NEWSLETTER June 2022

Hello Gents,

First off, a cautionary letter from *Moss Bank Park Model Engineering Society, Bolton*. Beware Thieves About!

Hi Graham,

I thought that I should notify you of a recent incident at our track. We finally managed to open for public running eight weeks ago and it was very successful but in the early hours of last Saturday morning a gang of well organised thieves ripped up and stole all the aluminium rail from our track as well as our stock of replacement lengths which were held in a very secure place. These crooks had all the appropriate equipment to easily get through our security measures. In doing so they completely destroyed all of the track. We are unsure what to do next for to mount another rescue project is a major undertaking with so few people and little finance but we will decide when it has sunk in. I would ask that you inform all the other members of N.A.M.E. to be on their guard especially those with similar rail and also to inform us if they are approached by anybody offering cheap rail for sale.

Stuart Rothwell

The newspaper link is here:

https://www.theboltonnews.co.uk/news/20188228.recently-restored-bolton-railway-site-hit-20-000-damage/

Now the good news. We enjoyed a visit to *Saltburn Miniature Railway,* and I was so impressed by all the hard work and the end result, and this for a railway relying on only a few people. I imagined a large Club, but no, there were only about 20 volunteer members. I wish them all the best of luck with future bids for funding, because they get no help from the council.

The August 3rd Club meeting is titled '*Engineering Failures And Lessons Learnt'.* Contributions are requested. If you would like to join in, and want to use a PowerPoint presentation to present your photos, we can help. Just ask. We have found that PowerPoint presentations work very well at our Club nights.

We have decided that the annual auction has become a bit of a non-event, and so we will not be dedicating a meeting to it. However, if you want to bring anything along to dispose of, please do. If something exciting is for sale, I am happy to let members know by an e-mail before the meeting,

Looking ahead to the AGM, it is your chance to have your say in the running of the Club and to put yourself forward to join the committee. New faces and ideas are needed to keep the committee on its toes and the Club enthusiastic.

Workshop.

George has been doing a bit of de-cluttering and brought quite a few books to the Workshop. There are some of the '*Workshop Practice Series'* among them, and all books will be available to borrow, with a library type sign out.

If you find that you need to use a machine, or tools bigger than those you have at home, or at the Club Workshop, please get in touch with me. A fellow member has kindly offered to help out if he can.

That's about it for now folks. Looking forward to seeing you on the 6th July at the Hungate Centre, for the annual *Bring 'n Brag* . Come and join in. Tea and biccy's at half time.

Kind regards, Jonathan.

☐ **Forthcoming Events.**

- **Wednesday 6th July: Club Meeting. *'Bring 'n Brag'*.**
- **Tuesday 19th July: Workshop Morning**
- **Wednesday 3rd August: Club Meeting. "Engineering Failures and Lessons Learnt "**. A chance for members to discuss some of their project failures and the lessons learnt by those failures.
- **Tuesday 16th August: Workshop Morning**
- **Wednesday 7th September: Club Meeting.** Ivan Shaw will give a talk on the flight testing of his 'personal' aircraft G-SEKR **
- **Tuesday 20th September: Workshop Morning**
- **Wednesday 5th October: Mike Sayers Trophy Evening. ****

**** Please Note:** These events may be interchanged

☐ **The Development Of A 'Wing In Ground Effect Vehicle' ~ A Talk By Jon Selby (Wednesday 1st June).**

This was the first talk from a visiting speaker at a Club meeting since before the Covid lockdowns. Jon's WIG (Wing In Ground Effect) vehicle was introduced in the August/September 2021 Newsletter with a video showing the concept operating.

- **Historical Background.**

Jon said that the path to the current project started in 1996 when he saw a programme on Channel 4 about the Russian Akranoplan (a.k.a. The Caspian Sea Monster).

There is a link to the Youtube video of the story of this craft at this link:

https://www.youtube.com/watch?v=x22nVFTd8nI

To return to the newsletter, press back arrow at the top left of the screen.

Jon has always been interested in water skiing, wind surfing etc. He went back to South Africa for four years. When he came back to Ryedale, he decided he would learn about composites. He ended up working for Jim Tucker at *Europa Aircraft* at Kirkbymoorside. He worked on the composite wing spars. The September 2018 Newsletter describes how Ivan Shaw designed and developed *The Europa* aircraft.

Jon then worked on a drone called *Phoenix.* After working to gain every skill set he could, he then went into business for himself, doing repairs for motorsport. One of the first cars he worked on was for Lewis Hamilton at *Manor Motorsports* in Sheffield. He then worked for different teams, and worked on World Superbike Suzukis for people like Guy Martin. He later worked on British Superbike Kawasakis.

Jon finally settled on working for two teams, one was for the current CEO of *McLarens*, Zak Brown, and also for a company in Manchester which deals with historic F1 cars.

- **Initial Investigations Into Ground Effect Technology**

In 2010, Jon started investing in Ground Effect Vehicle technology. In 2010 Jon got a young Russian who was living in California to come over and develop a concept design. This is the concept he came up with:

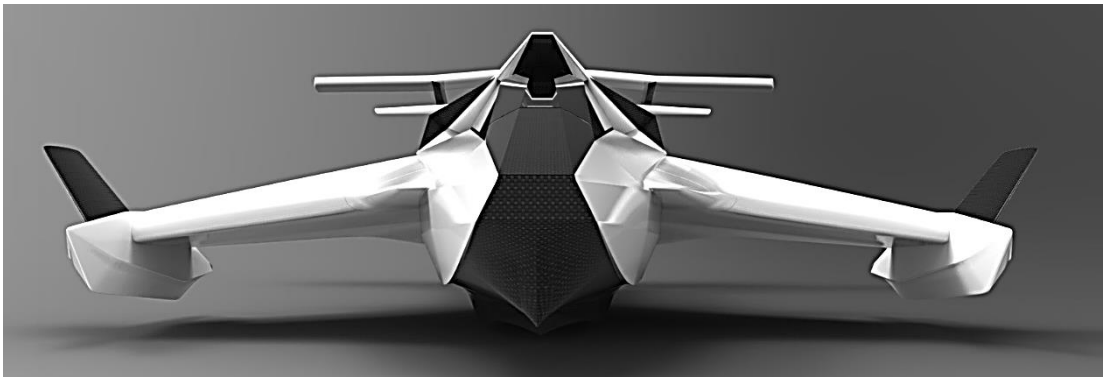


Fig 1

This design then went to a professor in charge of CFD (Computational Fluid Dynamics) at Rostov University. He was part of the Soviet programme in Ground Effect Vehicle technology. He taught Jon the basics such as deriving *Coefficient Of Lift*, and advised Jon on whether his designs would work.

After about six years of coming up with different designs, with many iterations, two designs were focussed on:

A Reverse Delta Wing Design

Fig 2

An Ekranoplan Type Configuration

Fig 3

- **The Construction Of Small Test Models.**

In 2016, Jon started to make some moulds to make a small model of a reverse delta craft:

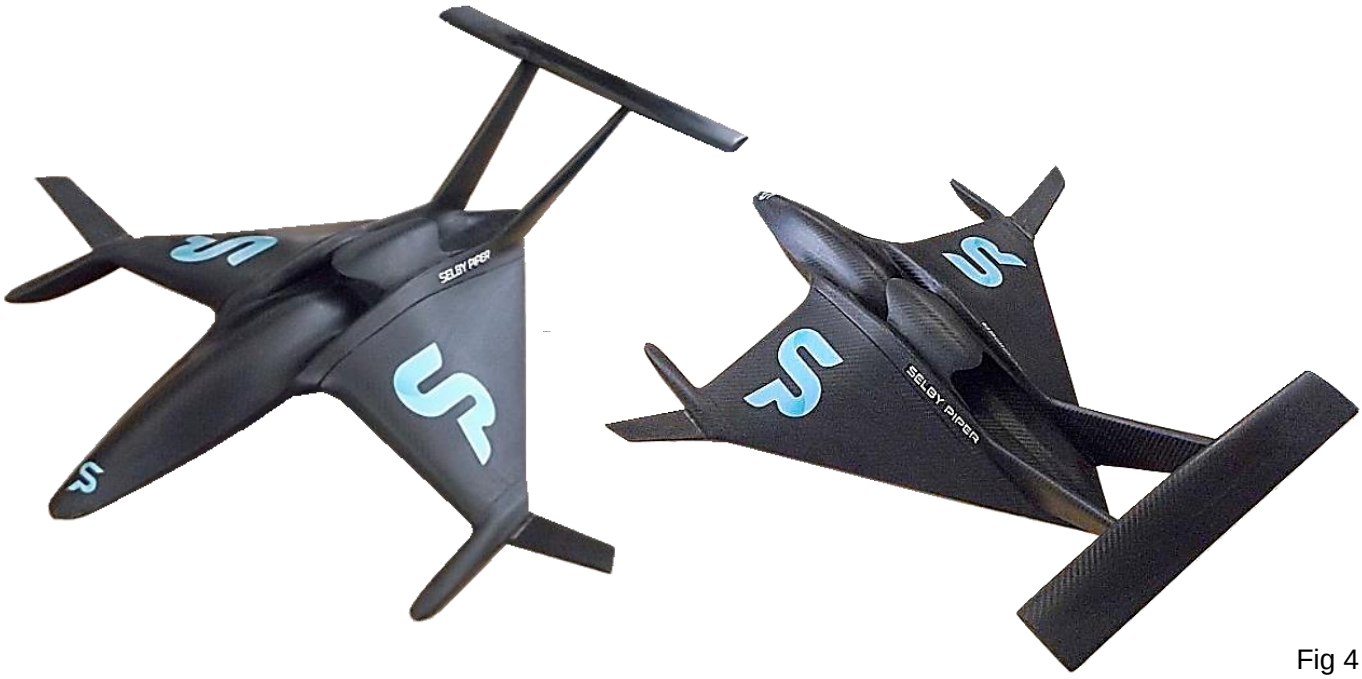


Fig 4

A similar model was suspended on a wire and spun on a circular flight path:

This test allowed the model to be tested in and out of ground effect, and to investigate whether there were going to be any difficulties transitioning from one state to the other. The model was powered by a ducted fan, which in turn was powered by a rechargeable battery. During the test, the canopy above the fan could be heard vibrating a lot. This was quite an issue. A lot of design features were validated by this test.

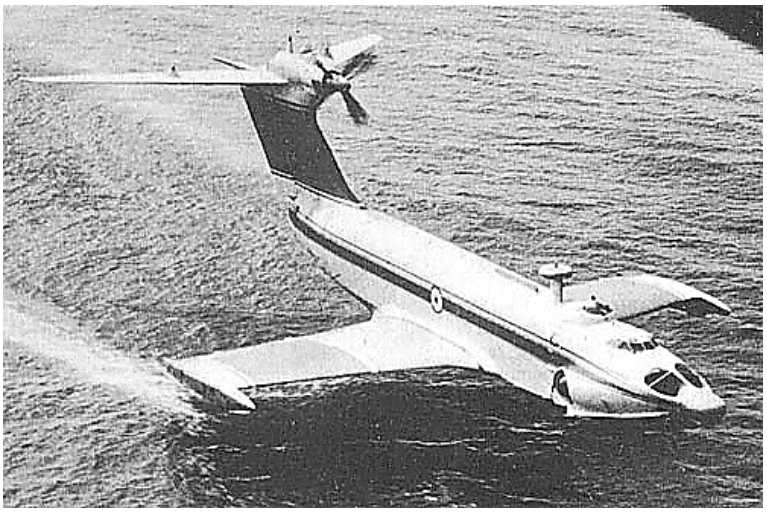
Some changes were made to fix the problem with the ducted fan canopy.

- **Sponsorship and Bigger Test Models**

In 2019, Jon's company was concentrating on hand-launched and vertical take-off drones. He took these to a drone show in London, where the above model of the WIG craft was displayed. This led to some interest and an offer of sponsorship to take the project further. A proposal was written and by the end of 2020, the project with sponsorship support was then begun.

This next stage envisioned a bigger test model. This had a length of 2.82 metres. Three configurations were investigated.

- **A Russian Type Ekranoplan** which is basically a tube with stubby fixed wings. The Russians built some of the largest '*Wing In Ground Effect'* vehicles. One was 92 metres in length and 550 tonnes. It could travel at 300+ km/hr. Huge budgets were spent on these vehicles in the Soviet Union.



The Russians are still focussing on this design. These are intended to be 72 metres in length, with either 550 passengers, 64 tonne payload and a cruising speed of 610 km/hr. Some will have mounted missile launchers.

Fig 5

- **A Reverse Delta (Reverse Lippisch Design).**

  Alexander Lippisch was involved in one of the craft that Jon has taken most inspiration from, the Reverse Delta.

Fig 6

Alexander Lippisch and Hanno Fischer designed the X113 together. This had a take-off speed of 35 mph. Hanno Fischer then went on to develop the X114, which was developed for the German military in order to explore low radar signature. Fischer then went on to develop the FS 8, with a couple being sent to Singapore.

Jon knows some people in France who are looking at a 40-metre-long craft with an 8 metre wing span. They expect this craft will take 70 people or a payload of 6 tonnes. They hope to service the oil rigs off the coast of Africa.

X-114 Fig 7

FS-8 Fig 8

- **A Tandem Wing**

  This craft has a German Background. The Tandem Wing craft are stable.

Fig 9

These three craft types, individually, have three different areas that they excel in.

- **Going Forward With The Reverse Delta Design.**

The smallest of the craft is the Reverse Delta. And that is what Jon will be focussing on, going forward. It is the far more manoeuvrable of the three designs. The Ekranoplan and The Tandem Wing concepts take a lot of time to turn. They also supposedly fly at a height of about 10% of the wing span, whereas the Reverse Delta flies at 50% of the wing span.

A Reverse Delta design of up to 17 to 20 metres length is probably the best configuration.

One aspect of '*Wing In Ground Effect'* craft is the potential to have low radar stealth properties, especially if the correct materials are used in their construction.

One idea Jon had to start with was a Reverse Delta with 'sport performance', or a craft useful in a wilderness like Alaska. The sport performance favoured a centrally mounted ducted fan.

- **Further Design Criteria.**

The company then decided to look at another two designs. The design was to make use of a central fuselage which would incorporate passengers and cargo. The aim of the project was to produce a stealthy 'Surface Effect Vehicle' (i.e. WIG) which utilises surface effect technology, which in turn gives the potential for super-efficient flight. The craft would be operational in most theatres of operation such as:

- Open water
- Snow
- Frozen lakes
- Land and Beaches.

There is also to be:

- Negligible radar presence.
- Low heat and sound signatures, as the ducted fan is contained.

- **Project Organisation.**

The whole project was then divided into six sections:

1) Making The Moulds For the 2.82 metre long Flight Test Model.

At this time the company had 99% of the patterns, so the first three months of the project was taken up with making the moulds to produce the 2.82 metre long flight test model. The patterns were made from MDF and were CNC (Computer Numerical Control) machined to shape.

The photos below show the top section of the craft. The sections were coated with *Duravit* primer, and then they were prepared, waxed and a release agent applied. A gel-coat was then painted on.

A carbon fibre layup was then layed into the pattern, onto the gel-coat. The layup was then vacuum bagged down, and resin was infused in. The final top section mould is shown below right.

:

Fig 10

Upper Mould Resin Infusion Process.

Fig 11

Lower Primary Mould.

Fig 12

Upper Primary Mould.

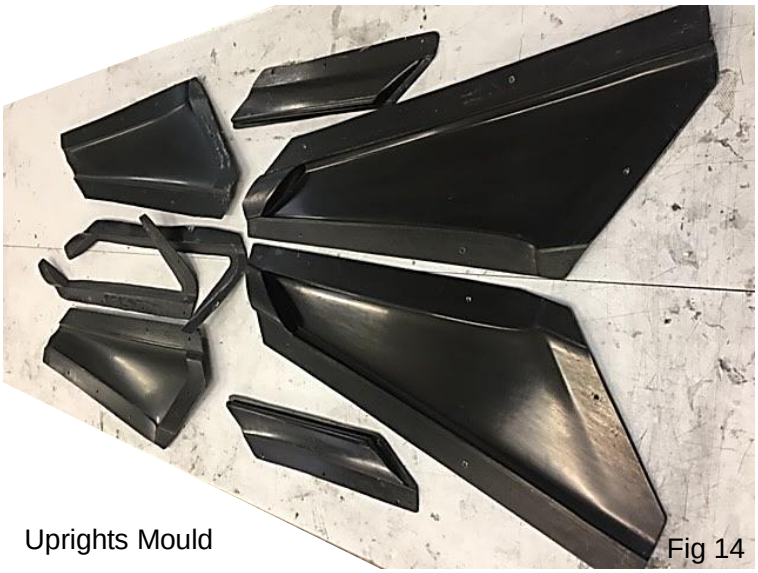
.

Fig 13

Spar Mould

Here are some more moulds:

Top Fairing Moulds



Uprights Mould

Fig 14

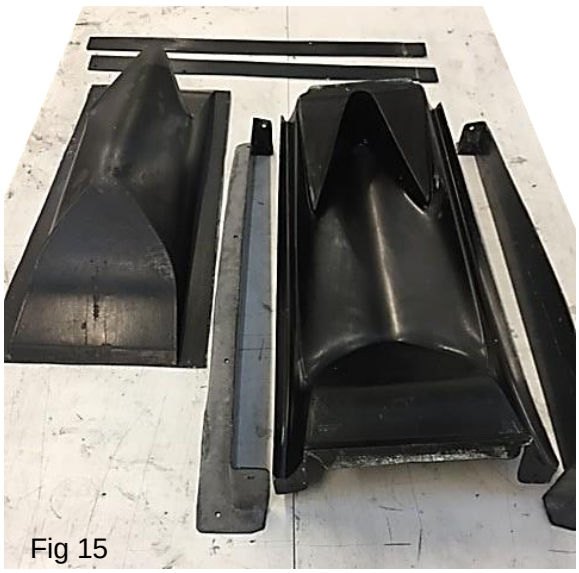


Fig 15

Fig 16

Mini Hull Wheel Undercarriage Moulds

Rear Wing Moulds

Fig 17

2) Making The Component Parts For The Model.

The next three months were spent making the component parts from the moulds and that was done with carbon prepreg and foam. The structure consists of a carbon skin/foam/carbon skin sandwich construction. The layup was consolidated by vacuum bagging and then the structure underwent an overnight cure.

A spare part was made so that the moulds could be validated before they were passed off as acceptable.

Fig 18

3) Assembling The Component Parts.

The next three months were spent assembling the parts.

The Ducted Fan

In the meantime, the ducted fan, which incorporates counter rotating fans, was being manufactured by a company called *Geola* from near Gatwick. This is the first one they came up with:

Geola were happy to take this ducted fan up to 15 kg of thrust.

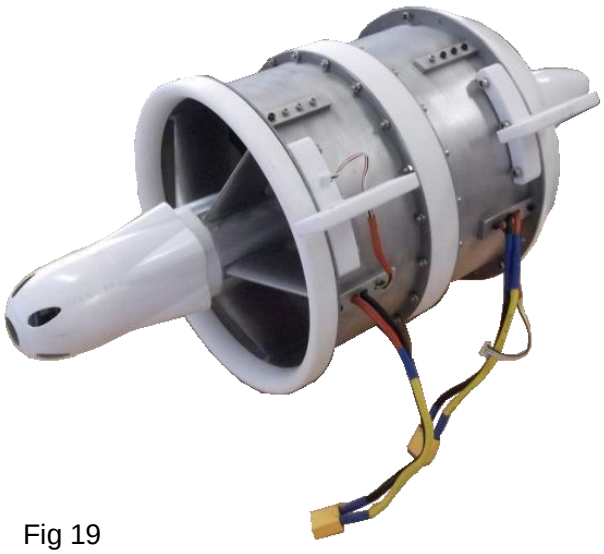


Fig 19

Geola then came up with an improved version which is now in the test craft. This version can comfortably handle 15 Kg of thrust.

The only difference between the two versions is the material used in the construction of the blades to cater for the rpm involved.

There is still a lot more to do with regards to getting more performance out of the ducted fan, but the current fan's performance is greater than what was asked for.

4) Fitting Out The Craft With The Flight Control System.

The next two to three months were spent fitting the craft out with the Flight Control System (FCS). *Geola* did that as well.

The FCS was changed a little after the Large Model Association (LMA) was involved. Rob Buckley from the LMA upgraded the FCS because as it weighs more than 25 Kg it needs to be certificated by the C.A.A.

Antennae were mounted in the front of the craft, and backup systems were included.

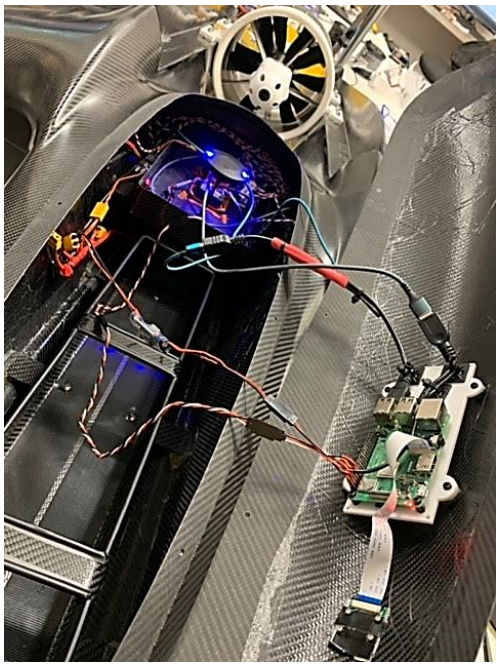


Fig 20

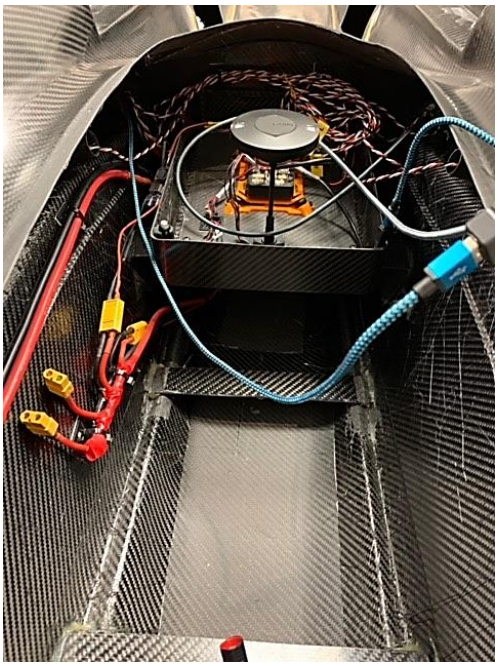


Fig 21

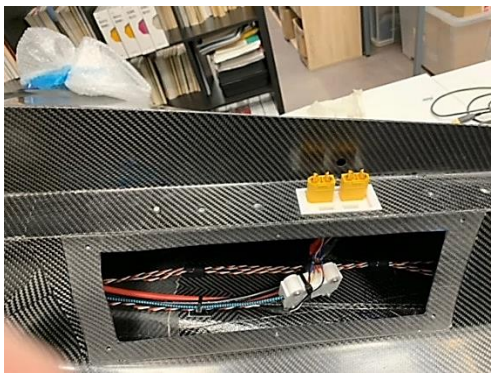


Fig 22

Fig 23

5) The 2.82 metre (9.25 ft) Model Tested On Land.

The next step was to take the model to the grass strip at Newton On Rawcliffe to allow flight testing. Ruben, Jon's son has a drone that can be operated to follow the model in flight.

There was a lot of resistance coming from the grass. A car mat was required to allow the craft to release itself from the grass. The motor worked fine.

The craft was then fitted out to Rob Buckley' specifications and got ready for testing back at Elvington.

Initial tests were unsuccessful due to operator error, and in addition there were some wind gusts. Another issue was that the centre of gravity wasn't checked properly, and the angle of attack of the rear wing wasn't correct either. There were a few problems on the day.

The good news was from drone footage; it was realised that flight would be possible with adjustments.

First flight was then achieved with Andy Johnson at the controls. He had spent time understanding the flight characteristics of the craft and followed all the procedures suggested by the sponsor. Further flight testing resulted in a longer flight.

Andy realised that if the craft was given 50% power it would take off. Andy was very happy with the controls. He said that the elevator was very sensitive. This would have to be further dampened for further flight testing.

6) The 2.82 metre (9.25 ft) Model Tested Off Water.

The next stage was water testing. Jon hadn't been able to put the craft on the water because they didn't want to have to seal anything for the land testing, in case something needed to be changed later on. They didn't want to compromise anything. After the testing on land was complete, the craft was sealed up and was then taken to the water.

They came to realise that the craft was riding very low on the water, and it wasn't ready to fly.

Jon built a shaped hull and covered it in carbon. Here is a photo of the craft upside down:

Fig 24

Fig 25

After talking to Ivan Shaw, he thought he had enough area for lift, but actually, by adding this construction extra weight was added too. When the craft was placed back on the water, there wasn't much of an improvement. The craft was taken back to the water again, but unfortunately there was so much drag, the craft wasn't going to fly.

The sponsors, however were happy, they knew the craft would fly, and it was just a case of solving the issues of a decent central hull design.

- **Some Solutions For The Problem Of The WIG On Water.**

i) Hydrofoil.

Jon is hoping to use a hydrofoil of this type:

Fig 26

A properly designed hydrofoil will easily lift an 80 Kg person, and a surfboard with a battery. On the water, the craft weighs 38 Kg. Jon is hoping to introduce the hydrofoil under the hull in such a way that it will not affect the aerodynamics in flight. One idea is to retract the hydrofoil after take-off.

ii) Water Jet Hull

A young designer in Zagreb, who was designing water jet systems, designed this water jet for Jon's craft:

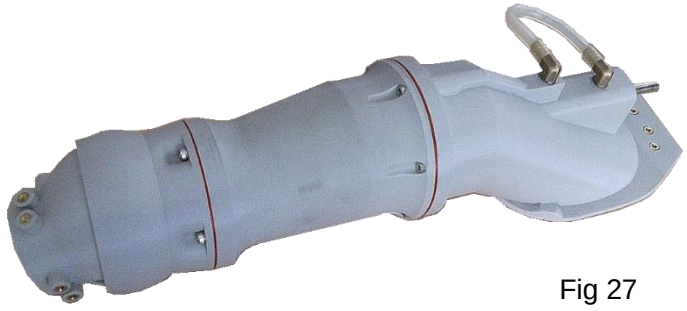


Fig 27

This water jet gives 15 Kg of thrust.
The item was 3D printed.
In addition, it has been coated.
Two have been manufactured.
This may be an option for propulsion.
The craft is 38Kg so with the 25 Kg thrust from the contra-rotating fans and the 15 Kg of thrust from the water-jet, this should be a decent combination.
This ultimately gives a hydrodynamic solution.

iii) Reconfiguring The Craft.

Another area where the design could be improved is the way the airflow is channelled into the craft more efficiently. As mentioned before, there was a lot of drag on the water. There is also a gap between the ducted fan and the body of the craft in the area circled below:

Also the top of the fairing (circled) is very sharp at the top, where it should be more bulbous to focus the airflow better. *Geola* thought that 14% of the potential thrust was lost due to these issues.

There are quite a few things that need doing to refine the design.

Fig 28

- **Further Testing and Designs.**

Jon is very keen to get on with testing again after quite a break. Jon has another craft which has a dual outboard thrust system and this is a model:

Jon envisions a 17 metre long craft of this configuration with two crew and six passengers.

Another craft that Jon will be looking at with be 8.5 metres in length. This will be a two-seater training craft to licence pilots and act as a technology demonstrator.

Another idea is that the craft could be covered in solar panels so the craft can be charged in a location like a beach.

Fig 29

- **Registration Of Craft.**

During the design process, Jon was informed by 'The International Maritime Organisation', that these type of WIG craft need to be certificated before they can operate in shipping environments. Initially, there didn't seem to be any rules for certification. The authorities then derived rules for craft with 12 seats or more.

The Russians appeared to be more advanced in certifying WIGs, and Jon got the rules translated into English which was a start.

There also needs to be a type of pilot's licence to fly the craft. As WIGs are navigating through maritime traffic, they are regarded as marine craft rather than aircraft for licencing purposes.

Questions and Answers:

Q: Did you measure the thrust? For aircraft, you would tie it to a tree with a spring balance attached and measure the thrust.

Jon: Yes, we did something like that. This photo shows them measuring the thrust:

Fig 30

However, this is without the top fairing. The top fairing has been a hindrance, but is required to hide the radar signature of the ducted fan.

From the small model being spun around in the factory, I thought we would have a lift coefficient of between 1.3 to 1.7. From the telemetry on the test runs, the craft was 36.4Kg in weight took off at 33mph and came out with a lift coefficient of 1.55.

That is real feedback that can be applied to the larger craft, so we can get a feel for what speed certain craft weights will take off at.

The only problem with WIGs is that they have to be built like a boat, but fly like an aircraft. Also, any water getting into the craft will affect weight, C of G and balance.

We may have to look at some bladder systems and monitored compartments. The most important thing to do is keep the weight down.

Q: What is your next step?

Jon: The next step is to install the hardware that the sponsor requires with antennae and receivers. All need to be placed in the best position with respect to centre of gravity.

The 2.82 metre test model is going to be tested again, this time with a hydrofoil. The motor will also be serviced. The dual engined model will also be prepared for test.

Q: I think that once you get all the data from the scale tests, you need a manned craft. That was Burt Rutan's philosophy with aircraft. The proof of concept will be achieved through actually flying the craft.

Jon: The 2.82 metre model is a 1/3rd scale model of the full size 8.5 metre craft. We just want to validate that and be comfortable. I'm very keen to go with a manned version, especially a training craft, and setting some initial standards for certification.

After writing and submitting proposals, we are now far surer of what is required with regards to the specifications and registration.

Q: What wing loading do you have on these craft?

Jon: I don't really know, but I've made sure that the main spar has been designed to take all the loads expected. I'm more concerned with the impact loads on the craft when it is supported on its outer sponsons. I keep being told that the sea is going to test the design.

Q: What speed are you looking at? If you hit the water at 70 mph for instance, it will be like hitting something solid.

Jon: For the 2.82 metre craft, I would say 40 mph is the most it's going to need. The FS-8 takes off at 63 mph, and apparently, it's a rough take-off. Once it's in the air it's great, but I've seen passengers being bounced about. The secret, I think, is in the hydrofoil technology which should smooth things out.

Q: Are you limited by sea state?

Jon: Yes, to a certain degree, but that is less so if the craft is fitted with a hydrofoil. One idea is that the hydrofoil would be stowed once in flight.

Q: How will the full-scale craft be powered?

Jon: For range we're going to have to go with turbofans like the Ekranoplan. With batteries, there is the problem with weight. Batteries are not the safest things either. Battery fires are an issue. At the moment there is so much movement towards 'green technology'. I'm all for recycling plastics back into fuel.

Q: Are the ducted fans used commercially for anything else, or were they made especially for you?

Jon: They were made especially for this project. *Geola* did a CFD analysis of the craft. *Geola* also made a another set of counter rotating props for the dual engined craft, but that was more of a scale up from something they had done previously.

I'm not happy with the profile of the dual engined craft, and it's too heavy. I prefer the profile of the 2.82 metre model we've just tested.

We will be testing on water at Wykeham lakes, and we have had help from The Sea Scouts.

Q: One observation is that if you use battery power, you don't have to bother with the C of G changing as it would do with fuel.

Jon: Or you can keep the fuel in the spar.

Q: I was talking to Ruben and was asking if there was a computer controlling the flight control system.

Ruben: We are using a *Pix-Hawk* which runs all the servers and motors, and we have special flight control firmware.

Jon: That is one of the next stages. Ruben wants to develop the flight control system in-house with Rob Buckley from the LMA. I'm leaning towards using two companies which deal with military flight control systems.

Ruben: One of the next stages is looking at autonomy.

Q: To keep the craft in trim and balance, do the control surfaces move very slightly?

Jon: We have two elevators on the rear wing. Those deal with the pitch. There are also two rudders, one on each upright. Then there are ailerons in the outer winglets. That is enough to control the craft.

I was worried that the winglets and ailerons weren't sufficient for control, but the feedback from testing was that they were OK.

With the dual engined craft, you can see much larger, more traditional winglets. We have another winglet to fall back on which is still in test.

PEEMS would like to thank Jon Selby for proof reading this article and for kindly allowing his photographs to be reproduced in this Newsletter. These photographs are not to be reproduced without Jon Selby's permission.

☐ **PEEMS Visit To Saltburn Miniature Railway (SMR) On Wednesday 22nd June 2022.**

Introduction.

Nine PEEMS members including partners, visited the Saltburn Miniature Railway (SMR) on an arranged visit.

The SMR have an excellent website at this link:

https://www.saltburn-miniature-railway.org.uk/

To return to the newsletter, please click the back arrow at the top left-hand side of the screen

We were met at the ticket office at 'Cat Nab' (close to the beach) by Robert Proctor, the Shed Manager. We were then given a ride through the Valley Gardens to the terminus at 'Forest Halt'. Both the terminus and the station at Cat Nab have a 'run around loop' to allow the loco to head the train in both directions.

We then rode back to the Engine Shed, which is near the midpoint of the track, for an excellent tour conducted by Robert.

The locomotive used on the journey was *'Saltburn 150',* a Diesel Hydraulic 4-6-2 which had been totally rebuilt in the SMR Engine Shed/Workshop.

From the SMR website

This 4-6-2 Locomotive was built in 1975 by Artisair and based on a scale replica of 'Flying Scotsman' having been originally named as such. Motive power is provided by a 2.25 Litre Ford Transit Diesel Engine located in the Tender powering Hydraulic Transmission. It is therefore known as a Diesel - Hydraulic and power is transferred to a motor in the Loco which in turn drives the centre wheels.

We bought it from Cleethorpes Coast Light Railway and after several modifications carried out in our workshop, we renamed it "Saltburn 150". This was in honour of the town's celebrations in 2011 when Saltburn celebrated a century and a half of existence.

This lovely looking Loco is used for hauling our passenger coaching stock and also our maintenance wagons on a regular basis and is another popular Loco here at the SMR.

The Journey

There is a very brief video of the journey from Cat Nab to Forest Halt to the Engine Shed, at this link:

https://youtu.be/Hn09Y9JlyDA

To return to the newsletter, please click the back arrow at the top left-hand side of the screen.

A Brief History.

Before travelling on the train, Robert gave us a brief history and current status of the railway.

The railway was run and maintained by volunteers, no one gets paid, and the volunteers are involved because of their interest in engineering and running a railway for the public. There are about twenty volunteers, the youngest being nineteen. The volunteers do all the gardening, all the track maintenance and they build/rebuild locomotives. Robert was involved in the build of *"Blacklock R"*, SMR's steam locomotive.

The track is half a mile long, which isn't far, but the railway is restricted by Skelton Beck, and it can't go any further.

The current railway was born in 1947, and was established by Mr Herbert Dunn from Bishop Auckland.
Mr Pickering then bought it in the 1950s. Mr Pickering owned *Saltburn Motor Services* (SMS), which was a bus company. The council ran Cleveland Transit, and wanted to buy SMS. The council bought SMS in the 1970s, and got the railway with it. The council couldn't run the railway, and it failed after two years. Various people then tried to resurrect it, but didn't have the expertise or the money.

In 1985 the 'Saltburn Miniature Railway Association' was born, set up by hobbyists and enthusiasts, and since then has gone from strength to strength. The 'Association' then became a limited company, so that no-one would be exposed to any monetary problems. The directors are all limited to £1.

The line itself is on land that is owned by the council, but the council really don't have any input. Basically, the volunteers run the railway themselves. There are about 40,000 passengers a year, and all the money is made on ticket sales, The railway gets no Government grants. All the track and loco maintenance is done by volunteers. Incredibly as will be explained later, the machine shop at the Engine Shed, is very basic (probably no larger than the PEEMS workshop), and all the machining, welding etc. is done there. However, any parts that require CNC are contracted out.

The Engine Shed.

The first locomotive we examined was the steam locomotive *'Blacklock R'* a 4-4-2. It is based on an *Atlantic Class* locomotive, and runs on Saturdays.

SMR got this from *Windmill Farm Railway* as a 'bag of bits' Some of it had gone down to the *Fairbourne Light Railway* in Barmouth when it was 15" gauge. Then Fairbourne regauged to 12¼" gauge. Robert got the rest of the boxes from there.

It had a brand-new *Franklin and Bell* 32-tube boiler, one reason why they got the loco. This boiler has an operating pressure of 150 psi.

It came as a 'non-runner', a 'wreck', and Robert rebuilt it after it was dismantled. It took three years (from 2013 to 2016) to bring it back to an operating standard.

The cylinder and valve gear are exactly the same as for *No. 24* on the Cleethorpes Coastal Railway which was built by Fairbourne. It has a *Walschaerts* (as opposed to a *Stephenson*) valve gear.

It's not a piston valve, it's a slide valve.

The lubricator was bought off E-Bay, and when the handle is turned drops oil into the top of the slide valve.

There is a front-end throttle on the boiler (similar to large locos). This is a ball valve off the top of the boiler, which is the simplest way.

Inside the front end was a blast pipe which was a Stephenson's invention. There was also a blower which is used when the loco first sets off.

It provides a negative pressure at the front end which draws all the hot gasses from the fire through the tubes.

When steam is required at the station, the blower is put on, which is safe. However, when setting off from the engine shed, compressed air is used.

Compressed air can be put into the boiler to power the loco in and out of the shed.

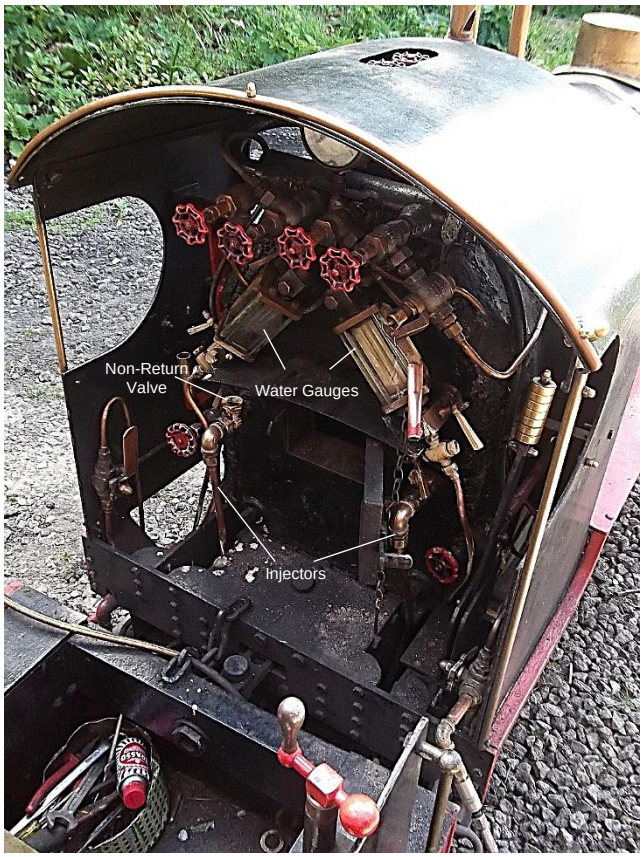
When the loco is first fired, the compressed air is used to operate the blower.

Under the front of the engine was the fire pit. Rods are used to lift the fire bars to allow all the fire/ash to fall into the pit. The fire bars cost £30 each to cast. These are cast in Middlesborough.

Inside the cab there are two water gauges, indicating the levels. Two gauges are required by law. There also needs to be two ways to get water into the boiler from the tender. This is done by two injectors. The injectors are each equipped with a non-return valve. The injector uses the *venturi effect* to inject water into the boiler using the boiler's own pressure.

By law, two safety valves are required. These are *NABIC* valves.

SMR used to use coal, but there were complaints about the smoke and the smell, so now they use smokeless fuel. The locomotive runs fine on smokeless, and there isn't any clinker.



'Blacklock R' was named after Reg Blacklock, another former volunteer, who was the prime mover in restoring the railway after it had laid dormant for several years. The loco entered service in 2016, after its naming ceremony and is proving to be a popular addition to the SMR fleet.

We then visited the other locomotives and workshop in the shed.

Prince Charles was the original locomotive on the SMR and has been there since 1953. It represents a 4-6-2 *Pacific Class* locomotive and was built around 1950 by H.N. Barlow. It is powered by a 4.1 litre *Perkins* diesel engine which is located in the tender. The diesel engine drives a 110-volt dynamo providing power to the electric motor located in the locomotive. The electric motor turns the centre wheels via a radical gearbox and two chains. The dynamo is the same one as used on the *Preston* Steam Roller.

This locomotive is a favourite with everybody. The controls in the cab are similar to those used on trams. The right-hand lever on the centre pillar is the forward/reverse selector, whilst the one on the left is the throttle which varies the current into the electric motor windings.

Except for the steam loco, all the brakes on the other locos operate by compressed air. There is also an air compressor on the coaches. All the braking is based on the heavy good vehicle way of braking. There are the emergency brakes and the service brake. The emergency brakes consist of spring brakes which are on until the air pressure builds up to the required pressure, at which point they come off. The service brake is operated from the cab as seen above.

The *'George Outhwaite'* Diesel-Hydraulic 0-4-0 Tank locomotive. This was built by I.C.I apprentices in 1994. The locomotive is another one named after a former dedicated former volunteer.

This loco is used by maintenance crews and normally has two wagons attached, one for transporting materials and tools and the other a “jolly” wagon for transporting working parties to job sites along the track. Maintenance is scheduled around Sunday and Wednesday mornings.

This is the bowser. ‘Red’ gas oil (‘red’ diesel) used to be used for the generators that provide the electricity (the engine shed is off grid), but ‘white’ diesel now has to be used instead. This generator is a big one and has to be kept running.

SMR have been to their MP and Customs and Excise, and they said that ‘red’ diesel can be used for the locos, but the generator has to run on white.

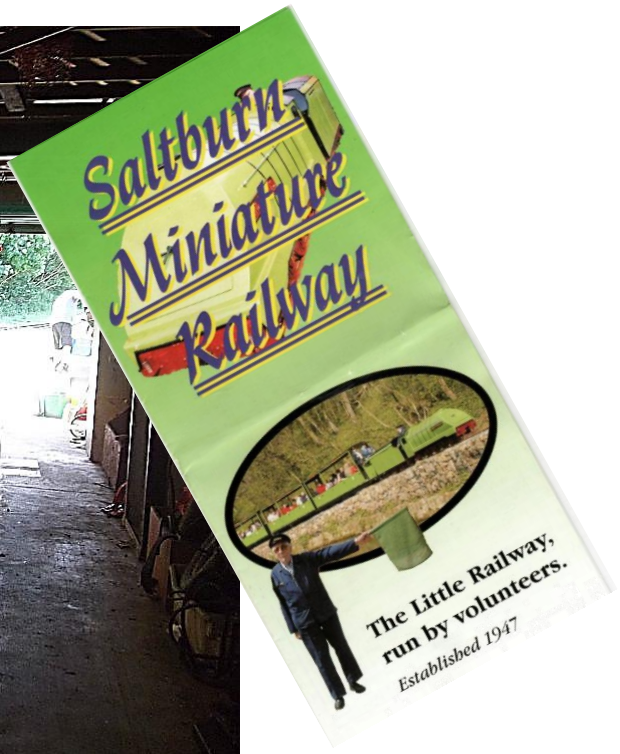
The problem is that two separate tanks would need to be used, so SMR decided to use ‘white’ for the locos and generator.

It used to cost £900 to fill the bowser, now it costs £1500.

The Workshop

All the maintenance work on the railway is carried out in the Shed workshop. The workshop equipment consists of:

- A decent grinder.
- A couple of benches, one with a vice.
- A pillar drill.
- A band saw.
- A hydraulic press. (Robert used this on the flywheels on his Velocette).
- Mig welders, one being portable for use on the track.
- A Clarke CL430 5 speed lathe.
- A washing machine.



After visiting the railway, we retired to *The Ship Inn* for welcome fish and chips and drinks!

PEEMS would like to thank Robert for spending time explaining the locomotives and operational details of the SMR, and his team for giving PEEMS a special ride on the railway.

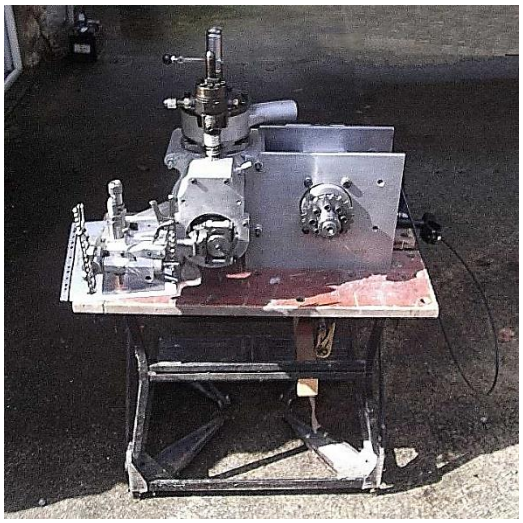
☐ John Arrowsmith's Visit To PEEMS on Tuesday 17th May.

John Arrowsmith's visit to PEEMS was reported on in the May issue of the Newsletter. John Arrowsmith, is the 'roving reporter' for *Model Engineer Magazine* and he visited PEEMS so he could write a report about the Club. PEEMS decided that for the visit, the exhibition they would put on would be split between two sites; The PEEMS workshop and grounds for the larger exhibits, and the newly re-opened *Hungate Centre* for the rest of the members models.

Because there were so many exhibits, they could not all be shown in the previous issue, and so the rest are presented here.

a) Exhibits at the PEEMS Workshop

- **Flash Steam Unit To Power A Motorbike Or Three-Wheeler ~ Paul Windross.**



The unit has been temporarily assembled and will be eventually be wire nutted and wired.

The pump assembly has still to be finished and various oil covers have to be made.

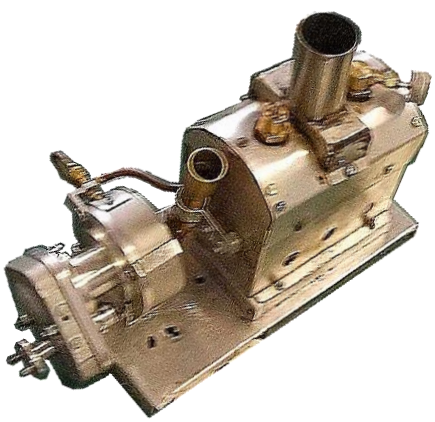
At the moment the steam generator and burners are in the process of manufacture.

- **Stationary Engine Powering A Floodlight ~ John Nesom.**

b) Exhibits at the Hungate Centre.

- **Small Engines.**

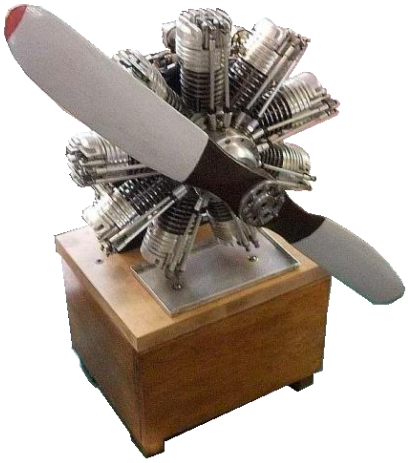
'V' Twin Engine ~ John Heeley



50mm Turbine Assembly ~ John Heeley

- **Aero Engines.**

¼ Anzani ‘Y’ Type Aero Engine ~ Mike Sayers



Nine Cylinder Radial Engine
Notional development of a Bentley aero-engine – ‘What Might Have Been’. John Heeley

Part Built Gas Turbine
John Heeley

- **Clock and Planets**

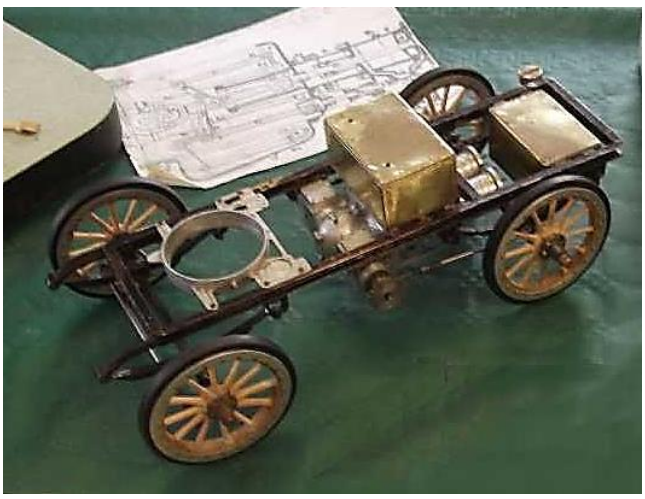
Solar System ~ Ron Baier

Solar System ~ Ron Baier

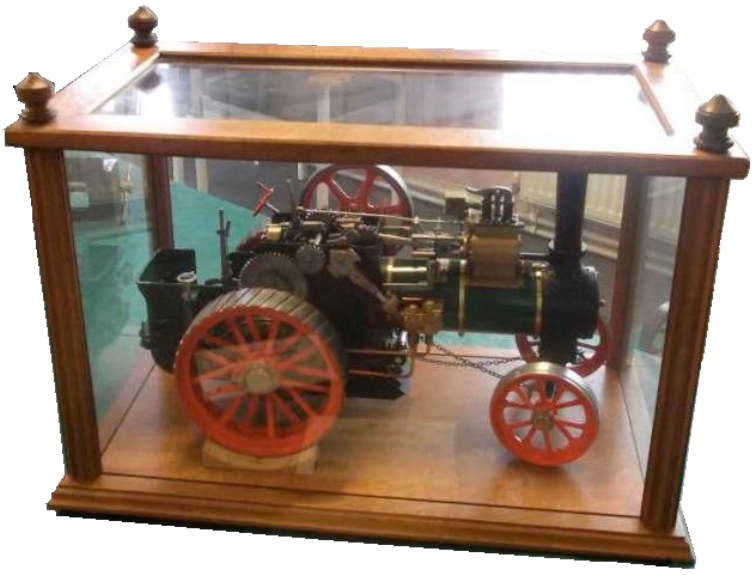
Table Clock To
Richard Gretton Design
Dave Dobson

- **Vehicles.**

1½” Fowler Steam Crane Engine. Peter Bramley.



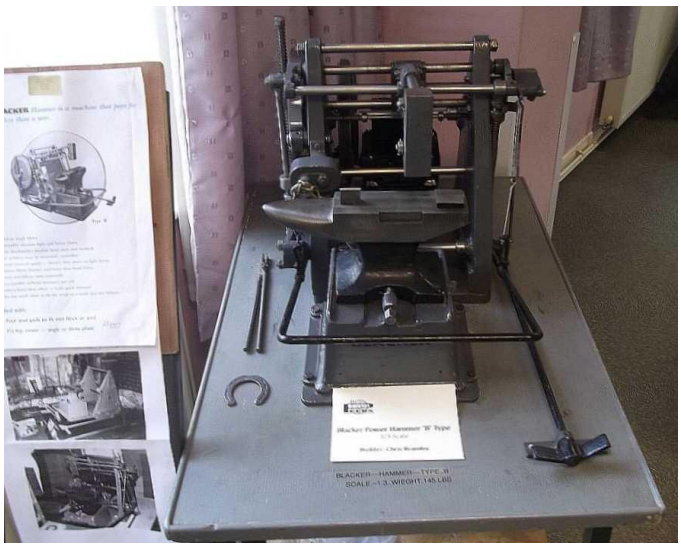
Chelmsford Steam Car 1½” Scale model built from illustrations in ‘Modern Engine’ by Rankine Kennedy (1920). Commenced 2014. Peter Bramley.



1” Scale Minnie Traction Engine ~ Adrian and David Hick

- **Tools.**

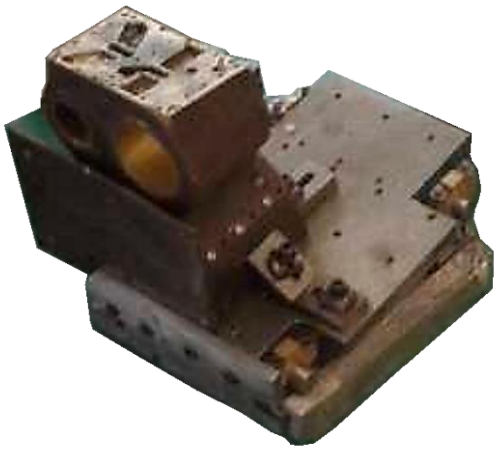
Mill Drill Table ~
Continuous Torque
Variable Speed – Iain Hale.



Blacker Power Hammer ~ Type ‘B’ ⅓rd Scale
Chris Bramley

‘V’ Block which I clamp into my metal cutting bandsaw vice when cutting around bar. Stops the bar rotating and I can now cut thin pieces. 75 x 200 x 20mm block of steel with matrix of holes which are tapped with the same thread as my mill clamping kit M8. Again used in the hand saw, using this gadget I can cut thin pieces. Plate adapter 75 x 200 x20 with stub. Using this gadget I can move the lathe chuck from lathe to mill or vice. Same thread as my Myford lathe. M2 rotating taper to which I can attach lathe chuck. OK for skimming motor commutators if one end isn’t tapered. Wiggler. Home brew cross slide drill 24 volt. Fine feed small drilling attachment. Sheet steel rollers. Sheet steel bender. Rotary table chuck adapter. Rotary table fitted with Arduino/stepper motor, ideal for gear cutting etc. Ted Fletcher

Wooden Wheel Machining Centre for making spokes and felloes for wooden wheels.
Peter Bramley



Sine Table with Fowler Cylinder.
For machining precise angles
Peter Bramley.

☐ **Further Progress On The Flash Steam Unit To Power A Motorbike Or Three-Wheeler ~ Paul Windross.**

I did an initial test with the full-size flash steam generator burners.

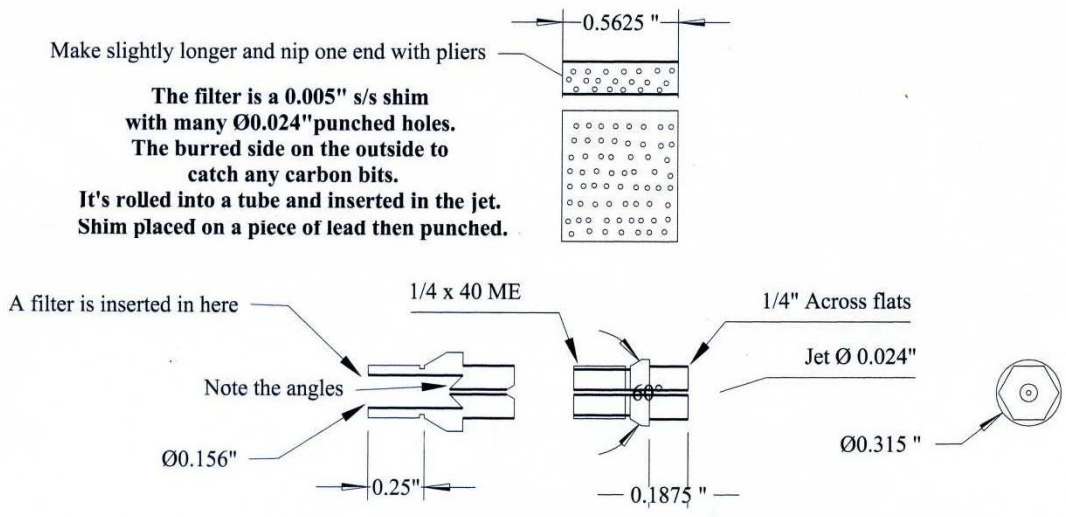
There were a few issues getting the three burners to operate correctly.

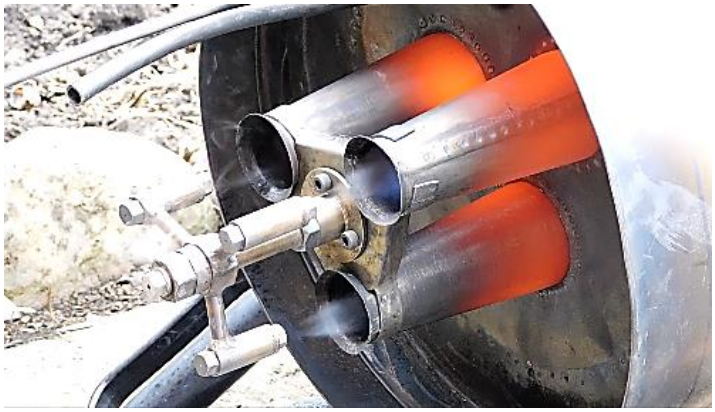
I am using a fuel hand pump to pressurise the burners for the test, and there will be a few problems matching the engine pumps for correct delivery. It's similar to my record model flash steamer where it took numerous tests to get the burners matched to the water pump's delivery.

There have many alterations to the burners. I found that the exhaust outlets were too large and I had to restrict them. I have had to make jet filters to stop carbon deposits blocking them.

The burners will be similar to the model ones which were very successful.

Below, there is a drawing of them and the photos of the burners working.





☐ **Armed Forces Day Scarborough ~ Saturday 25th June.**

For Armed Forces Day, Brian and May Stephenson kindly arranged a garden party at their house with donations for *'Help For Heroes'.*

As there was a massive influx of visitors to South Bay, the offer of parking at their home was very welcome. It was a short walk to an excellent vantage point above South Bay where most of the naval and aeronautical activities were taking place.

In the South Bay was a Type 23 Duke Class Frigate and a Tide Class Royal Fleet Auxiliary Supply Ship.

The air displays included:

- RN Merlin and Wildcat helicopters.
- A '*Navy Wings'* Seafire.
- RAF *'Battle Of Britain Memorial Flight'* Spitfire and Hurricane.
- RAF Red Arrows.
- A '*Navy Wings'* Reliant Stinson
- RAF Typhoon.

PEEMS thanks Brian and May for providing excellent facilities, drinks and food.

£145 was raised for *'Help For Heroes'*

The Hurricane 'signing off ' over Brian and May's garden.

To hear the engine the link is here:

https://youtu.be/4KG8YqdvVXw

Contact:
If you would like to contribute to the Newsletter,
the contact is: Nevile Foster Tel 01751 474137 or e-mail nevf123@outlook.com