

## Leica TM5000's and Axyz MTM Verify Ship Propellers

Bird Johnson is one of the United States' premier manufacturers of large surface ship propellers, primarily for the United States Navy and Marine Corps. Many of these propellers have adjustable pitch and can measure up to 18' (5.5 m) in diameter, weighing 6,000–10,000 lbs. (2,700–4,500 kg) each. The hubs, which hold the blades to comprise a complete propeller, can weigh an additional 50,000 lbs. (22,700 kg). Each blade may take two weeks to machine and finish, and four to six blades attach to each hub. Blades and hubs are cut from raw castings of beryllium-copper alloy. Bird Johnson also machines hubs and blades of stainless steel for use on icebreakers.

Bird Johnson belongs to the Norwegian Ulstein Group ([www.ulstein.no](http://www.ulstein.no)) which also uses Leica instruments and systems like the Dimensional Control and Analysis System DCA-TPS.

Bird Johnson has been a user of Leica theodolites (T2002 and ManCAT) since 1987. Soon after the introduction of Axyz MTM in 1997, Bird Johnson upgraded their ManCAT system to Axyz MTM, and added two TM5000 motorized theodolites. Leica's JW Isern trained Louis Holt, Neil Murphy, Eric Simpson, and Bill Caskie at Bird Johnson's facility using the MTM system.

Bird Johnson uses Leica theodolites to compile data about a propeller blade's profile along radial scribe lines having 10% increments.



*Louis Holt, Quality Inspector, standing beside one of Bird Johnson's ship propeller blades.*

The area between 10% and 95% of the total blade radius is of prime concern to the finished blade performance. The theodolite data are used as an independent verification of the numerically controlled blade machining process. The same data also tell the metalworkers, who finish the blades by hand, where material must be removed or added. Since blades of the same series have similar profiles, databases for each of the common production blades can be established. Bird-Johnson plans to use motorized theodolites to rapidly inspect propeller blades after machining, and before shipment to the customer.

The inspection process, using theodolites, typically takes one day to completely measure a blade. Bird-Johnson estimates that using he

motorized TM5000 theodolites, and Axyz software the setup and orientation times are reduced by 50% over the T2000 theodolites and ManCat software. Additionally, since Axyz software runs under the Windows™ 95 environment, Bird-Johnson is able to feed data from the computer numerically controlled (CNC) machining centers to the Axyz software, and use the machining data as a reference for final inspection.

In addition to the TM5000 theodolites, Bird-Johnson uses a DL2-laser eyepiece to spot points, which then are observed with the second theodolite, eliminating the need to mark targets on the blades. The DL2 has been extremely useful in measuring blades which come in from sea, and have had the scribe lines worn away.

Leica is committed to a partnership with Bird-Johnson, which will help produce the highest quality ship propellers possible within a reduced time schedule.

If you want to know more about Bird Johnson visit them on their web site: [www.bird-johnson.com](http://www.bird-johnson.com)

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