

# Acra KAM-500 Helps to Breathe New Life Into the Young Eagle

**CURTISS-  
WRIGHT**

DEFENSE SOLUTIONS

## Challenge

- Maintenance burden
- Aging fleet
- Large volume strain acquisition

## Solution

- TCII upgrade
- Damage tolerant maintenance
- SEWST & OLM programs

## Results

- Overhauls eliminated
- Fleet availability increased
- Fleet-wide tracking

## Challenge

The PZL-130 “Orlik” (Young Eagle) is a single engine, two seat trainer aircraft designed and built for the Polish Airforce. The TCI variant has successfully operated as a trainer and acrobatic aircraft since the mid-90s, but several issues make continued operation a challenge.

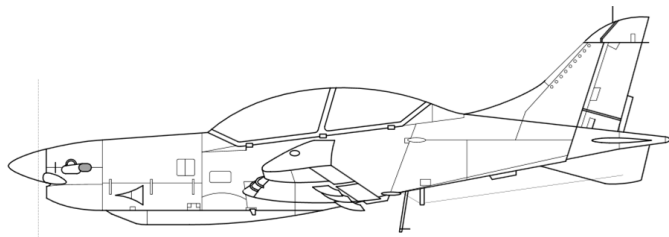
The TCI required frequent overhauls (every 1,000 flight hours) and regular maintenance. This led to high overhaul costs every 6 to 7 years and significant depot time. With this overhead and TCI components approaching end-of-life, an upgrade program was launched. A “damage tolerant” maintenance approach would be key part of this upgrade, allowing regular overhauls to be avoided and life extension in the future.

The Air Force Institute of Technology (ITWL) began a complete upgrade to the Orlik (new wings, avionics and engine) and the implementation of a new maintenance

system based on Aircraft Structural Integrity Program (ASIP) principles. The anticipated benefits were:

- Avoidance of overhauls by proving 6,000 flight hours during development, using a full-scale fatigue test (FSFT)
- Adoption of a damage tolerance maintenance approach using real operational data to feed the FSFT

In order to guarantee a high level of measurement reliability, ITWL sought to have sensor redundancy, with multiple strain gauges at each load measurement location. To achieve this ITWL required a compact form-factor DAU, capable of sampling a high number of analog acquisition channels synchronously along with avionics flight parameters (velocity, pitch/yaw/roll angles etc.). A clear upgrade path was also desired to allow for future unplanned measurement requirements.



## Solution

Between 2011 and 2014, ITWL and PZL Okecie carried out a Service Life Assessment Program for the PZL-130 ORLIK TCII Structure. This program was known as SEWST (Polish: system for operating aircraft based on their actual health). An operational loads monitoring (OLM) program was a central part of SEWST and involved an extensive set of measurement points on the TCII.

To support the large number of strain gauges, accelerometers and flight data parameters, ITWL chose the Acra KAM-500 as the data acquisition for the OLM program. ITWL were able to build several custom measurement systems through the selection of off-the-shelf KAM-500 measurement modules. The system consisted of over 100 measurement sensors located at 86 measurement points.

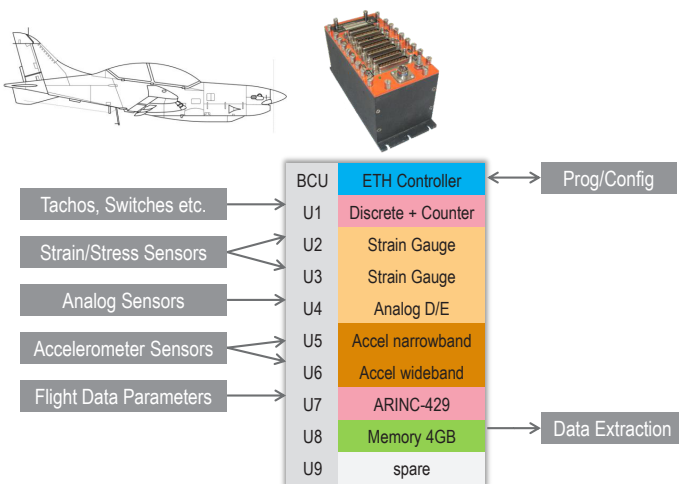


Figure 1: Example configurable measurement system created using standard Acra KAM-500 data acquisition modules.

## Results

The SEWST program successfully concluded in 2014, and the new damage tolerant maintenance system was put into effect at the beginning of 2015. The benefits realized by the program included:

- Huge savings from reducing maintenance costs (approximately \$70M over the lifetime of each aircraft)
- Increased operational availability by eliminating downtime during overhauls (about 25% of the fleet would have to be constantly in the depot)
- Extension of total service life to 6,000 flight hours, with future extensions possible

The use of KAM-500 instrumentation gave ITWL a system that was flexible to their requirements, expandable to cover more measurement points and compact enough to be installed within the Orlik. The Acra KAM-500 also provides scope for future operational loads monitoring across the Polish fleet, one OLM aircraft remains instrumented and may be used in the future as reference aircraft for the rest of the fleet, allowing estimation of local structural loads in each aircraft by relating COG accelerometer flight parameters.

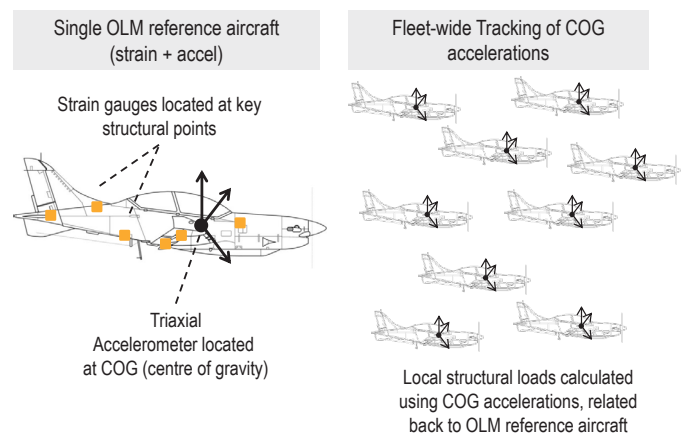


Figure 2: Provision for structural loads monitoring across PZL-130 TCII fleet