

• SOUND FOR HALF A POUND • john ranson

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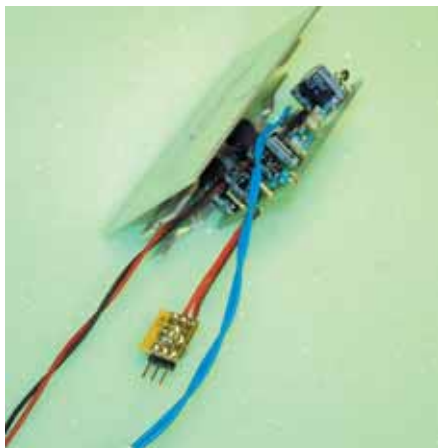
Update

Since the last sound article in QEFI April 2006, the development of scale sound has moved on again, and this time it is for the smaller model. As the title suggests, you do not now have to have a large model to carry sound and that could help many modellers.

Having seen how a scale plane is transformed by the true engine sound being broadcast out of two speakers, I really wanted to try and convert the Brian Taylor conversion electric Bf109 (QEFI September 2005) to have a genuine Daimler Benz engine growl inside. At 68" wingspan and less than 10 lbs weight, it really did not want an additional one pound (1/2 kg) payload. The main ideas to get the weight down were to reduce the number of speakers from two to one, and also to avoid having a separate battery for the sound generation. But the question was – would it be satisfactory?

Thomas Benedini, the German electronics expert who has been adapting his circuitry to make the plane sounds possible, was contacted a few months ago and he has now produced a new amplifier which will operate at higher voltages. His super 12-18 v two – channel 40 W amplifier as installed in the Beaufighter and the HE111 does normally limit itself to requiring a separate battery, but this new 12-30 v, 35 W mono amplifier can be run directly from most flight packs which are between these voltages. Thomas sent me the first version of this amplifier and it was set up on the bench.

▼ New mono 30 v amplifier with modified heat sink



Scale sound is losing weight! John describes the latest developments

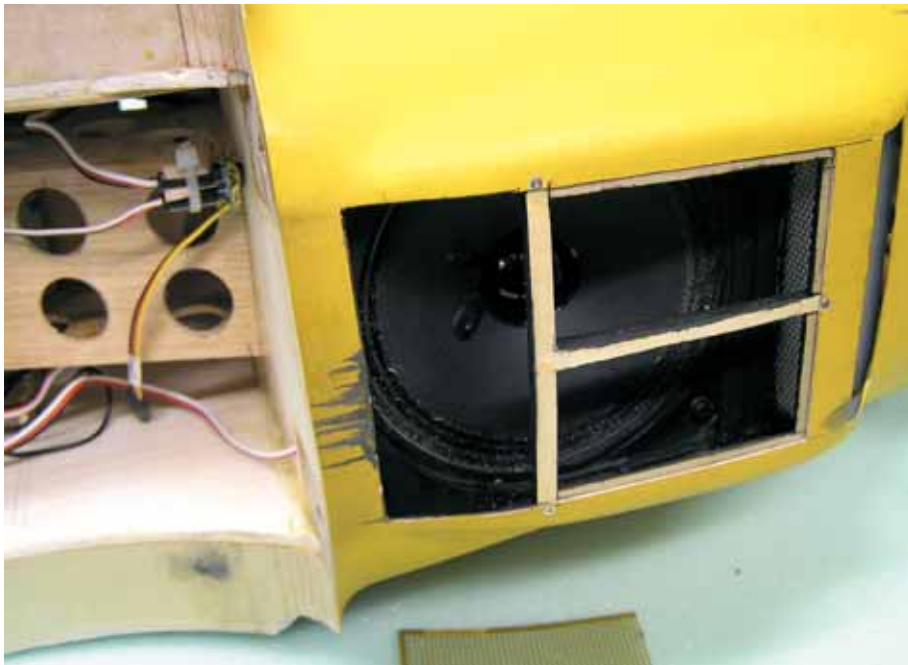


A TBS Micro sound circuit was also ordered and Thomas programmed with the digital sound file of a genuine bf109 engine. Inertia starter? Of course, and it sounds great as the starter engages, but more of that later.

The TBS Micro circuit plus the new amplifier and a 4" R10S Visaton speaker was set up on the bench with the 6s3p LiPo flight pack (25.2 v maximum). Thomas had thoughtfully provided a small volume control potentiometer beside the amplifier so the

output could be regulated to the speaker. The total cost of the electronic components from Thomas is around £100.

The transmitter programming is now much improved and simplified and the garage was soon filled with the crackle of a V12 Daimler Benz. The amplifier output was turned up until it sounded as though the speaker was nearly distorting. I do know from experience that it is easy to burn a speaker out, so I did not want to overload it. They are very cheap at around £7



▲ Speaker box and sound grille with Micro sound circuit on the bulkhead



▲ Bench test and running the amplifier is running comfortably cool (with fan on) at 1.5 A

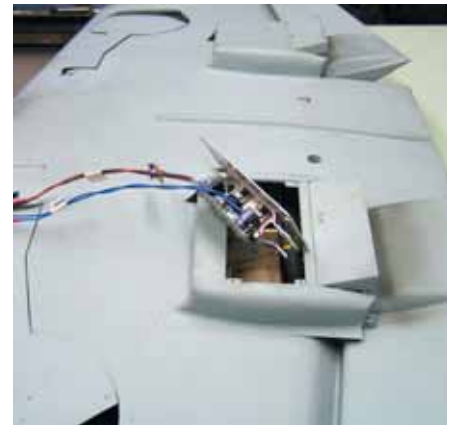
each from RS, so a failed speaker is not the end of the world. The amplifier had a heat sink fitted and I made an alternative version out of thin aluminium plate. Nevertheless, it got quite hot after a couple of minutes. They all get hot, but this one seemed to generate more heat than the 12 v amplifier. By running the fan heater (with the heat turned off) the amplifier heat was dissipated to acceptable levels, and a long run of 10 minutes was conducted.

Bf109 Sound Installation

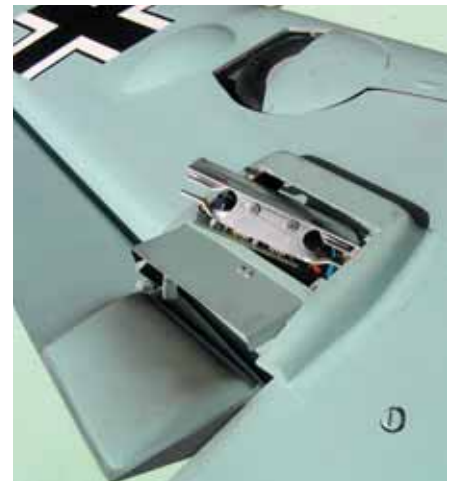
As that all seemed to work, the installation in the 109 was started. The main problem was where to graft a 4" Visaton R10s speaker into the plane. The wing is constrained on the underside by the retracting undercarriage, so after some head scratching I decided to fit the speaker in the underside of the rear of the

engine cowl. It has been found that the way to fit a speaker properly is to ensure that the edges are sealed and the noise cannot easily get out from the back, to cancel out the noise from the front. Just try to get a good volume from a speaker not in a box and this effect will immediately become obvious. The capacity of the sound box does not seem to be that critical, although it should not be minute.

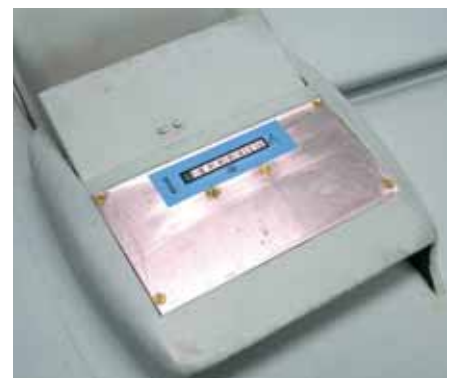
The cowl was therefore cut back and the speaker grafted in. Other modellers are fitting them in the cowls of radial engines and this is an ideal place to hide speaker(s) and let the sound out. However, there may be a problem with the air blast from the propeller pushing on the speaker cone and restricting its output. Baffles may solve this effect. Non-radial engine models are more difficult for speaker installations, together with the requirement of not significantly moving the C of G.



▲ Where better to put the amplifier to keep it cool?



▲ The cooling fins really do work well



▲ It all works well and even the first graduation temperature indicator is not turned black now

The amplifier had to go somewhere where it could be cooled adequately, and what better place than one of the scale radiators on the underside of the wing. Even the radiator flap works with the main wing flap, so it should work, and it does. The aluminium plate heat sink was adapted to fit this radiator and additional small fins were fitted inside to protrude into the air-stream going through the radiator in order to take the heat away. Stick-on non-reversible temperature indicators were bought from RS. Without air cooling, the amplifier does get hot, but with the fan cooler (and eventually in flight even on a very hot day) the temperature does not now get onto the first graduation at 70°C.

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▲ The 109 can easily take the weight



▲ Daimler Benz sound now



▲ Radiator cooling gills open as well. Photo – Bob Mahoney



▲ 2 x 40 W amplifier with modified cooling fins



▲ 2 x 40 W amplifier behind the dummy cylinder heads

The whole set up was tested on the bench again. The current to the amplifier at the LiPos 6S voltage was set at 1.5 A by turning the volume control. It is possible to fry these speakers, and 1.5 A seems to give good sound level of about 98 dBA at 1 m, without damaging the speaker coil. This is a good level for one speaker and even with two the sound only just gets to, or slightly exceeds, 100 dBA at 1 m. The total weight of the components is only 7½ oz so with the additional wiring and bits and pieces it is truly the 'half pound sound.'

Bf109 Test Flight

Now the model comes alive. By flicking the auxiliary toggle switch on the transmitter the audible inertia starter whine runs up, and when it bites into the starter ring and the engine sound is engaged, the throttle stick is eased forwards to start the prop turning. The raspy tickover is authentic and the model is taxied out to take-off. The engine note is proportional so the motor roars on take-off. Low fly-pasts do sound really good and the machine guns are fired by the same toggle switch. So get on the tail of a Spitfire and toggle that switch!

The 109 has now had eleven long flights with sound and there are no interference problems. It really does make a difference in bringing the model alive, and it does not seem like half the sound of a two-speaker system. The 109 easily carries the extra weight easily and with the introduction of Lipos it is only 9¼ lbs all up weight.

Beaufighter Sound

The Beaufighter has now had the two speaker system fitted and running for many flights. The amplifier was originally mounted in the fuselage with no air-cooling. I suspected that it was getting hot and turning itself down with the



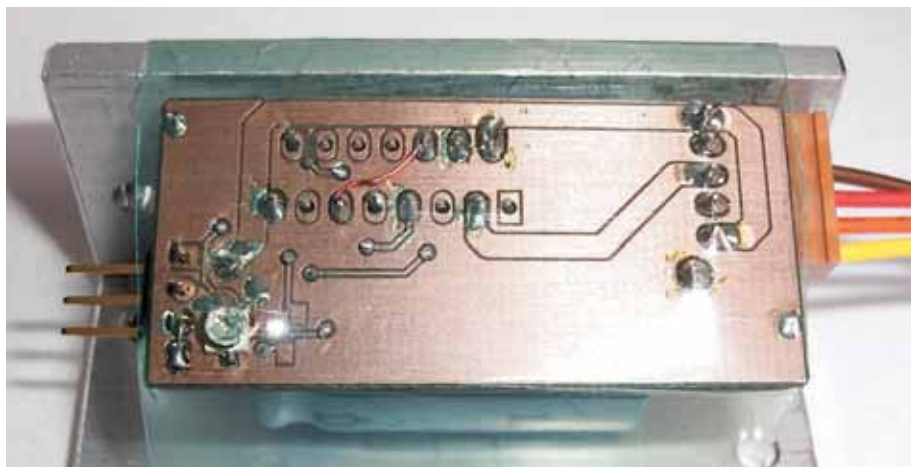
▲ **Growling Beau. Photo - Graeme Macfarlane**



▲ **Finals with radials burbling. Photo - Graeme Macfarlane**

integral over-temperature automatic protection control. It was subsequently remounted in the cowl behind the dummy cylinders with thin fins protruding into the air-stream in the cowling. It now gets excellent cooling. I also found that the old 12 v NiMH battery pack was failing on me, and I now use a Thunder Power 1320 mAh 4-cell LiPo pack. Others are using a 3-cell sound pack and this is adequate. However, the 12-18 v amplifier will seldom see 12 v from a 3-cell LiPo and it could be as low as 9 v. With the 4-cell pack it goes from 15 v down to 12 v minimum. That is within the specification of the amplifier chip. At 14.4 v the amplifier chip is rated at 25 W, and at 13.2 v the amplifier is

▼ **New Benedini 50 v amplifier**



rated at 15 W. Who knows what it is at 9 v, but it will be substantially lower than 15 W. The new LiPo 4-cell pack will power the sound for up to 30 minutes. The sound output at these higher voltages is also increased, so the amplifier volume control must be turned down a bit with the integral potentiometer so that the total current at 15 v is only 2.5 A or less. Two speakers have been fried in finding this out!

The Beaufighter has now flown for 16 flights with sound and it has all been worth it. Some of the flights have been 15 minutes long. Together with Pete Nicholson and his new electric P47 with sound, these two electric models were even entered in for the May BMFA 'flying only' scale competition at Boscombe Down and there was much interest

in the sound. It just shows that these electric models can now compete at the top levels, and yes, the two models did score well on sound realism! Pete achieved a very creditable third place with his P47 and we can now compete with I/C engines on more than equal terms.

Alternative Speakers

There are better speakers out there for those who can use them. If you can fit a 5" or 6" speaker then the Blaupunkt range may be more suitable. They have developed a range of Neodymium magnet speakers which have the potential to give out more sound for less weight. I tried their ODx 92 (3.5" diameter) speaker, and it did not perform as well as the Visaton.

However, reports from the clever people on the Internet indicate that a single 160 mm diameter Blaupunkt ODc 162 speaker (or international equivalent) gives a better dBA level than two 4" diameter Visaton R10s speakers at slightly less weight. These speakers are not cheap like the Visaton R10s, so it is best not to overload them. This large speaker is ideal for mounting in a radial engine plane, although at the time of writing we have not eliminated the question of whether the blast of air from the prop affects the performance of the speaker in flight. A Blaupunkt 130 mm diameter speaker is also made (ODc 132) which might be useful as a single or as a double speaker installation.

50 v Amplifier

Thomas has also now designed a 50 v amplifier for those with higher voltage battery packs, so the complete range of voltages for the amplifiers should be available by the time you read this. The TBS micro sound circuit with the sound file memory gets its 4.8 v power supply from the receiver and this is minute and it will feed any of the above amplifiers. Thomas has a website at www.benedini.de and a range of short video clips of the results is being built up. How could you fly your scale plane without sound now?

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