

FROM CONCEPT TO CERTIFICATION

Interview with AD&C co-founder and CEO Marcus Basien



Before any aircraft concept takes to the sky, air travel authorities require the aircraft be certified. One would expect a big organisation like EASA would function like a centralised verification authority. However, small companies like Aircraft Design & Certification Ltd. offer certification services for general aviation aircraft. Leonardo Times sat down with AD&C co-founder Marcus Basien to discuss the process of certification, future developments of the industry and possibilities for Aerospace Engineering students.

TEXT Jules L'Ortye and Lubi Spranger, BSc Students Aerospace Engineering, Editors Leonardo Times

AD&C is a design organisation that focuses on the certification of small aircraft. How was the company founded?

'We are a design organisation. We are approved as such by EASA to certify designs, but this does not necessarily mean that we're creating our own designs. So, the product of our company is not a specific part or an aeroplane. We deliver the service to certify an aeroplane. This started as a consequence of my annoyance with the following: every design project you start to be involved in, you start certifying the organisation first. Additionally, a lot of companies in the general aviation world start up and try to design something and then they fail economi-

cally because they did not realise what it means to certify.'

What do you think it means to certify?

'Certification projects always start with the certification of the organisation. Maybe we can make the certification process more efficient if we stop certifying new organisations. EASA, very early in their beginning, published that a design organisation can be in the supply chain of a product. The traditional aeroplane companies have a design office and a production office. The design office has two functions: designing the actual aeroplane and showing compliance with the requirements set by au-

thorities. EASA allowed that process to be performed by a different organisation; a service supplier. Note that this process is a highly specialised task that touches the core of your product. This is something that struck me. At the time I was working as an independent consultant. This meant that I would join a project team from a certain company and become part of the design organisation. While doing so, I performed the Compliance Verification Engineering certification and often helped them be an organisation. Then I decided to do this one last time for my own company and then offer these services, including the organisational certification, to interested companies. Therefore, the technical



Figure 1. Tail test of a light airplane

to hand in your application; a very formal step. From this moment on, an interesting period starts where one has to work with your counterpart at EASA. This joint team is called the certification team, spearheaded by the primary certification manager. This team discusses which certification basis should be used. There is some flexibility in the choice of the certification basis. In class, students will encounter expressions like CS-23 and CS-25. These are certification specifications. However, the certification basis entails a bit more. It is a summary of everything that you need to do with the

cept that. Nonetheless, from a legal point of view it is possible and has been used. For example, the CS-VLA code dictates that Very Light Aeroplanes are limited to fly under VFR-day conditions, carry a maximum of two persons and have no more than one engine. These days, there are a lot of examples of Very Light Aeroplanes certified to fly under for VFR-night conditions, carry a maximum of three person, et cetera. So, it allows for flexibility. On top of that, the standard sets are always subjected to cases like certification review items or special conditions.

content of the work that we are doing is still the same as when I was working independently as a consultant, but we can go a lot broader now. Not solely because we have a larger workforce, but also because we have the approval to do so. This is why AD&C was founded and how it started almost ten years ago. The engineers that go from one aircraft project to another are called the gypsies of aviation. I try to collect those gypsies into a tribe around me that offers certification services.'

Is there always a fixed guide to certifica-

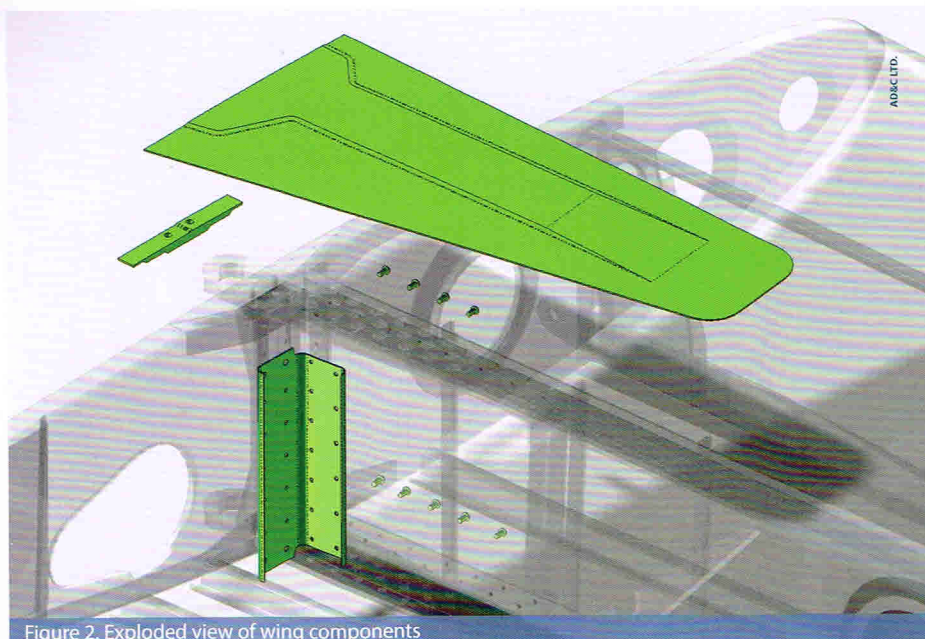


Figure 2. Exploded view of wing components



Figure 3. Seat testing as done by AD&C employees

that one has to realize that the type certificate of the engine was drafted while it was assumed that the engine would have a propeller at its flange. In this case, the engine is connected to a gearbox. This will induce different vibrations on the engines. Therefore, the engines are acting in an environment they were not certified for. For me, this is the interesting aspect of the certification process: In those cases we have to work closely with the authorities since the standard set of requirements do not foresee the characteristics of the aircraft.'

In those cases, you have to work around the problem?

'Instead of working around this problem, you have to make a definition of the certification basis with the EASA specialists or whoever else is in your team.'

Once something is pioneered, does that result into a new certification basis?

'Up to now, we have written two certification bases. In one of those cases, we weren't working on an EASA project. Instead we were working for the Solar Impulse project. The Solar Impulse is a Swiss-built electric aircraft powered by photovoltaic cells. Once again we faced a problem where the certification bases were not suited for this given aircraft. We encountered something totally different. The Solar Impulse is an aeroplane with a wing loading that is so low, that according to Swiss law it is not even an aeroplane. Looking at the wing loading, one could argue this aircraft can be certified as a hang glider. However, a hang glider should not have an engine, not to mention four. Luckily, there is a good working relation with the authorities. The certification of those peculiar aircraft is something you have to do together.'

How do you experience the cooperation with EASA? Do you get a lot of feedback from EASA within a reasonably small

timeframe?

'Yes, we do! They do have limits that dampen the reaction time but those tend to be mostly budgetary limits. Certain specialists like flight test people are not always available when you need them. Other than that, I have never seen the elapse time of the project driven up by the authority.'

Which of the projects you worked on were the most interesting to you personally?

'Within our current company we worked all the way from so-called minor changes to Supplemental Type Certificates, which go a bit deeper in the design of an aeroplane. The projects that have full Type Certificates are the more interesting ones. Those projects include all facets of an aeroplane, including the things that are—from a certification point of view—relatively repetitive. I have two examples of interesting projects. There was a crash of a glider in Austria in 2010. The glider, a classical instruction glider aeroplane with a very good record, lost a wing and crashed. A fatigue problem was detected and the consequence of that crash was that the aeroplane, designed in the sixties of the last century, has been grounded worldwide. EASA decided to ground the aeroplane until the problem has been resolved. We had to dig into design data that was sixty years old and into documentation that was fifty years old. It was done in what we call the Eastern Bloc. We made an arrangement with the company that was the manufacturer at the time. We made a so-called 'TC-Holder arrangement' in which they gave us design data of the aeroplane that was interesting from both structural and certification and a procedural point of view. We started modifying the structure that already had a fifty-year life behind it and that's quite interesting to do. The other interesting project was confined and is running right now. We're doing a certification for a company in Leipzig, Germany, that is basically a hard-core chemistry company. One of the things they have designed is a new type of covering material for everything that is fabric-covered, may it be it for a glider or an aeroplane. We were asked whether we could certify it so that they can sell it to any fabric covered aeroplane type. That's interesting. That's very broad. How do you tackle that? These types of projects are really interesting since you truly dig into them. That would never happen if it weren't for EASA allowing third-party companies to offer certification services. That's the interesting part.'

Is there a lot of competition in this niche market?

'There is competition, but not a lot. The competition is not of a level that other companies are offering the exact same services that we do. What we do is offer our design organisation to customers. Let's say you have got a project and you want it certified, we can do that for you. You use us as the service supplier. And I see only two other companies offering a relatively similar product at this moment. We have one direct competitor offering certification and one company that offers the actual design activity in a way that it's certifiable. I see the competition more in the way where we have to compete with our customers. As they decide whether they want to do their own design certification or use our services. Whoever wants to design something for aviation and wants it certified, will face this decision.

The market in aviation is highly dynamic. Which changes do you expect to have a big influence on AD&C's business model?

'We were faced with EASA, being tasked by Brussels to simplify processes for smaller projects and companies. Hence, to relieve the need for a design organisation. A certification process where the applicant can certify an aeroplane without being a design organisation; without the need for a design organisation. Correctly setting up a certification program shows an organisation's know-how. And in the end that's exactly what you have to do to come up with a design organisation tool. The only thing that happens is that this process is never designed to give any privilege or responsibility to the one that executes it. Consequently, EASA has to do all the verification. Therefore, this project or program may be attractive for the applicant it may be even cheap for them. However, it would cause a lot of work on the authority's side. There is a reason we spend – note we're a small company – 6000 euros per year on EASA just to be a design organisation. Furthermore, we have our internal audit twice a year. During this period, our company is shut down for a week. Additionally, we have the surveillance audit once a year, when we're blocked for another week. We have a certain amount of time dedicated to just being a design organisation. And that gives us privileges, which of course also cost us



Figure 4. AD&C founders Marcus Basien and Boris Kölmel



Figure 5. The AD&C team in front of the Solar Impulse

money in the end. If you want to substitute this in the so-called ELA1 (European Light Aircraft) process, somebody has got to pay in the end. Therefore, I'm not convinced this is a good thing to do. Initially, we were very worried that our business concept would collapse, but that's not the case. Not at all. Customers realise experience is important. As an organisation, what do I expect in the future? I think we will have quite some changes in technology. Especially looking at all-electric aeroplane concepts. There's a lot of subsidy money from the European network directed to programs that develop an all-electric aeroplane. A lot of projects come up with electric propulsion systems that are still in its infancy and they don't get very far. This is because of problems regarding the battery capacity for example. Still, it's a new technology, so there will have to be new certification standards to be able to ad-

dress these changes.'

Although AD&C is a relatively small company, they're offering internships to students who finished their Aerospace Engineering Bachelor's degree. We also asked if it possible for students to do their graduation thesis at AD&C. Basien told us:

'Yes. Actually, we have already doing that, both within our company and within companies of customers. I'm quite happy with how that works. It's a matter of timing; full Type Certifications are ideal. As long as we have a topic and you got three to six months, you can consider these internships.' ✈