

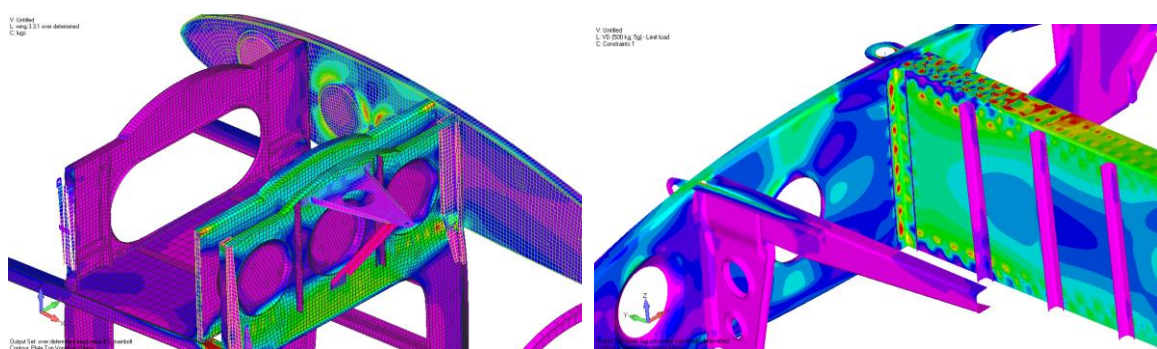


## Blaník L-13 back in the air

It is the most produced glider worldwide, but not allowed to fly anymore. The European Aviation Safety Agency (EASA) issued Airworthiness Directive (AD) EASA-AD-2010-0185-E as preventive safety measure in the course of investigation of the June 12th, 2010 Blaník L-13 glider accident in Ferlach/Austria. Investigation of this crash has not been officially concluded yet. The AD prohibits any further flight. The US American Federal Aviation Administration (FAA) and many other airworthiness authorities followed EASA and published respective measures.

Aircraft Design and Certification Ltd. (AD&C) has developed a supplemental type certification (STC), including a structural modification as well as an inspection program, as method of compliance for EASA-AD-2010-0185-E. The approval process utilized a cooperation arrangement with the type certificate holder Aircraft Industries (formerly "LET"). The STC is now available at AD&C.

The STC is based on elaborate 3D geometry and load path analysis (by reverse engineering) and is verified by high quality finite element method (FEM) calculations and structural testing including strain verification. Even individual rivet/bolt load analysis has been performed to identify the root cause of the problem. The well known and approved load spectra KosMos, incorporating a realistic quantity of aerobatic maneuvers, is adapted and applied for the analysis of the Blaník wing and fuselage carry through sections. Further analysis includes the horizontal tail attachment area. Based on the findings of the analyses 3 new parts have been designed and installed to improve the load transfer from wing spar to fuselage. Hi-Lok bolts, known to have superior fatigue resistance, are used to exchange the critical rivet in rivet spar cap connections and to ease later inspections in the affected areas.



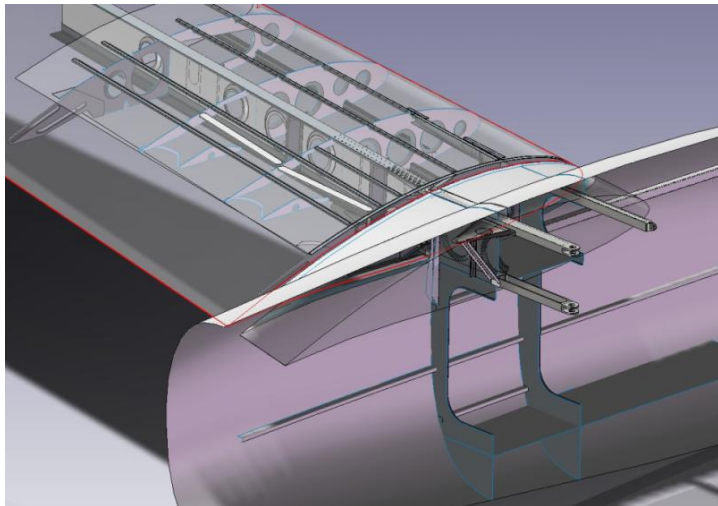
The structure of the Blaník, when healthy, has proven for decades to be safe within the limitations of the airplane. However, after many years of operation, potential occasional abuse, repair, maintenance and overhaul, the determination of whether a given structure is still healthy is a challenging task. Inspection by advanced, affordable as well as proven methods for detection of cracks does not on its own allow declaring critical areas healthy. Crack propagation analysis on the original structure by AFGROW using stress intensity factors of the aforementioned FEM analysis have shown that crack growth in the area of concern, if unchanged, can quickly become uncontrollable.

AD&C expresses their gratitude for the support received in the development of the modification and inspection program to Aircraft Industries (Kunovice, TC-holder), Wolf



Hirth GmbH (Kirchheim/Teck, parts production), ATG (Prague, non-destructive testing), Schur NDT (Hamburg, consultancy on NDT/Eddy current testing), MP Magnetische Prüfungen (Reutlingen, production of Eddy current test normal). Special thanks go to AirTech s.p.o.l. (Holešov), a Part-145 approved organisation which undertook the initial installations and is available for your airplane modification. Likewise special thanks go to the Red Bull Blanix-Spiegelflugteam of Austria who made the STC possible by faithfully offering their airplanes to us for the initial modification and structural testing.

Currently the STC is at final approval stage by EASA, the first modified airplanes are now operated again under permit to fly; approval by FAA has been applied for. The permissible operational life of the modified area is prolonged to a total of at least 6000h (irrespective of the accuracy of individual historical records), however the limitations of the rest of the aircraft cannot be changed, without according in depth analysis, from the original 3750h. AD&C is considering a further program for a general life time extension, pending on market response.

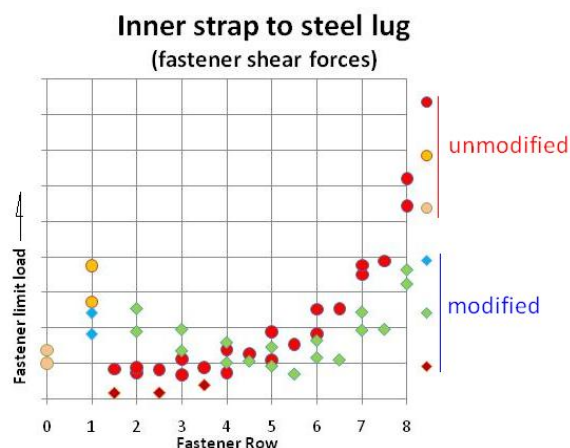
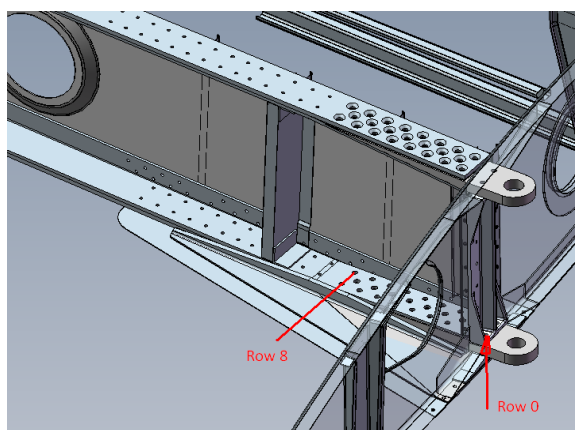




AD&C expects the following questions to arise frequently:

- **What does the modification cost me?**

- There is the price for the kit of AD&C (€ 6500.- excl. taxes) plus the costs of its installation at your maintenance organization.
- The kit contains an engineering order for the specific airplane, all custom made parts and supplements for the maintenance and flight manual. The kit price does not only cover costs for the parts production and shipment, but also the depreciation of the development and the authority approval by EASA (FAA to come at no different costs).
- The installation costs depend on your maintenance organization and are composed out of:
  - the NDT inspection (about 2-4hours per airplane),
  - the labor costs for the mechanical installation (2 workers 3 days after training),
  - the labor for the (initial) 500h inspection which is not too different from an annual inspection
  - the costs of standard hardware (Hi-loks, close tolerance bolts, rivets). These costs can vary significantly based on the source used and country shipped to.

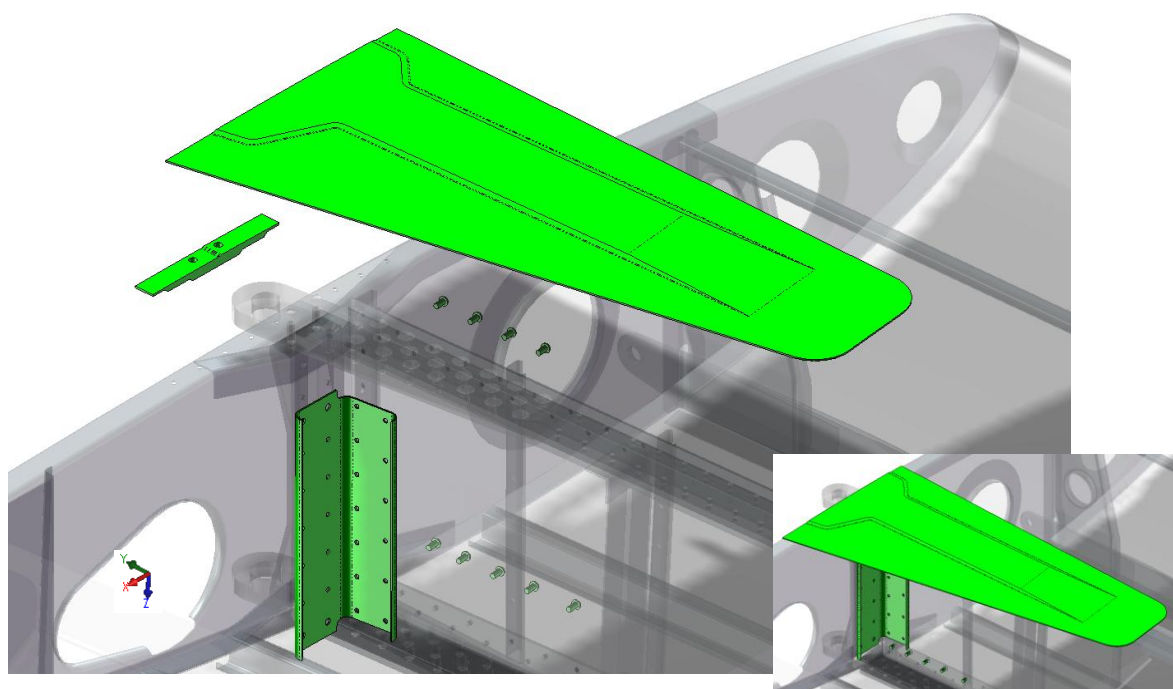


- **The total costs may be in the order of magnitude of the whole glider value. How does AD&C justify the cost of the STC?**

- AD&C undertook the efforts of
  - an agreement with EASA on a project that re-installs the limitations, without imposing changes (like no more double seated flying, no more aerobatics, reduced masses and speeds etc.)
  - arranging a working relation with the TC-Holder Aircraft Industries (former LET)
  - detail CAD re-engineering of the wing root and the fuselage center
  - detail FEM analysis of the wing root in both original and modified situation
  - detail fastener evaluation in all critical areas
  - detail FEM analysis of the fuselage center and the horizontal tail attachment
  - detail fatigue analysis
  - detail crack propagation analysis
  - investigating specific eddy current inspection techniques and test normal production using original aircraft structure
  - validate the design in a structural load test
  - etc....



- AD&C has funded the initial approval with EASA and continues to fund the application for approval by FAA.
- The list is long and not exhaustive, however the major share of the kit costs are driven by production costs of the parts involved.
- **What are the options to lower the costs?**
  - AD&C is offering a 5% reduction for volume orders of 10Kits. Pooling via your approved maintenance / overhaul and repair station will also reduce the costs for installation and NDT inspection.
- **How and where can I order the STC Kit?**
  - You send an e-mail to [blanik@aircraftdc.de](mailto:blanik@aircraftdc.de) giving us:
    - Your name and contact details
    - Serial number and registration of your airplane
  - You will receive an order form in which you see the conditions and in which you return to us information about your airplane that we need for statistical purposes in order to increase aircraft overall life time.
  - We send you a bill.
  - After reception of payment the STC kit will be shipped to the approved maintenance station, a copy of the approved Engineering order will be sent to you own address.
  - The maintenance organization performs the STC according to the engineering order and issues the release to service for your aircraft.
  - Initial production expected ready for shipments early May.
- **What does the modification look like?**
  - We are installing a reinforcement of the lower spar cap strap, a new shear load path link to unload the root shear transmission and we change some of the highly loaded fasteners to larger cross sections.



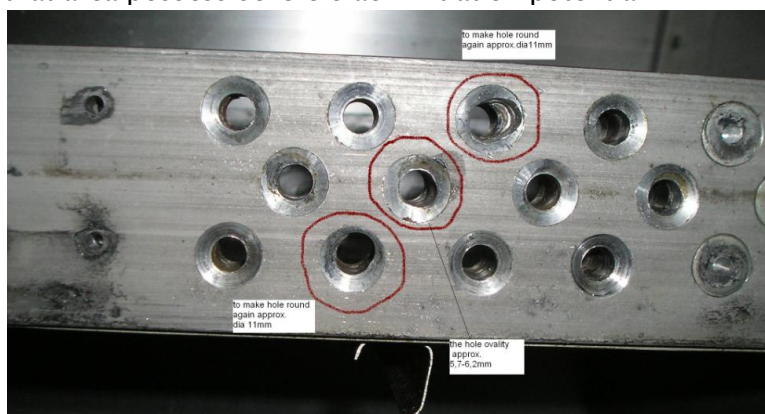
- **What is the approved life time of the Blanik after modification?**
  - The approved life of the modified Blanik is reinstated to the EASA approved 3750h it had before modification. AD&C has designed the modification for at least 6000h



against the so called Kosmos spectra which contains 12% of aerobatic use. However since we are unable (at this stage) to address the remainder of the airplane in the same depth, the approved usable time of the airplane is unchanged. Basically there is no valid argument to increase the airplane operational life because just one critical area was improved.

The same concerns the aerobatic usage. The original limitation of 2% remains valid.

- **Does AD&C plan to increase the life time of the Blanik?**
  - o YES, depending on market response we plan to do so.
  - o It must be understood that this will require not only analysis (and potentially modification) of the remainder of the airframe but also life cycle testing which is time consuming and costly.
- **Why does the airplane need to be modified at all? Can it be true that a single accident in 40 years destroys all the faith in the airplane?**
  - o It is not relevant that there has been only one accident. One is too much. The accident airplane clearly showed severe fatigue degradation. This area coincidences with areas found in fatigue testing back in the 70s of the previous century.
  - o The Blanik proved a reliable airplane, and the accident investigation is not finished, but it can be said that the analyzed critical area, seen in the light of contemporary airworthiness requirements, would have difficulties being substantiated today. Some issues of the structural behavior you only see by FEM which was not available during the development phase half a century ago.
- **Why can we not only inspect? Why do we need a modification?**
  - o "Safety by Inspection" is a valid option to account for criticality and is utilized by AD&C in other areas (namely the wing carry through and the horizontal tail attachment).
  - o For the wing root lower spar cap this is no option for several reasons
    - Analysis shows that an unmodified structure can have uncontrollably fast crack propagation.
    - The safe life of the area in question (if healthy), according to today's standards would be very low.
    - Inspection of the bore holes with a non detectable crack size in the order of magnitude well below 1 mm is NOT possible without reaming of the holes. Doing so does weaken the remaining cross section.
    - It has been identified that manufacturing defects, and/or overhaul and rework in that area possess severe crack initiation potential.





- **Who can do the installation?**
  - o The modification can be installed at any Part-145/Part-M or equivalently approved maintenance organization having the Blanik within their scope of approval.
  - o In the course of the modification, personnel approved (EN 4179 or NAS 410) for non-destructive testing utilizing Eddy current, optical (borescope) and dye penetrant inspection techniques is required.
- **Does the modification require specific jigs and tooling?**
  - o We do require the use of an Eddy current test reference normal that we will supply to the maintenance stations. We also require specific Eddy current testing equipment and licensed personnel.
  - o Other than that only a few specific tools (namely reamers for heat treated steel and fine adjustment sinkers) are required.
  - o The modification does NOT remove the steel lug which would bear the risk of losing the overall alignment.
- **Is my airplane eligible for modification?**
  - o Current types of aircraft are the L-13, the L-13A will be included if demand shows the need.
  - o The condition of the bore holes of the lower spar girder lug splice must be clean, round and declared crack free when reamed to 6.9mm. Final reaming to 7.14mm is done to minimize the undetectable crack size.
- **What happens if my wing does not pass the inspection?**
  - o First you are very happy that you found the problem that could have killed you before it did so.
  - o Second you will contact AD&C with details of the problem – we will give you a quote for an assessment. If it is hopeless we will tell you at no costs.
  - o AD&C will take back and reimburse for those parts that have not seen any customizing drilling and are free of any damage, if all parts can be returned AD&C reimburses € 4500.-.
- **What about the Llewellyn modification or the announcement of Aircraft Industries to develop an inspection technique that does not require opening or modification?**
  - o Basically you have to ask them.
  - o Dafydd Llewellyn's modification certainly would be a candidate to technically solve the problem. However getting this approved by EASA would have involved the same amount of engineering and substantiation work. It was made clear by EASA that there is no going beyond the old limitations (namely a life increase) without in depth analysis of ALL structure and according testing. Therefore AD&C focused on the mitigation to the AD, rather than on a life increase.
  - o AD&C has an arrangement with Aircraft Industries for the development of this STC. AD&C is not involved in the other inspection method, but understands that its potential use is limited to airplanes with full historical records and data. Whether or not it will come with additional limitations we don't know.
- **Who is AD&C anyhow?**
  - o AD&C is a small, but international and efficiently operating engineering service provider with EASA Part 21 Subpart J Design organization approval. AD&C, based in Neckargemünd/Germany, was founded in 2005 by Dipl.-Ing. Marcus Basien and Dipl.-Ing. Boris Kölmel. The aviation experience background covers three decades on four continents and ranks from numerous general aviation type certification projects to specific experimental airplanes like the SolarImpulse, where AD&C



staffed design and certification leading functions. Further information can be drawn from the AD&C website [www.aircraftdc.de](http://www.aircraftdc.de).

Contact information for Blaník-STC inquiry: [blanik@aircraftdc.de](mailto:blanik@aircraftdc.de).

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