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Development & testing of a new high pe

Professional skills, desire and technology add up to make a fantastic jet modelling glue that's amongst the best available.

1 Introduction

Deluxe Materials has been developing model hobby specialist products for over 45 years. Early in 2011 we decided we had the technology to develop an advanced thixotropic epoxy glue that would deliver ready mixed epoxy capable of high adhesion to the advanced composites used for the assembly of high performance jet models.

We consulted experts who required the adhesive to:

- Offer exceptional adhesion to the majority of composite materials including wood, epoxy glass fibre and carbon fibre.
- Be non runny, **(Fig 1)**
- Be visible in the joint
- Allow plenty of working time.

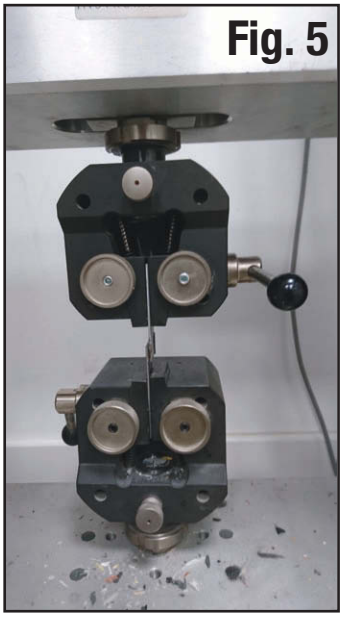
In Feb 2012 we launched AeroT<ch epoxy **(Fig 2)** which has now sold thousands of packs all around the world.

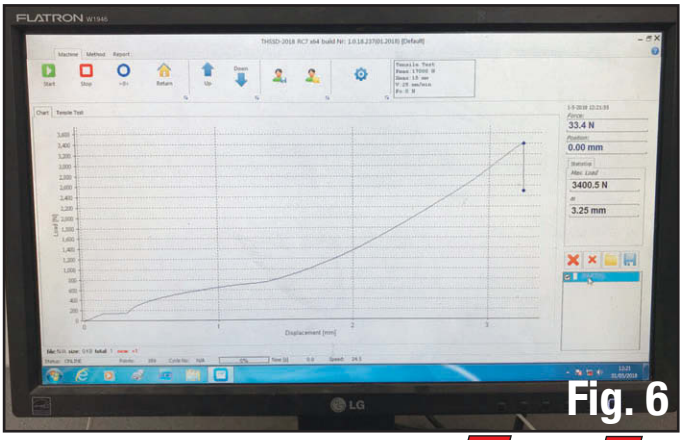
2 Testing procedures

We are often asked how this glue compares with X? Is it better than Y? In this test we decided to go head to head testing of AeroT<ch epoxy with a major competitor adhesive that modellers were using as this would answer some questions. In short it was The AeroT<ch shoot out!

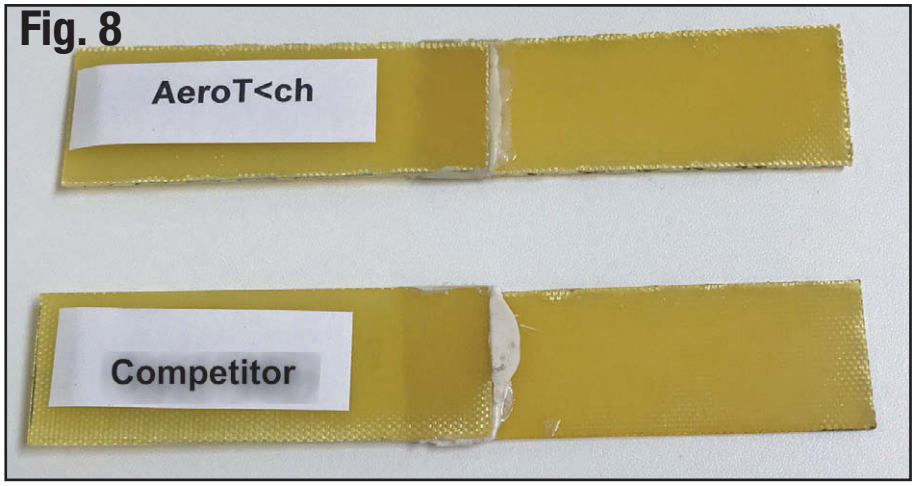
A laboratory **(Fig 3)** with tensile testing equipment **(Fig 4)** was chosen. The tensile tester holds the test parts in its jaws **(Fig 5)** which are then progressively loaded until the point of fracture.

The data is continuously recorded and displayed on screen to the point of failure **(Fig 6)**.





rformance epoxy glue for Jet modelling



Test parts made from a selection of modelling materials **(Fig 7)** were selected, cleaned with solvent, glued and left to set for 48 hours.

The test parts **(Fig 8)** were mounted in the jaws of the tensometer **(Fig 9)** and subjected to break testing by increasing the load until break point.

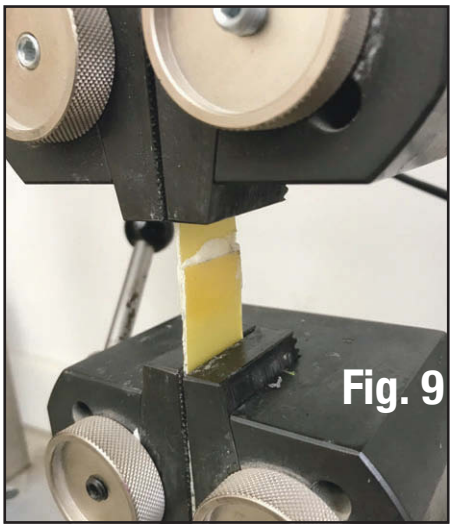
We tested bond strength on the following substrates:

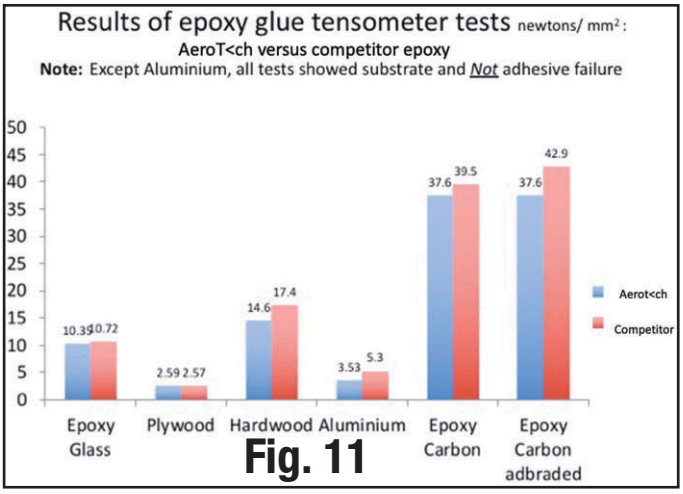
- Epoxy glass
- Hard wood (Ramin),
- Plywood
- Aluminium
- Epoxy carbon

Some of the post test parts are shown in **Fig 10**

3 Discussion of results and conclusions

As might be expected, plywood had the lowest strength and carbon fibre composite board the highest. The results are as shown below **(Fig 11)** and tabulated in the appendix.





Epoxy Glass (Fig 12): Both products provide a very good bond to epoxy glass. The tests show that in both cases the substrate failed and not the glue, exposing the glass itself. The test results in fact are a measure of the substrate strength rather than that of the epoxy.

Plywood and Hardwood: As with the epoxy glass both products offer adhesion stronger than the woods themselves.

Aluminium: Neither product bonded well to aluminum. Some special surface treatment seems to be required here for both products.

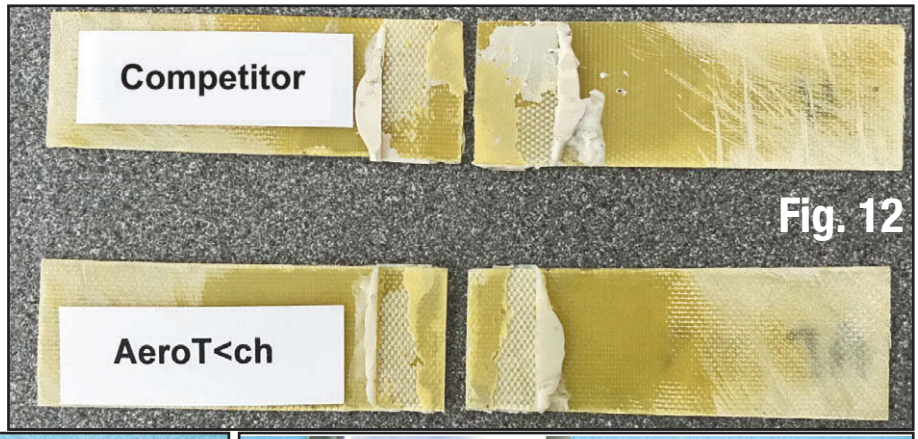


Fig. 12

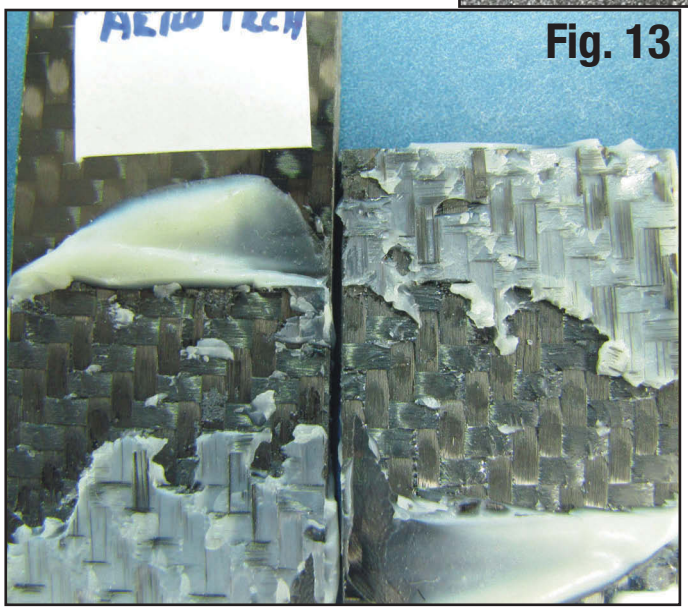


Fig. 13

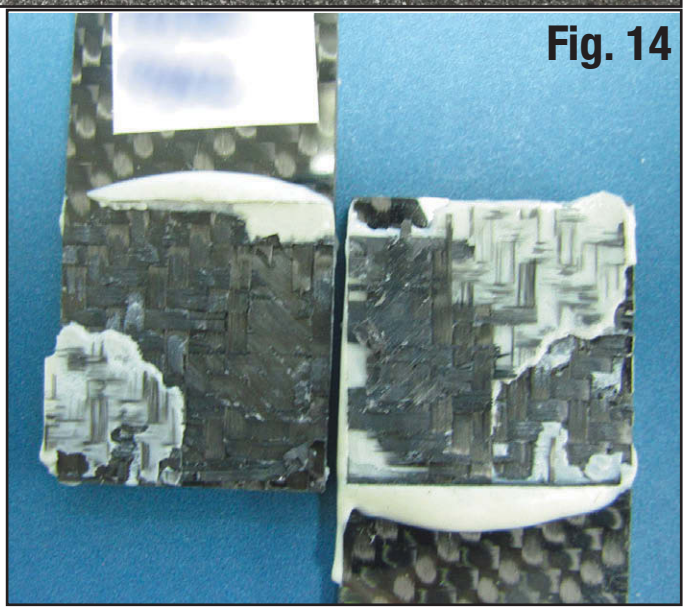


Fig. 14

Epoxy Carbon (Fig 13/Fig 14): Both AeroT<ch and competitor epoxy glues bonded well to the surfaces of epoxy - carbonfibre. In the test the surface of the epoxy layer was removed exposing the carbonfibre itself. Again this was a case of substrate failure and not adhesive. On this high strength material both products offered similar results. 37 and 39 Newtons/ sq mm for AeroT<ch and competitor respectively (over 2.4 ton / sq inch!).

The tests were repeated with abraded surfaces but this was inconclusive as both tests again exhibited substrate failure.

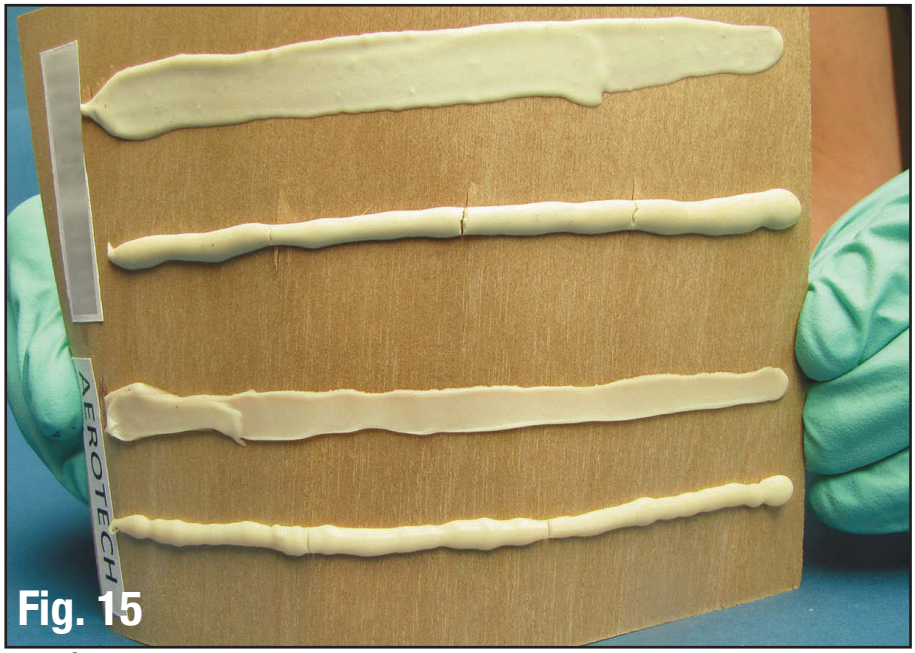


Fig. 15

3.1 Conclusions

AeroT<ch epoxy and competitor offer very good adhesion to a wide range of modelling materials including epoxy glassfibre, carbon fibre and wood. The bond strength of both products exceeds that of the materials. The test results do not show any real difference in performance of either product. Both are good!

4 Flexibility

We also compared the flexibility of the two products. We applied both a thin and a generous layer of epoxy onto 1/64th plywood and flexed it to the limit. As you can see both epoxies performed similarly **(Fig 15)**.

5 Kerosene fuel compatibility

After consulting a few experts it was suggested in 2012 that a long-term fuel storage test was carried out as some modellers may wish to use Aerotech adhesive for built-in fuel tanks inside jet models.


Fig. 16

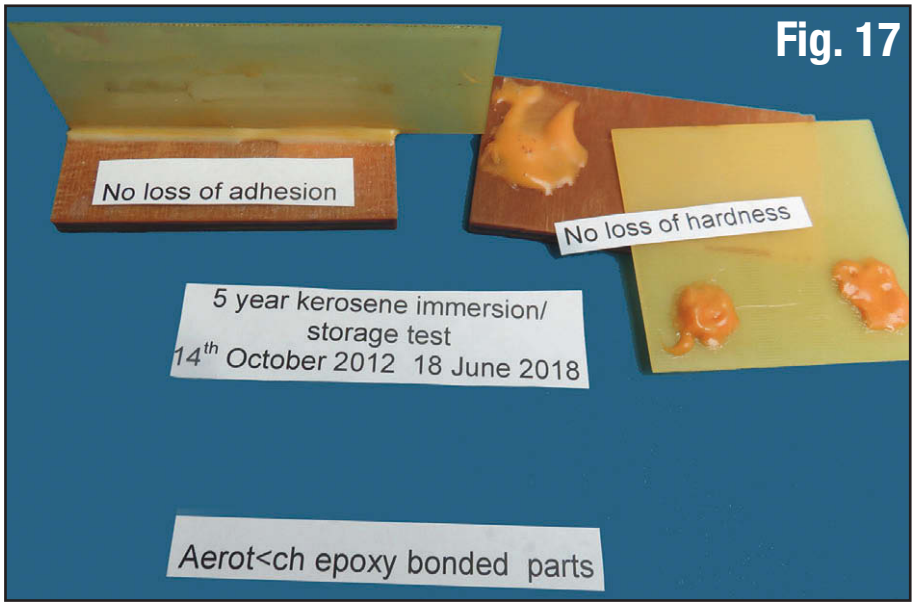


Fig. 17

We therefore prepared several test specimens:

- A composite bond to plywood
- Composite bond to composite.
- A surface bond.

After 5 years of total immersion **(Fig16)** the AeroT<ch epoxy showed no deterioration at all with all the bonds are in good order **(Fig 17).**

One final comment is that this remarkable new product involved some new epoxy technology with silane adhesion improvers that chemically assist the surface bonding to epoxy.

AeroT<ch is available also in a small twin syringe pack AD63 **(Fig 19)** for those applications where only a small dab for self-mixing is needed.

AeroT<ch is distributed to all good hobby shops by our network of distributors found on deluxematerials.com and includes Ripmax in UK and Germany and Horizon Hobby in North America.

Fig. 18

Fig. 19

My thanks to :

• Colin Straus at Ripmax for encouraging me to develop this product

• Dave Wilshere for his guidance on the development of this advanced epoxy Jet adhesive.

• Andy Rann for his belief in our product and building his Ultra Flash with AeroTe<ch epoxy.

John Bristow

Appendix

Material	Bonded Width	Bonded Length	Bonded area mm 2	Break force Newtons		Break Pressure Newtons/mm		Comment
				AeroT<ch	Competitor	Aerot<ch	Competitor	
Epoxy Glass	25.4	12.5	317	3288	3400	10.35	10.72	Substrate failure
Plywood	25.4	12.5	317	367	365	2.59	2.57	Substrate failure
Epoxy carbon	25.4	12.5	317	591	427	1.86	1.34	Joint failure
Hardwood	12.5	12.5	156	2292	2719	14.6	17.4	Substrate failure
Aluminium	25.4	12.5	317	1121	1683	3.53	5.3	
Epoxy carbon	25.4	12.5	317	11,948	12,576	37.6	39.5	Substrate failure
Repeat (Abraded)				(11,933)	(13,648)	(37.61)	(42.95)	(Substrate failure)