Application News

Turbine Flowmeter Helps Record-setting Aircraft Increase Engine Power

Industry: Aerospace ***Service: Flow Rate/Total*** ***Fluid: 145/Nitro Methane Fuel Mixture***

Overview

At events like the Reno National Championship Air Races, technology and history come together to create an unforgettable experience for participants and spectators alike. Unlimited air racing can involve speeds up to 500 mph at 40 to 50 feet off the deck, not to mention four-G turns, heat, turbulence, and dead-stick landings. Highly modified ex-WWII fighters of the Unlimited class—worth at least a million dollars each—share the ramp with new high-tech, kit-based composite aircraft of the Sport class, along with Formula One and Biplane racers.

In this demanding, highly-competitive environment, race teams seek any advantage that will improve the speed and reliability of their aircraft. This includes extensive R&D on fuel mixtures delivering enhanced performance across the flight envelope.

Situation

The “Rare Bear” is a modified Grumman F8F Bearcat that has dominated the Reno Air Races for decades. It holds many performance records for piston-driven aircraft, including the 3 km World Speed Record of 528.33 mph (850.26 km/h) set August 21, 1989, and the time-to-climb record of 3,000 meters in 91.9 seconds set in 1972.

One of the major modifications to Rare Bear involved installing a more powerful Wright R-3350 in place of the Pratt & Whitney R-2800 engine that is standard for a Bearcat. The new engine produces in excess of 4,000 horsepower. The aircraft’s owners mix Nitro Methane into 145 fuel to increase engine power. Fuel flow measurement and control are critical, as damage can result if the mixture is incorrect.

Solution

Only one type of flow measurement instrument—Flow Technology’s FT Series turbine flowmeter—met all of the requirements involved in mixing fuel for the record-setting Rare Bear aircraft. For this application, FTI recommended the FT12 meter, which is accurate over a wide flow range and provides exceptionally fast response. In addition, the meter’s small physical size allows for installation almost anywhere.

System Description

Accuracy, repeatability and reliability were all key factors when deploying the FT Series turbine flowmeter solution for the Rare Bear. To ensure utmost accuracy, Flow Technology calibrated the turbine meters with blended oil at the exact viscosity of the fuel mixture (0.8 cSt). An extended range calibration was also performed in order to achieve greater precision over the entire working flow range of 0.25 – 25 Gallons Per Minute (GPM). Finally, a high-temperature, amplified RF pick-off rated to 125° C was specified.

Technical Information

Flow Meters: FT-12AEXB-LEAH4
Electronics: 27-94057-113 RF Pickoff
Fluids: 145/Nitro Methane Fuel Mixture

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