in a 3-bladed propeller. Note that the blade polyurethane collar has two grooves machined into it. The upper machined groove is for a snap ring (not shown) which keeps the blade from falling into the hub (figure-2) when the propeller is not rotating. The lower machined groove is for the O-ring (figure-1, black elastomer seal) that prevents lubricating grease inside the hub from leaking outboard. In a 3-bladed propeller, the O-rings installed in the polyurethane blade collar grooves are compressed and rub on the metal hub arm (figure-2) to form the grease seal.

In the case of a blade made for a 2-bladed propeller, there is the same groove machined in the polyurethane collar for the snap ring but there is no machined

groove in the polyurethane collar for the O-ring. In the case of 2-bladed propellers, the O-ring groove is machined into the aluminum hub arm (figure-2). When the blades are installed in the hub arms, the O-rings are compressed and rub on the outer surface of the blade polyurethane collar to form the grease seal.

As is the case for most all materials, the propeller aluminum hub and polyurethane collar materials expand with increasing temperature. This increases the compression of the O-ring seal. In addition, because polyurethane expands at a greater rate than aluminum, this results at extreme temperature conditions in sticking of the blade collar in the hub arm.

## **DESCRIPTION OF PROBLEM:**

*This Advisory Notice addresses the operation of ACI propellers on the ground operating at elevated (hot) temperatures.*

There have been four incidents involving ACI propellers, operating on the ground, where one or more propeller blades have become stuck in the propeller hub arm. The first two of these incidents occurred early in the manufacture of AeroComposites propellers where corrective action was taken involving collar dimensional change.

The last two incidents occurred more recently under extremely high propeller operating temperatures on the ground. It was reported that the propeller hub was too hot to touch. In these latter two incidents, which occurred during ground operations, the blades after moving to course (high) pitch did not return to low pitch until the engine was turned off and the propeller allowed to cool. After cool down, with the engine shut down, the blades returned to low pitch under return spring force. In both incidents, high air temperatures on the ground were reported (e.g. 115 degrees F). In one of these incidents, the engine had been run at high power during ground testing for a sustained period of time and the propeller rpm was being cycled. It may be that the engine may have been operating with an oil temperature above the manufacturers recommended maximum oil temperature limit. This same hot engine lubrication oil would have been transferred to the propeller during high pitch change actuation.

There have been no incidents reported of AeroComposites propeller blades sticking in flight. This is attributed to typically lower air temperatures in flight and the cooling effects of ambient air with propeller rotation and forward flight of the aircraft. The result of blades sticking is that full engine rpm and engine power may not be achievable, where the propeller is operating more like a fixed-pitch propeller.





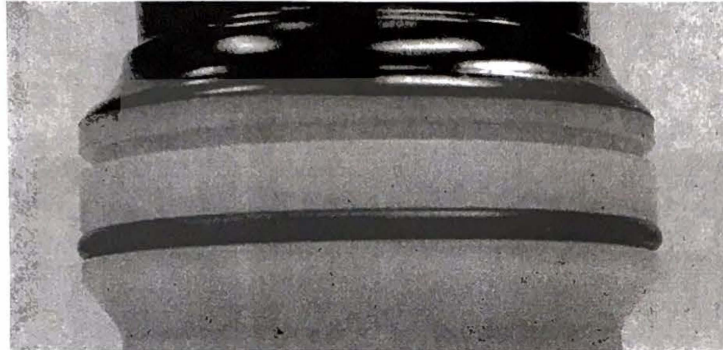


Figure-1 Lower Base of Blade Showing Polyurethane Collar

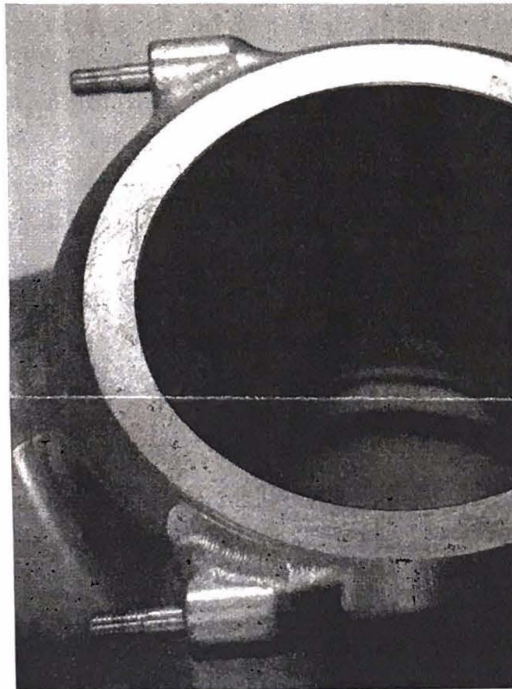


Figure-2 Hub Showing Blade Arm Socket