EVANS CAPACITOR COMPANY

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Reliability of EVANSCAPS

MTBF > 5 Million Hours
Unlimited Cycle Life

All Hybrid Capacitors use Tantalum pentoxide anodes and Ruthenium Oxide cathodes with wet electrolyte. This design has been proven in over 15 years of field service and numerous customer application qualification tests for use in Military and Aerospace Systems.

THQ1, THQ2, THQ3, THQ4, series capacitors all use identical components. Reported MTBF for THQ3 capacitors is over 25 Million hours.

THQ5 series are the same as to THQ1, THQ3, and THQ4 capacitors in every way except for slightly thinner anode components. All other components are identical. Years of field experience with THQ5 capacitors would imply similar MTBF life.

In THS series capacitors, the in service field data and qualification test results reported to us indicate an MTBF of >5,000,000 hrs.

TDD series capacitors are very similar to THS capacitors and should provide equivalent, if not better MTBF.

THQA2(M2) series Capacitors are very similar to THQ1 capacitors. THQA2(M2) has over ten years in service and over 30,000 units fielded; attesting to reliability and should provide similar MTBF.

High current cycle qualification tests and field experience in Phased Array Radar, LIDAR, and Diode Laser Drivers, demonstrate that Hybrid capacitors are not cycle limited in any way. Billions of shots reported in service with no effect on performance.
TDD cycle testing for Lawrence Livermore NL. 6 billions capacitor cycles over 231 days of testing, no failures, caps test to spec.

To determine the above stated MTBF of Hybrid Capacitors, we rely on actual field data and qualification test results provided by our customers.

In actual on-wing operational performance, we have field data from the Arrowhead system in the Apache Helicopter.
Accumulated hours in service on the Arrowhead system was provided to us periodically by Lockheed Martin Company MFC. The last report was accumulated system hours as of the end of September 2010. There are multiple quantities of two different Hybrid Capacitors in

that system: THQ3125332 (125V 3,300µF) and THQ3050243 (50V 24,000µF) which are packaged as modules. The accumulated flight hours at that time represented >10,000,000 capacitor hours of service, without any failures. Since that time the program has accumulated many more hours (probably 100,000 to 200,000 total capacitor hours per month, as Arrowhead is installed in a growing percentage of the fleet) without a single capacitor failure reported.

The THS3125422 (125V 4,200µF) has been produced in significant quantity for a phased array radar program. Our customer for this system, Northrop Grumman Baltimore, provided us with some basic information following their qualification testing of the capacitors. The tests were under accelerated conditions, both pulsing and static, for life testing of the capacitors. The tests were ended without a single capacitor failure, resulting in a greater than 5 million-hour MTBF assessment of capacitor life. Subsequent fielding of many systems totaling thousands of capacitors has provided data of excellent system and capacitor reliability.

Although the actual total in-service hours for all Hybrid Capacitors is unknown, the total in-service MTBF can be estimated. To estimate the total fleet MTBF, we use 260,000 as the number hybrid capacitor units. This is the number delivered between 2005 and 2012. We use this period as we would assume that virtually all these units be in service. At only 100 hours per capacitor this would provide 26 million capacitor hours. At 1000 hours per capacitor, this would provide 260 million capacitor hours. We would predict that the actual number is between these points. The incidence of reported failure is so small, as to be negligible. Virtually all failure analysis determined failures were due to improper mounting, lead attachment, or system design - usually found in qualification testing.