NEWSLETTER September and October 2022

Hello All; this month's Newsletter is a bumper issue so without further ado, there's just a few things to mention.

Thanks to Paul Gammon for passing on his tips and knowledge about clamping. If you were not able to drop in at the last workshop morning there is a write up in the Newsletter.

Thanks also to Ted Fletcher for inviting us to join his visit to Dick Craven's Motorcycle Collection. Unfortunately, I was unable to attend (a busy life!) but I heard very good reports.

You should receive this Newsletter before the AGM. I accept that it is not as exciting as some meetings we have had, but it includes a light lunch with *Pie and Peas* to tempt you to come and have your say.

We are awaiting further details about the Model Engineering Show planned for March next year, at Harrogate, and because the apparent rate the months are flying past this year it will soon be on us. Watch this space.

Best regards, Jonathan.

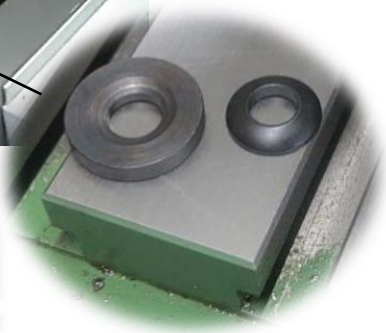
☐ **Forthcoming Events.**

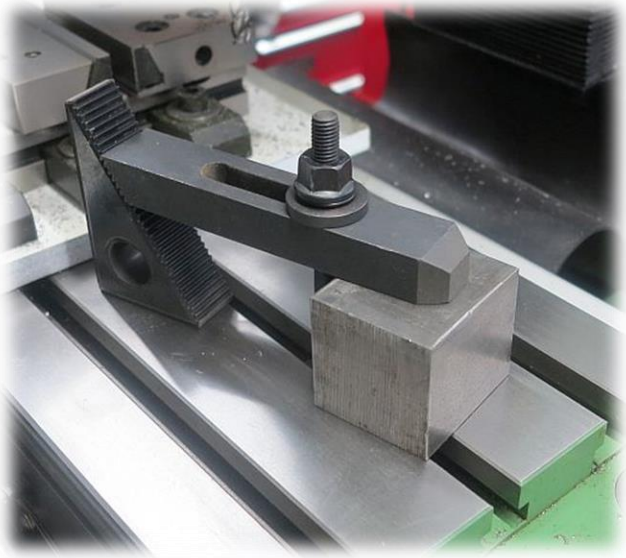
- **Visit To *Sylatech* Kirkbymoorside.** We are still awaiting news of the day we can visit *Sylatech* in Kirkbymoorside As soon as we know of the date and time, the arrangements will be sent to members.
- **Friday 4th November: 11am to 2pm** at the Hungate Centre**: PEEMS Annual General Meeting** followed by 'Pie and Peas'.
- **Tuesday 15th November: Workshop Morning.**
- **Wednesday 7th December: The Mike Sayers Trophy Evening.**
- **Friday 10th and Saturday 11th March 2023**. ***National Model Engineering Sho*w** at Harrogate to be held at the Great Yorkshire Show Ground. (See page 3). To be confirmed.

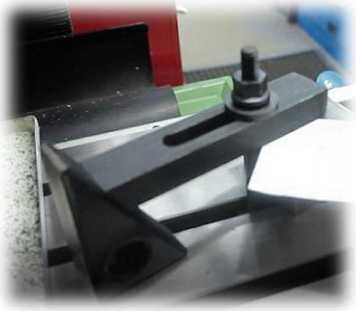
Tips From The Toolroom ~ Clamping: A Demonstration By Paul Gammon.

At the September Workshop Morning, Paul gave a demonstration of the best way to clamp components for machining.

- An essential part of the clamping arrangement is the use of a spherical washer under the clamping nut.
- The clamp should always be touching at the front and not at the back, so the clamp is very slightly positioned 'uphill'.
- A good idea is to get a machine light to check that the clamp is touching at the front and not at the back.

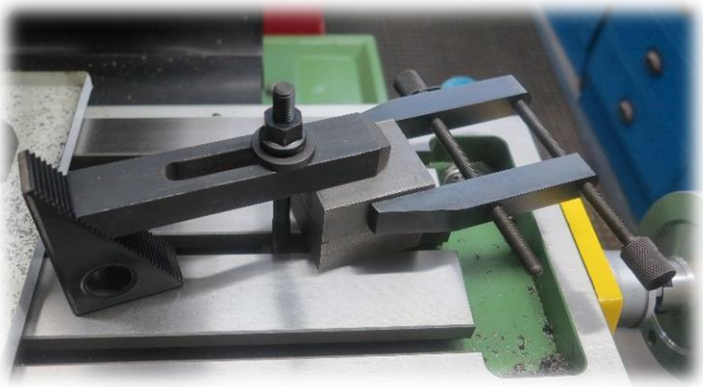






- If the clamp is set up correctly, the nut does not need to be overtightened (just a bit of a 'pull'). If it is too tight, the clamp starts to bend, and if it starts touching at the back, the front lifts up further increasing the bending on the clamp. A lot of people don't realise this.
- The gap at the back of the clamp can also be checked with a piece of paper (see above). The idea of the spherical washer is that the stud should always be vertical. As the clamp is at a very slight 'uphill' position, without the spherical washer the stud would tend to 'go towards' the job.
- Always use as many clamps as required for the job, at least two, but as many as can be accommodated.

Using A Toolmaker's Clamp For Holding Two Or More Components Together.



- Paul doesn't recommend using a tommy bar with a toolmaker's clamp, because there is a danger that the jaws will be bent.
- Using a toolmaker's clamp is a 'feel thing' and is a hand skill acquired with practice.
- Above right, the clamp is pivoting at the back when the clamp is rotated on the job. This means the jaws are opening out towards the free end. However, when the clamp is tightened it will square itself up on the job. By adjusting the back screw, the clamp can be 'felt' to be squaring up. This is a 'hand skill'.
- Again, as many clamps as necessary should be used on the job. Quite often with tool making, dowels are used when assembling components and they are usually located too. The toolmaker's clamp will be used where tools need to be drilled and tapped, but are not usually used with milling operations.

Club Meeting Wednesday October 5th ~ 'Designing Your Own Aircraft', A Talk By Ivan Shaw.

There was a good turnout for the evening with quite a few guests.

Chairman Jonathan Milner started off the proceedings with some business news.

This was the first outing of the new PEEMS projector, screen and speaker. There is also a new lap-top, but on the evening we were using Ivan's.

- **Annual General Meeting (AGM).**

The AGM will take place next month at the Hungate Centre. It will be on Friday 4th November, because PEEMS couldn't get the Centre on the Wednesday for a lunchtime meeting. The start time will be 11am, with a 'pie and peas' lunch.

This year we haven't been blighted by Covid, so all the officers and committee members will formally "stand down". We are hoping that other members will *join up, join in, step up and join* the committee, and take up the officers' roles. Candidates are sought for the following posts:

- Chairman
- Treasurer
- Secretary
- Newsletter Editor
- General Committee Members

Anyone who considers joining the committee for any role, should make themselves known to Jonathan (Milner) and David (Proctor). There is a formal process that requires candidates to be proposed, seconded, and be voted for at the AGM.

David will provide the requisite paperwork in the next few weeks. As has been previously advertised, the Chairman, officers and committee are all standing down to allow other members the opportunity to step up and help run PEEMS. There is a formal nomination process that needs to be completed, and for that, nomination forms will be e-mailed and posted to members. A stock of forms will also be available at the AGM should late deciding candidates make themselves known.

Whilst the current post holders are willing, as a back-up, to submit themselves for re-election, this should not be interpreted as a desire to stay on in post. Rather it is an unwillingness to let PEEMS fold due to lack of other members coming forward.

During Covid we decided to keep the committee 'as was'. We can't do that anymore as we need to be seen to be open as possible and we want everyone to join in. For anyone who becomes, for example, secretary, there will be a chance to 'shadow' the current secretary for a time, to become familiar with the role.

- **Air Compressor.**

Alastair McLeod knows of an air compressor that is going for 'scrap value'. A local garage in Whitby is getting rid of it. This is an old-style garage type. If you are interested please contact Alastair. His contact details are in the Member's List.

- **Daytime Meeting Suggestion**.

Ted Fletcher who travels from Scarborough for our meetings has a proposal that PEEMS meetings be held during the daytime. This is something we could consider, but it should be noted that the Hungate Centre is usually booked up at lunch time. The other problem is that a lot of our guest speakers have work or commitments during the day. We could consider holding the meetings during the day during winter, and on a night in summer, but it may be difficult to tie in with CaVCA who own and run the Centre. Currently we are booked on a Wednesday evening until the end of next year.

Iain Hale said that due to the fact that six members travel regularly from Scarborough, 'Scarborough Mates' could host a couple of meetings, say at lunchtime. Jonathan thanked Iain for the invite. There are a lot of things to discuss.

- **Model Engineering Show At Harrogate.**

Jonathan received an e-mail about a proposed *National Model Engineering Show* at Harrogate to be held at the *Great Yorkshire Show Ground*, on Friday 10th and Saturday 11th March 2023. The Harrogate show will be promoted by an Events Office in Pickering. Simon Boak has resurrected it. Jonathan asked; "*what do the members think? Will we be willing and able to resurrect the spirit of PEEMS at the new exhibition?"* A show of hands showed a very good response on the evening.

In response to a question about whether the Model Engineering Show would be held at Doncaster again, Jonathan said that the original organisers had retired, and that it was very unlikely that the Doncaster Show would be resurrected.

'Designing Your Own Aircraft', A Talk By Ivan Shaw.

Ivan began by saying, Winston Churchill once said a talk should be like a lady's dress, long enough to cover the subject, but short enough to maintain interest.

Ivan has spoken to PEEMS before in September 2018, and the talk was written up in that month's newsletter.

PEEMS Members also visited his workshop in April 2019, (also in that newsletter), but in case there were people who had not attended either event he would do a recap before discussing the current flight testing.

- **Introduction**

Ivan has been flying since 1969, and has therefore been flying for the last 53 years. He started as private pilot, and developed into a commercial pilot, flying for *Aberdeen Airways* and *Jersey European* with the HS748 twin turboprop passenger aircraft, as First Officer. However he was always interested in the engineering aspects of aviation and built his first aircraft, Burt Rutan's *Verieze*. He then got into aircraft development.

The Burt Rutan *Long-EZ* was the aircraft where Ivan went from an aircraft builder to an aircraft designer/developer.

Although the aerodynamics is a Rutan Long-EZ design, Ivan put twin *Hewland* engines on it, and then twin *Norton Wankel* rotary engines. This was first flown in 1986. This had the registration G-IVAN which he got from the CAA and which cost him £5. Ivan thinks that this was the first amateur built twin engined aircraft to fly in Europe at the time. This aircraft got Ivan from an aircraft builder to an aircraft builder/developer.

In the mid-1980s, there weren't a lot of people around who knew much about canard aircraft or composites. Ivan got invited to run a company in Newbury Berkshire which was putting the *Mercury* light aircraft into production. This was the aircraft that Rutan (Scaled Composites) designed for Colin Chapman of *Lotus* fame. Burt Rutan's *Scaled Composites* company also designed the *Virgin Galactic*.

This is the aircraft that Ivan designed the structure for, and went out and tested. Ivan flew it on its first flight. It had all sorts of problems. The photo is in the Mojave Desert. Ivan spent three or four months there trying to develop it. Eventually it 'fell out of the sky' in a normally 'unrecoverable spin'. It did a 17½ flat spin. Mike Melvill was flying it but managed to recover it through skill and airmanship. He was the first person to fly the *Virgin Galactic*. Mike has a 'Spaceship Licence No. 1' (Astronaut Commercial Licence No.1).

- **Europa Kit Plane**

Ivan wanted his own personal aircraft and this is the *Europa*. This is the first aircraft that he designed from a blank sheet of paper. The photo shows the first flight in about 1992. He only intended building one for himself. It can be kept at home on a trailer, taken to a petrol station to fill up, and then to a farmer's field. It can then be rigged in five minutes, and flown off to cruise at 120 kts consuming fuel at 3.5 galls/hour. Many of his friends then wanted one. He was then in the "aeroplane business", later with 1000 planes sold in 32 countries around the world.

These are the company demonstrators. The upper one shows a monowheeled design which can lift off tundra. For the American market a tri-gear was supplied.

These are three customers aircraft. The middle one G-PTYE belongs to Jon Tye, a Vulcan display pilot.

- **The Department of Trade and Industry (DTI)**

This is the Europa with a glider wing for a DTI (Department of Trade and Industry) competition. As can be seen here, the rudder has been extended. You could decide on the day if you want to fit the glider wing or the standard wing (see photo below). Ivan had a lot of help from the DTI grant support in the early stages. They had an aviation department in London, but Ivan dealt with the Leeds office.

The technical officer and accountant visited Ivan to make sure the grant money was being spent correctly. The technical officer was very keen to fly but the accountant seemed reluctant, but Ivan could see he had to do it although he was quite nervous.

This area of the North Yorkshire Moors is an area of quite intense military air activity. It is 'uncontrolled airspace' so it's a 'see and be seen' collision avoidance system. Ivan flew over Hutton le Hole with the accountant, going North, and in the West he saw a *Tornado* which turned towards them. Ivan waggled his wings to make sure the pilot had seen him and he waggled his wings back to say yes. The *Tornado* then came 200ft below them. Ivan did a *half Immelmann* turn over the top of it and pulled down on it inverted. Ivan said that the look on the accountant's face was certainly different to say the least! Eventually the accountant wrote up about the *Europa* in the DTI magazine and the *Europa* became a *Millennium Project* displayed in the *Millennium Dome*. It eventually got back to Michael Heseltine that Ivan was the man who had flown one of his officers upside down. This Europa has the G-ODTI registration. Ivan knows how to 'creep for a grant'.

- **Europa Variants.**

Here is the full range of variants: Monowheel, tri-gear and glider wing. The *Europa* company was sold in 1999, after getting the registration G-1000 from the CAA.

There is a very good video here showing the utilisation of the three Europa variants:

https://www.youtube.com/watch?v=2W4foTmO6SY

Please press on link. To return to the newsletter, click back arrow at the top left-hand side of the screen.

- **The Liberty XL2.**

The *Europa* is a kit aircraft and Ivan went on to develop a FAR 23 certificated aircraft called the *Liberty XL2*.

The *Liberty* was taken to America to produce because the biggest market is there. This photo is in Montrose Colorado. All the peaks here are at 13,000 ft. and there are 49 peaks which are over 13,000 ft.

The aircraft is flying at 11,000 -12,000 ft.

Here the sun is below the level of the aircraft. The sun was going down, and the aircraft was flying at 13,000 ft, in the sunshine whilst it was dark on the ground.

Here is the *Liberty XL2* and the *Europa* side by side. If you design an aircraft there are all sorts of risks. Not only do you have to get the mechanicals to work, there is also the aerodynamic risk. It may fly, but will it fly to the certification requirements? That is something else.

Basically, to reduce the aerodynamic risk, Ivan scaled up the *Europa* up to create the *Liberty*. You can see the family likeness although there are no common parts between the two. However, aerodynamically the *Liberty* is the *Europa* 'on steroids'.

This photo was over Florida and you can see the tufts of wool on the wing. These are called "flow visualisation aids" and are pieces of wool held on with 'gaffer' tape. These help the pilot in flight test to see the airflow separation during stalls and departures.

The *Liberty* was designed with folding wings, and was kept in a container on Wombleton airfield for many years.

- **G-SEKR ~ The 'Personal' Aircraft.**

When Ivan retired, he needed a project. He once flew his *Liberty* down an airfield in Kent alone. Aviation tends to be male dominated. His two friends flew down alone in *Europas* as well. Their partners/wives didn't fly with them. He concluded they all had the wrong aircraft. What they really needed was a single seat 'personal' aircraft.

All aircraft start with a requirement / wish list. Most single seat aircraft are "one trick ponies". They are usually designed for aerobatics or for racing. Nobody had designed a personal aircraft with high utility and usefulness. Ivan likes to fly from North Yorkshire to Paris or The Scilly Isles or Mull, where he likes to go cycling. He likes to go places. He didn't want aerobatics, but he wanted an aircraft that could go quickly and efficiently to places. He wanted to carry a folding bike/suitcase/flight bag. Ivan is quite big, and a lot of the aircraft built today were designed in the 1940s when people were smaller. For comparison, look at the size of cars today and 50 years ago.

This was Ivan's wish list/requirements:

- Single place a 'personal aircraft'.
- High utility or usefulness.
- 180 Kts cruise speed from 100bhp Rotax 912 engine whilst returning 50mpg.
- At 120Kts super economy/loiter cruise speed, return 90mpg.
- With the newly announced Rotax 915, 140bhp engine a max cruise of 300mph at 12,000 ft is calculated.
- Long range, greater than 750nm.

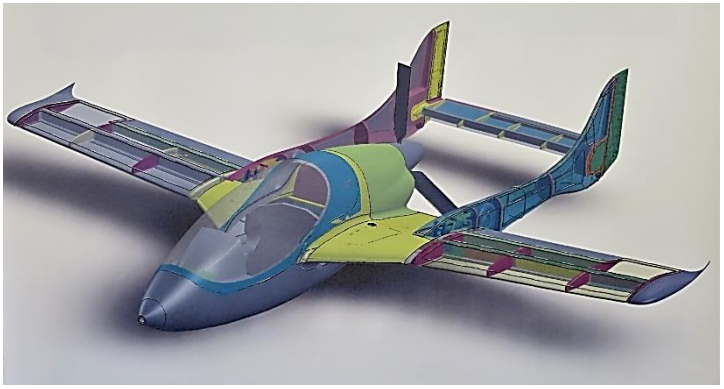
• High useful load with enough space for a folding bicycle/suitcase/flight bag etc.
• Variable useful load.
• Good grass field performance.
• Folding wings for home/trailer/container storage. One man, one minute!
• Comfortable for full size person 110% percentile 250lb pilot.
• Excellent field of view.
• Quiet.
• Green.

The first thing you do when you design an aircraft is a 'fag packet' sketch. The next stage is a general arrangement drawing (G.A.). The first thing needed is the concept. Because Ivan wanted a good field of view, he put the engine at the back. Because it is a small aircraft, he wanted all the useful variable load on the centre of gravity (CoG). The aircraft had to have CoG range of 3". So it was important to do all the balance calculations first. If it's wrong you will need lead ballast at the nose or tail. Ivan is quite pleased that in the end, the CoG ended up within 1/16" of that predicted.

With the G.A. you are looking at wing, fin and tailing sizing.

The aircraft sizing, weight and balance can then be put *into 'X Plane'* which is a computer simulation of the aircraft flight characteristics where you can virtually fly the aircraft.

Once that is done, CAD drawings and models can then be created. The gear was designed to retract into the booms. The explanation of the aircraft build is presented in the September 2018 PEEMS Newsletter.



PEEMS visited in April 2019. The visit was just prior to the aircraft being painted. It got sent away for painting. It was painted yellow because the aircraft is quite small at 18' wing span and 17' length. It is so small it needs to be as conspicuous as possible.

- **The LAA (Light Aircraft Association) Show**.

After painting, the aircraft was displayed at The LAA Sywell show in 2019. It hadn't flown at this point.

- **The Flight Testing Of G-SEKR.**

Original First Flight taken with camera phone

This is Ivan prior to taxying out on the first flight of G-SEKR on the 28th September 2020, from the former RAF Church Fenton which is now Leeds East Airport (LEA).

….and flying later with 'fixed down' main gear (no doors):

Photo ~ Copyright Alex Grace

There is some amateur footage of the first flight (including a camera phone clip) at this link:

https://www.youtube.com/watch?v=iKE6PuAV-nQ

Please press on link. To return to the newsletter, click back arrow at the top left hand side of the screen.

It's a bit 'shaky', but captures the excitement of the moment.

- **Air-To-Air Filming**

Someone with a helicopter offered to film G-SEKR flying air-to-air. Ivan has done a lot of formation flying and formation on camera, so this was viable with his experience. Ivan showed PEEMS the video 'rushes'. The first video showed the aircraft taxying out. Both rudders are seen pointing out. To turn left, the left rudder is put out. To turn right the right rudder is put out. And if it brakes, both rudders go out. This rudder action also acts as an air brake. With full rudder it goes to a wheel brake and this provides differential braking for steering.

Ivan is going to produce a corporate video about G-SEKR, the link for which he will send to PEEMS later.

The aircraft has flaperons not ailerons or flaps, but a combination. It is difficult to get a pusher aircraft to cool on the ground. However Ivan has a ground cooling fan for these types of eventualities.

Q: What is the take-off speed?

Ivan: I'm taking off at 65-70mph.

Q: Did you 'feel' the helicopter rotor?

Ivan: I did feel the rotor behind me on the ground, but not in flight.

The main gear is now fixed down. It took a year and a half to get to this stage. Once the aircraft is built you have to get everything working. The brakes didn't work during taxy trials. The oil temperature was too hot, the water temperature was too hot, and at the beginning, the pitch of the aircraft was very sensitive. So the tailplane tab gearing had to be changed to get an acceptable stick force/g. It wasn't harmonised. You are looking for a certain harmonisation in the aircraft. Although the pitch sensitivity wasn't OK, the rest of the controls were acceptable.

Even though Ivan doesn't have the right propeller on the aircraft, he is happy with the way G-SEKR flies.

Currently the propeller is a microlight propeller which is designed to fly at 90 knots, not the expected 200mph.

He needs to get a propeller designed with a twist and pitch on it.

Q: What height will the aircraft eventually fly at?

Ivan: You wouldn't normally fly above 10,000 to 12,000 ft without oxygen, but the aircraft could get up to 20,000 ft. At 8000 ft you only have 75% of the oxygen anyway. So at 8000 ft flying flat out, you are only developing 75% of the power. A turbo will normalise that pressure.

- **The Flight Test Programme**

The flight test programme on G-SEKR is now complete.

When Ivan was designing and flight testing *Europa*, he had Don Dykins, (Chief Aerodynamicist on Airbus) to help him. Ivan did all the aerodynamics on G-SEKR himself. The aircraft meets FAR23 certification requirements. Most home built amateur designed aircraft wouldn't meet FAR23 certification requirements.

Spinning

Initially when flight testing an aircraft, the question is: does it fly? At the beginning you don't do anything aggressive within the flight envelope. Then, when you are happy the aircraft does perform as expected, you then progress to more challenging manoeuvres such as steep turns, stalls and spinning.

These are the challenging manoeuvres:

- Dive to maximum speed due to flutter (Vd). That manoeuvre requires a parachute to be worn.
- Departure from stall. The wing stall occurs when the angle of attack of the wing is too high for the speed flown.
- Aircraft spinning when the wing stalls. This is where a rudder is kicked in, and the aircraft stalls and enters a spin.
- It then has do a three second pilot input or one turn, whichever is the worst, and then have to recover within a further rotation. This is the requirement for a FAR 23 certificated aircraft.

Spin Matrix

Ivan then showed the videos of G-SEKR going through the 'Spin Matrix'. In the videos Dan Griffith was the pilot. Dan Griffith is the chief test pilot for the LAA. He was a test pilot for the CAA, and an ex-military test pilot. He has put in for the record for the most aircraft types flown. Eric 'Winkle' Brown held the record for the most aircraft types flown at 487. Dan has flown more at 525 aircraft.

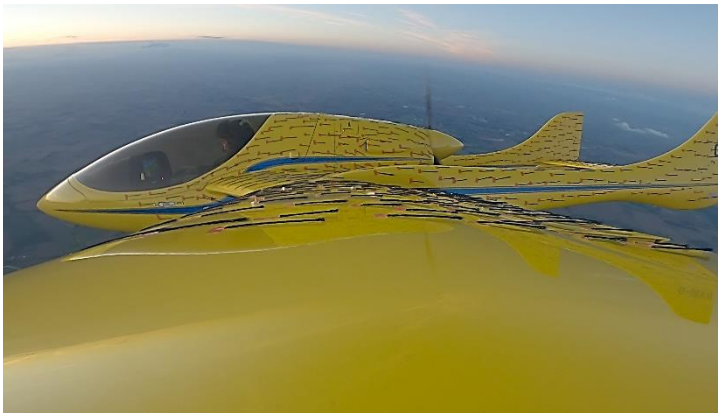
One of the main questions when you are designing an aircraft is; will the aircraft be stable and controllable in flight?

The flight test programme involves a **spin matrix**:

Normal spin left.
Normal spin right.
Spin left full right aileron.
Spin right full left aileron.
Spin left reverse recovery.
Spin right reverse recovery.

G-SEKR covered with woollen tufts for airflow visualisation

At spin/departure the woollen tufts are disturbed and on recovery the tufts re-attach in line as before.
Here are some photos taken by the wing camera. The wool tufts on the aircraft show exactly what is happening.
Ivan is pleased how the tufts are laying down in level flight. The airflow is smooth over the entire aircraft.



Laminar flow over the aircraft in straight and level flight indicated by aligned tufts.

Separated air flow over the aircraft at entry to spin as indicated by disturbed tufts.

- **The Garmin Twin Axis Autopilot.**

This is an excellent piece of kit. Ivan can take off, hit the button on top of the stick, and it will fly the aircraft to the South of France without him having to touch the stick again. Instrument-wise, G-SEKR has a full 'glass cockpit' with no 'steam' instruments. The field of view is fantastic because everything that could block the view is behind the cockpit (including the wing). There is also a window, between the pilot's legs to see if the nose gear is down or up.

On the electronic display, if Ivan selects to remove the Sat-Nav Map, all the temperatures and pressures on the engine cylinders are displayed. Four exhaust gas temperatures are shown. There's everything that you need to know about the engine on the display. Information on the electrics is also shown.

Q: Do you have a cabin heater?

Ivan: No. The aircraft is composite and is an insulated box. It is quite warm under the canopy.

Q: How do you turn the aircraft on the ground?

Ivan: I put on full left rudder and then it hits the left brake, and I then turn left. It is a similar system when I want to turn right using the right rudder.

Q: Do you steer with the nose wheel?

Ivan: No, the nose wheel is castored.

Q: Is the aircraft still under development?

Ivan: All aircraft are under development for example the Boeing 737 with variants 737-200, 737-300 and 737-400.

Q: Would you fly to Paris in G-SEKR tomorrow?

Ivan: Probably not. It's only done under 20 hrs flying, and it's a brand-new type. Ideally I would like 100 hrs before I do anything like that.

Q: How do you control the speed of the aircraft? Is it fixed speed and you adjust the speed by changing the pitch of the prop?

Ivan: No, aircraft speed is controlled by the throttle. The current propeller is fixed pitch. It's a 'ground adjustable' Propeller. The current prop is designed for 90 kts and the aircraft is designed for twice that.

It's a good reliable propeller to get airborne. What is required is a constant speed propeller. Currently it's like a car with one gear. A constant speed prop can be set at 'fine' for take-off and then the pitch can be coarsened going through the flight.

Q: If you change the propeller will you have to repeat all the flight tests?

Ivan: No, not for a propeller. At the moment we have limited the dive to 200 mph. We need to go nearer to 250 mph (Vd). If you are diving at 200+ mph you can overspeed the engine because it is a fixed pitch prop That's another reason it's restricted. With a prop with more pitch the engine won't overspeed.
The new propeller is the next job. It's done all its flight test programme. It's been quite a challenge.

Q: What is the airframe stressed to?

Ivan: 4.0 g x 1.5 ultimate factor

x 1.5 factor for composite degradation under hot/wet conditions and manufacturing tolerances

= 9.0 g.

- **Intermission**

We then stopped for a short break. After tea and biscuits, we returned to see a video and to hear Ivan explain his challenging third flight. This was followed by a 'Question And Answer' session.

- **Lessons Learnt.**

Ivan began by saying that the first half of the talk had been about the 'good stuff'. For balance, the second part of the talk would be about some of the difficulties he had to deal with early on, including the challenging third flight.

As mentioned earlier in the talk, the aircraft features a fully retracting nose and main gear. The retractable gear relies on the 'arm strong' method (i.e. manual), consisting of a lever and chain mechanism to retract the main gear.

Based on requirements, the inertia that needed to be retracted was two arms of 20lb each with 10lbs of mass at their ends. Both main gear retract into the two booms. Ivan introduced rubber bungees to balance both gears. He had calculated, using the drag estimates for the doors, that the problem would be retracting the gear.

On the ground it was balanced and worked. When he took off on a Sunday afternoon for the third flight, the nose gear door closed and he could only bring the nose gear up to sit on the door. For that reason, he pulled the circuit breaker. With the main gear down, the doors attached to the front of the main gear presented their flat faces to the wind. This created a lot of drag. The oil temperature was going up, and Ivan reasoned that retracting the gear would allow the aircraft to go faster, which in turn would increase the airflow, which would then reduce the oil temperature. This was conceived as a short flight ending in 'tea and medals', but it didn't work out that way.

This a step-by-step account of what happened.

Ivan showed the video, of the pilot's eye view of the whole flight from take-off to landing. Fortunately, Ivan had a *Go-Pro* camera on his helmet.

The right-hand gear handle moves 90° forward to retract the gear. The instrument panel was showing the two main engine systems A and B. The engine controls are all electric. The Rotax engine is the latest model with electronic fuel injection and electronic ignition. There are two plugs per cylinder and two fuel injectors per cylinder (it is a redundant system).

As Ivan took off, all the temperatures and pressures were 'in the green'. Once airborne the aircraft was a bit 'twitchy' in pitch, but Ivan got used to it. It wasn't a problem. It wasn't divergent in pitch, but it was sensitive.

The nose gear door had closed, and looking through the nose gear window, it was seen that the nose gear couldn't be retracted, but could only be brought back to gear door. So the circuit breaker was pulled. It was a nice sunny day and it was going to be a short flight. It was a brand-new aircraft that had only done half an hour's flying.

Q: What does the circuit breaker do?

Ivan: It's a fuse, but it can be reset once.

The oil temperature went up, the gear lever was pushed forward and the gear easily retracted back into the booms. Everything went quiet and it felt like the brakes had been taken off and the aircraft surged forward. The engine was then throttled back. With the acceleration of the aircraft, the oil temperature was expected to come down.

Now a warning light came on one of the systems indicating that system B had failed. The system's warning light was continuous which indicated that that system had been lost. This had happened in 7 or 8 minutes of the flight.

The worry then was that the other system could be lost. Then there would be no engine, and there was the danger of ditching in a field. The thought then was to get back on the ground.

The problem then was trying to get the main gear down, and it wouldn't go down even by pulling on the handle with maximum effort. The gear came down so far but no further. They both needed to lock down. The aircraft is quite sensitive in pitch and as both gear started to come down it altered the CoG of the aircraft by bringing it 1" forward.

Two hands were needed to control the aircraft, one on the stick (left) and the other on the gear handle (right). The aircraft didn't stall, but Ivan was flying as slowly as he could. He was at 1200 ft. As Ivan let go of the stick the aircraft was pitching up and down. He was trying to get the aircraft down and the oil temperature was starting to rise into the red.

The main gear wouldn't go down and the nose gear wouldn't go up. The aircraft was brought back to minimum speed which Ivan managed to maintain. The sun came out and it was quite warm. Ivan realised the canopy was steaming up and he was hyperventilating. There was not enough ventilation in the aircraft. He had only one vent on the panel, and he wasn't getting enough air into the cockpit.

The oil was now getting very hot. Ivan tried oscillating the pitch and putting on g which would make the gear heavier but he still couldn't get the main gear completely down and locked.

The concern was that the engine was going to go. There wasn't enough oxygen in the cabin, and with the canopy steaming up he couldn't see where he was going.

At this point the oil was on 'red line' at 220°C and over-heating. Oil was going out the back, over the tailplane and Ivan was getting very hot. At the same time the oil pressure was reducing, as oil was being lost out of the back of the aircraft. It became a question of which was going to expire first, the pilot or the engine.

He then had to wipe the screen to see where he was going. He had to get it on the ground. It's an awful decision to be made when you've built an aircraft, and spent a lot of time, money and effort.

Thinking that the landing will have to be 'wheels up' Ivan realised he would be a few inches above the runway coming in at 80 mph. He had no choice but to declare an emergency.

The nose gear was partially down but not fully. The engine was switched off and he glided in at 80 mph onto the runway. There was a grinding sound and then the aircraft turned on the runway to face the way he had landed. Fortunately he stayed on the runway.

Q: Why didn't you land on the grass?

Ivan: You can break your back landing 'wheels up' on grass. You may think grass is smooth. It isn't when you are sliding along at 80 mph.

Then what happened was; the police came, the armed police came, five fire engines came, plus the airport fire engine. When Ivan declared an emergency all the services were activated. An ambulance came, along with three paramedics. The lady paramedic checked Ivan and said his blood pressure was low, and she wished her's was that low.

Ivan said that this incident demonstrated that when an aircraft is being flight tested you have to go one step at a time and approach things very carefully.

First you do taxy trials, initially a slow speed taxy, making sure the brakes work. Then you do high speed taxy trials and then finally 'crow hops', where you come up to take-off speed, just lifting off and flying 100 metres at about 5ft from the ground. Doing that you can feel the controls. Not until you've done that a few times, and you're happy, then you can do a first flight. The aircraft doesn't know if it's at 5ft or 500ft.

You gradually open the flight envelope. You never take a problem into the air knowingly. If something needs fixing. It needs fixing in the workshop before coming back again to fly.

This incident showed though what can happen. Suddenly problems can compound with, in this case, four or five problems occurring simultaneously to attract your attention.

It wasn't a pleasant experience, but Ivan got away with minimal damage. It was quite a smooth landing. It landed on the two 'bump stops' under the lower fins (which are made from foam and Kevlar and are sacrificial), and the air intake duct under the fuselage belly which was ground away. The fourth point of contact was the nosewheel which shredded the tyre. It was only tertiary damage.

Ivan had stopped the engine, so the propeller wasn't 'windmilling'. The only damage was on one blade, at the tip which was an area 5/8" x 5/8" and looked like it had been filed. That was repaired with a scarf joint. It meant Ivan didn't have to buy a new propeller from America, writing a big cheque.

- **Questions And Answers**

Q: What was the problem with the gear? Why couldn't you get the gear down? Was it an aerodynamic problem?

Ivan: Yes. The problem was that the gear couldn't be retracted during ground testing without the help from the rubber bungees. They gave spring assistance. I assumed that the inertia of 20lbs of each main landing gear falling would bring the gear down over the over-centre lock which would then lock the gears down. The gear doors are attached to the front of the gear as seen on the previous photographs, and I had worked out the drag, but of course, it is difficult to work out the inertia energy of the falling gear, because the geometry keeps altering as it's coming down. I got it wrong. The action of the bungees and the drag on the doors provided too much opposition in trying to get the gear all the way down and locked. The main gear is now temporarily 'fixed' in the down position.

Q: Is the ‘down fixed’ landing gear going to be permanent?

Ivan: The aircraft uses differential braking for steering on the ground and the compact wheels and brake assemblies that I had purchased from the USA were unsatisfactory even after I modified them to double the friction area. Because the aircraft needs good brakes, I made the decision to fit standard aircraft wheels and brakes, which are now satisfactory. These wider assemblies would not retract into the booms so rather man modify the booms I took the decision to fix the main gear in the down position. The re-design of the retractable main gear is something that I can look at later…an ideal winter project?

In the meantime, I removed the main gear doors, and I’ve made fairings and spats to reduce the drag on the gear, as seen below.

Before


After

The aircraft was redesigned for retractable gear, and it looks nicer retracted.

Q: Couldn’t you have used a small hydraulic pump that you could have pumped by hand to get the gear up and down?

Ivan: Actually, with the hydraulic pump idea, I ended up with a foot pump, as you have more power in your feet. I got it all working too. The only thing that worried me was that I lost mechanical advantage at one point and the gear couldn’t get over the ‘over-centre’ lock. At one point the pressure was so great that it was actually straining the structure.

Q: Maybe you could get better mechanical advantage with a ratchet system?

Ivan: I’ve looked at ratchets, but it has to be a double ratchet system. Then that got complicated and I abandoned it. Then I went back to hydraulics. You can’t have electro-hydraulics without manual hydraulic backup on an aircraft. If the electrics go, you then have to go manual.

Q: Obviously your experience got the aircraft down safely.

Ivan: I had no choice. Once in the air, a pilot can’t just get out and walk.

Q: Do you find anyone to fly with?

Ivan: Statistically my next engine failure is in 4047!!

The flight test programme is now complete but I started ten years ago. I thought it would take three years, but I’ve enjoyed it

Q: What is your next project?

Ivan: Affordable housing in Hutton-le-Hole. I built three swift boxes. It took a day. I made them and put them up. That’s the sort of project I want now. I’m not going to do another aircraft project, this is my final one.

Q: Is there any reason why you have the throttle in your right hand?

Ivan: I could have done it either way, but I thought I would make it conventional, because if someone comes from a *Cherokee* or a *Piper*, they will have got used to right throttle - left stick and feel at home.

Q: Have you sorted the oil and water temperature problems as well as the systems problems you encountered during initial flights?

Ivan: Yes. Those problems have now gone away due to subsequent redesign and replacement of components.

Q: I assume you have fixed your ventilation problems.

Ivan: Yes, I've got a vent that works.

Q: On the *Slingsby Firefly* aircraft we had NACA ducts which drew air into the cabin. Did you do something like that?

Ivan: I could have done. NACA ducts work well enough on the side. We used NACA ducts on the *Europa*. They work OK, but they are not as good as the vent I've got. It ducts air in, and you can turn it to direct air to your face etc.

Q: Does the vent turn into the airstream?

Ivan: Yes, it ducts in from the airstream. The original system was not getting enough air in. The air came in from a series of holes around the pitot in the nose. Unfortunately, it was acting like *'Yorkshire Boarding'*, which is used in barns to keep the air out and the livestock inside comfortable. *Yorkshire Boarding* has wood panels with air gaps between. There could be a howling gale outside, but you can go into the building and no air gets through as the boarding is designed to stall it. That was what was happening. As I was exerting more and more energy, the temperature was going up and I wasn't getting enough oxygen.

Q: If you land wheels up in a metal aircraft you can see where there is distortion or damage, but you can't see that on a composite aircraft. How do you know if there is any damage to the structure? Is there an inspection procedure you have to follow.

Ivan: You are talking detectable and undetectable damage on a carbon fibre structure. Carbon tends to be less impact resistant than glasscloth or Kevlar. You can do a tap test to determine damage with a coin.

Q: Is there a legislative procedure you have to follow to check for damage?

Ivan: If the crash had been more serious and there was any doubt, we may have had to do a non-destructive test procedure (x-ray/ultrasound) followed by a static proof test. The damage was tertiary. I got away with it lightly. It was a fairly smooth 'four-point landing' on secondary structure. The damage was obvious, on the fin bump stops, the air intake under the fuselage belly, the nose wheel tyre, and one blade tip of the prop.

Q: What fuel do you run on?

Ivan: The engine is cleared to run on *Mogas* (Motor Gasoline) and it is now cleared for *E10*.

I run mine on *Avgas* because the fuel tanks in the strakes are composite/resin. I did some tests by taking some cured epoxy resin and put it in some jars and poured in different fuels and left them for months and years. I found that the resin didn't like the ethanol. I use *Avgas* which doesn't contain ethanol. *Avgas* is more expensive. and the engine runs better on *Mogas*. The engine is designed for that. It's got lead in it. *Mogas* is four star.

PEEMS thanked Ivan for an excellent and informative evening and some heart stopping video.

G-SEKR Over Castle Howard

G-SEKR Entering A Spin

The photographs in this article are owned by Ivan Shaw and should not be used without Ivan's permission.

Acknowledgement And Thanks To Ivan Shaw For Allowing The Use Of The Photographs And For Proof Reading And Helping To Compile This Article.

PEEMS Visit To The P2 Railway Trust and to The North Road *'Head Of Steam'* Railway Museum at Darlington On Saturday 8th October.

- **Introduction.**

This trip was a two-centre visit to the *Darlington Locomotive Works* (or the *Hopetown Carriage Works*) where the *P2 Railway Trust* is building a brand new version of a Sir Nigel Gresley's 2-8-2 P2 Class Locomotive *2007*, and a short walk across a picnic area to the *North Road Station* located on the 1825 route of the Stockton and Darlington Railway The S&DR was the World's first steam-powered passenger railway. The station was opened in 1842 replacing an earlier structure in North Road, and now contains the '*Head Of Steam' Railway Museum and Railway Centre*.

There is a connection, as it is hoped the P2 *2007* will be rolled out and steamed in 2025 for the Bi-Centennial of the 1825 opening of the Darlington to Stockton Railway.


The Darlington Locomotive Works


North Road Station, 'Head Of Steam' Museum and Railway Centre

- **The P2 Class Locomotive**.

The London and North Eastern Railway Class P2 was a class of 2-8-2 steam locomotives designed by Sir Nigel Gresley for working heavy express trains over the harsh Edinburgh to Aberdeen Line with steep gradients and tight curves. Hence the eight driving wheels. They also pulled sleeping carriages which were teak and heavier than standard passenger carriages. Six locomotives of the class were built and introduced between 1934 and 1936. These were 2001 (*Cock Of The North*), 2002 (*Earl Marishal*), 2003 (*Lord President*), 2004 (*Mons Meg*), 2005 (*Thane Of Fife*) and 2006 (*Wolf Of Badenoch*).

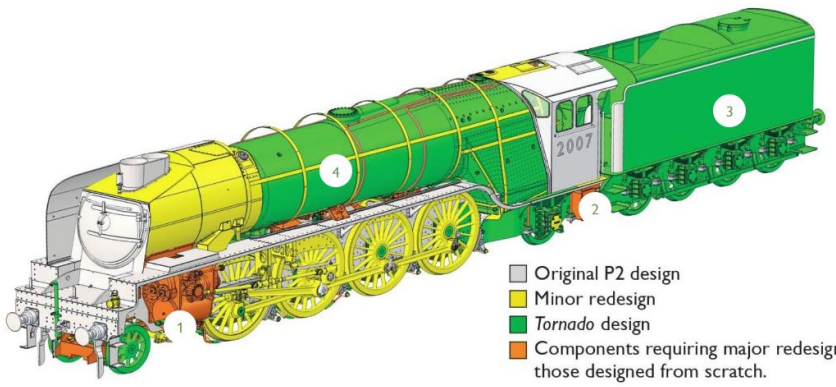
No original members of the class were preserved, as all were rebuilt into LNER A2/2 Pacifics by 1944. In 1936, the Class P2 were given streamlined fronts, similar to that of the Class A4. Between 1943 and 1944 the class were rebuilt under Gresley's successor Edward Thompson into the LNER Thompson Class A2/2 4-6-2 type.

Previously the A1 Trust had built *Tornado* from scratch with no restored or recoverable parts. This was based on the LNER 4-6-2 *Peppercorn* Class A1.

60163 TORNADO
New Steam for the Main Line

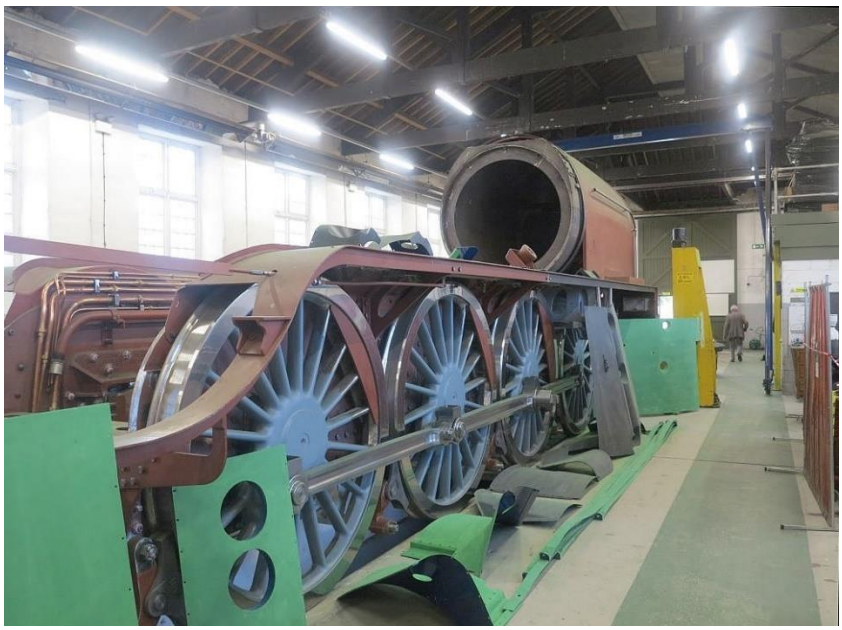
2007 PRINCE OF WALES
Building Britain's Most Powerful Steam Locomotive

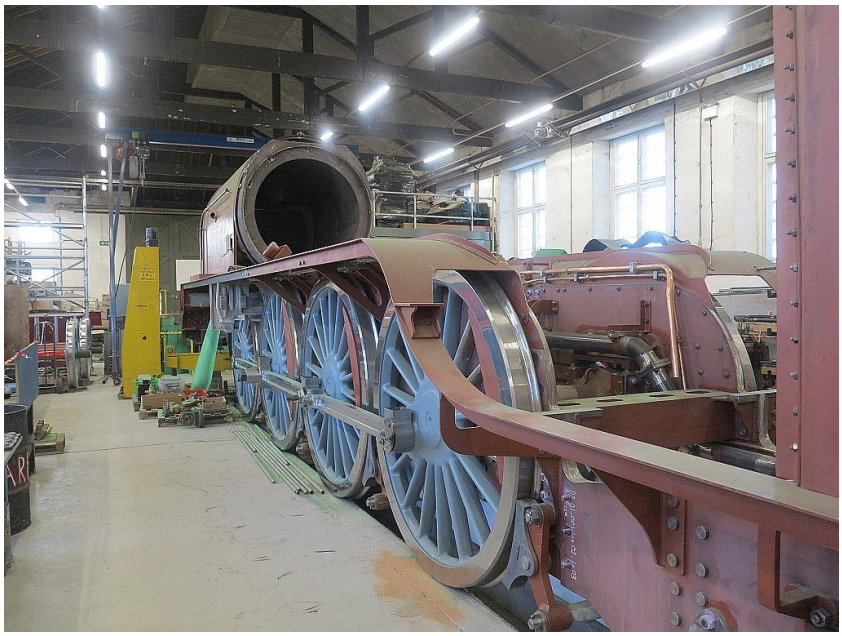
The P2 locomotive is said to share 70% commonality of parts with *Tornado*, including the boiler and tender. Modern modifications to the original design include roller bearings (also featured on *Tornado*) and an all-welded, all-steel boiler. The final build will utilise *Lentz/Franklin* poppet valve gear. In most other respects and appearance, the loco, to be numbered *2007*, will match that of the original No. 2001 *Cock o' the North* prior to streamlining. *(With help from Wikipedia)*



1. Cylinders will be a welded monobloc, meaning all three cylinders will be in the one fabrication.
2. Injectors are complex components which feed the cold water from the tender into the hot, pressurised boiler. They overcome the boiler pressure by using a series of converging and diverging cones, giving the water energy, with a feed of steam from the boiler.
3. Tender. Common to Tornado. In addition to coal and water, the tender contains a lot of electronic equipment for safety on a modern railway.
4. Boiler: Two boilers have been ordered from Germany, with one as spare They have been delayed but should be delivered soon.

The P2 Build





There is a very good YouTube video at this link explaining the Project:

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

Please press on link. To return to the newsletter, click back arrow at the top left hand side of the screen.

Gordon Best was very helpful in answering our questions about details of the build while he showed us around.

- **The ‘Cartazzi’ Rear Wheel Set.**

The first thing we examined was the ‘Cartazzi’ Wheel Set which sits under the cab. This allows the engine to negotiate bends without the need for a centrally pivoted ‘pony truck’ as on the front of the engine.

There is a good video by David Elliot, P2 Project Engineer explaining the Cartazzi Wheel Set:

https://www.youtube.com/watch?v=D74LqHeyPME

Please press on link. To return to the newsletter, click back arrow at the top left hand side of the screen.

The original horn liners on each side of the Cartazzi used to be 'soft' material, and the Cartazzi used to 'bash its way around' until the shape was worn in.

On *2007*, the two horn liners have a very slight curvature (formed by three 'flats'), which conform to the shape of the Cartazzi.

They are manganese steel.

Each of the two wheels wants to rotate in a vertical axis as well as move sideways and roller bearings are used in the Cartazzi and indeed all over *2007*.

- **Exhaust Steam Injector (4" Pipe).**

Instead of using 'live' steam to put water in the boilers, the exhaust steam can be used. It's a water saving device. This system was on the original locomotive. *2007* will require a 'live' and exhaust steam injector. Using a system of converging and diverging cones, a 'live' steam injector is used to deliver cold water into the boiler against its own pressure, using its boiler steam with no moving parts.

The exhaust steam injector is even more complex, as it is capable of running on exhaust steam from the cylinders when power is applied, or 'live' steam when the regulator is closed. By re-using steam that would otherwise be exhausted through the chimney, it provides a worthwhile saving in both coal and water.

It is, however temperamental. In the old days, the express from Darlington through York ran on nice flat lines and was an even run, and the driver just sat back because express trains had priority over other traffic. Nowadays, because the loco will have to operate in mixed traffic, the exhaust injector can be temperamental and difficult to use, because any alteration, or it being off, can stop it. It needs resetting at times.

- **Boiler.**

Two boilers are being manufactured, one to be fitted to *2007* and the other as a spare. They are currently being manufactured in Germany at the Meiningen Works, but because of Covid-19, there have been delays. They should have been at Darlington last Easter. Hopefully they will be delivered at the end of October.

The idea is to put the boilers together, including the cladding and everything, at Darlington with volunteers rather than contracting the job out.

There is a video here with David Elliott explaining the boiler cladding at this link:

https://www.youtube.com/watch?v=-jMG08kbcvU

Please press on link. To return to the newsletter, click back arrow at the top left hand side of the screen.

- **Tender**

The upper part of the tender is complete (and under wraps outside the shed), but the rest of the chassis, leaf springs and wheels are spread around the shop. The non-delivery of the boilers has had a 'knock on' effect with the rest of the construction. The tender can't be completed because the boilers need to take up the space in the shop where the work on the tender needs to take place. The idea is to assemble the tender after moving the whole engine out of the shop.

- **The P2 Locomotive Design Criteria And Past Operations.**

The P2 locomotive has eight driving wheels which gives it more traction for inclines than six wheels. The locomotive was designed specifically for the 121 mile (average 3 hour) route between Edinburgh and Aberdeen with its inclines and tight curves. The P2 has two outer and one central cylinder, with just over 1000 hp per cylinder (3400 hp in total). It was a powerful engine. *Tornado* was built for speed, The P2 was built not just for speed but power as well.

These engines also specialised in hauling sleeping cars which were heavier than standard passenger coaches. These large coaches also had teak bodies. Prior to the P2 locomotives, the sleeping coaches on this route required 'double heading' (two locos), while the P2 locos could do this job on their own.

Unfortunately only six of this class were built, and they existed for only ten years between 1934 to 1944 before being converted by Thompson, to Class A2/2 4-6-2 'Pacifics' during 1943/4.

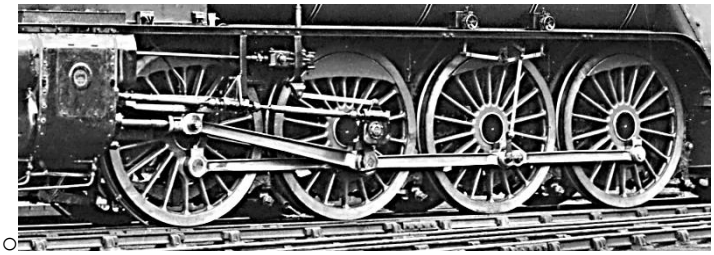
People ask why they weren't run down to London. Down at King's Cross they had about 30 A4s, and 50 A3's, all standard engines, and there was only experience in the sheds for maintaining standard engines. In Scotland, three sheds were able to maintain the P2 Class, and they were used to them. The 'track works' (tracks in the rail yard), were notorious for being the worst in the railway system. The A2 and A3s used to find that out. This was one of the problems in running from Darlington to Doncaster. If a locomotive was put into the engine shed in Doncaster, it would have to drive around bad curves where there could be a problem with derailment. The yard needed money spent on the track in order for the locos to run well at 10 mph in the yard.

- **Motion, And Wheel Balance.**

On the first YouTube video, the wheels of *2007* can be seen rotating on rollers. This was regarded as a milestone by the team, and followed the trail fitting of both sets of coupling rods. The current engine stage ('frames') was set up on the same rotator used for *Tornado,* which ran perfectly on the rollers. The full set of coupled wheels were rotated without tight spots being evident. However, the rotator which consisted of electrically driven rubber rimmed rollers under one of the wheels, had problems, as no balance weights had been fitted to the wheels at that stage. That meant that the weight of a full set of coupling rods had to be lifted twice during each revolution. The rotator was able to do this successfully with *Tornado* (six wheels, four coupling rods), but struggled with eight wheels and six coupling rods. Soon after the filming, the rotator failed with a suspected drive pin failure. On *Tornado* someone worked out what the reciprocating load was and special weights were put on for balance.

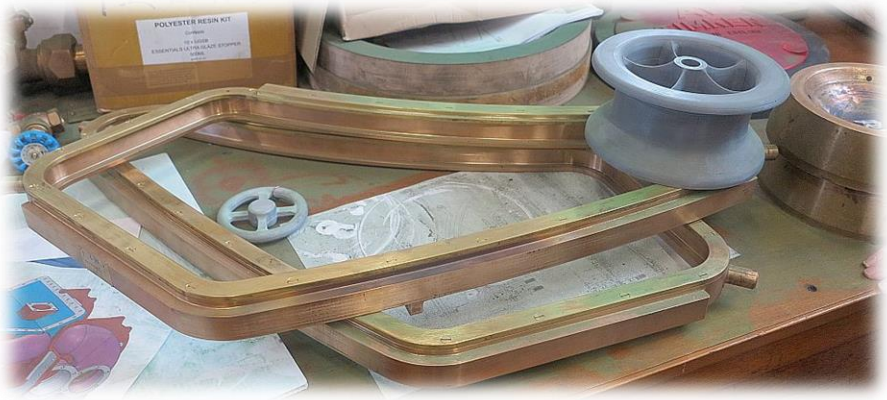
The wheels need balancing because of the eccentricities in the coupling rods, their pins and their bosses. Lead is used to balance the wheels.

The powered wheels (second wheel pair along) have a larger web, and hence more lead is required because those wheels have to take over 1500 hp each,



The valve gear on the P2 Class is a *Lenz*/*Franklin* rotary cam with a poppet valve type. This is the valve gear fitted to the P2 Class 2001 in 1934.

Here is a 3D printed plug (pattern) for the poppet valve castings. The originals were carved from wood, but it is far cheaper to 3D print. 3D printing is used throughout *2007* manufacture.



Other modern techniques have been used in the design and manufacture of *2007*. Computer Aided Design (CAD) and Finite Element Stress Analysis have been used. The cab sections have been laser cut prior to assembly:

One of the interesting features of the manufacture of *2007* was the use of countersunk fasteners behind the main wheels to give clearance. These are very tight fits and there was evidence of copper on the heads of the fasteners where they had been 'brayed in'.

Inside Connecting Rod,

and behind,

Two Outside Connecting Rods.

- **Signalling Gear:**

All the signalling on mainline tracks is now computerised with signalling information displayed 'in cab' on display screens. *2007* will also operate on mainline tracks and so is being fitted with similar computerised display screens. This is known as ETCS (The **E**uropean Train **C**ontrol **S**ystem) and is the signalling and control component of the **E**uropean **R**ail **T**raffic **M**anagement **S**ystem (ERTMS).

The main focus has been installing this system on *Tornado*, but once complete, there will be an obvious 'read across' to 2007.

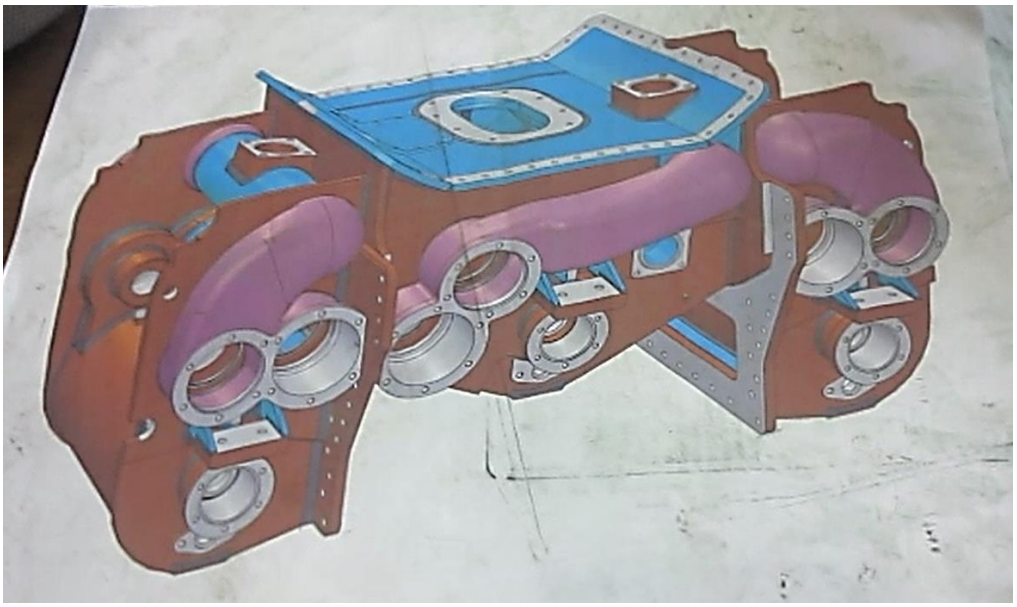
- **The Cylinder Block.**

There are three cylinders on the P2 Class, two outer and one central cylinder. The cylinder block on *2007* is a 'Monobloc', where all three cylinders are incorporated into a single unit.

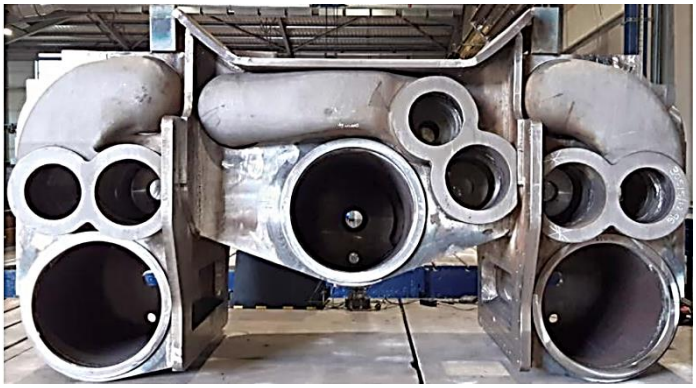
The Cylinder Monobloc is fabricated using steel castings, plate steel, and steel tubes, all welded together. The work was carried out by *Howco* in Irvine. After welding, the Monobloc was stress relieved by heat treatment.

At the time of the visit, the assembly had been sent away for machining. Detailed measurements will be taken before the Monobloc is then delivered to Darlington.

The CAD drawing of the 'Monobloc':



The final component :



Front View Of Cylinder Monobloc.

Rear View Of Cylinder Monobloc.

PEEMS would like to thank Gordon Best for a very interesting tour around the locomotive.

Following the visit to the Locomotive Works, we visited the *'Head Of Steam'* Railway Museum located in the North Road Railway Station. At the same time as our visit, *The North East's Friendly Exhibition* was displaying twenty two of their model railway layouts in the museum. Of special interest was Paul Gallon's 'N' gauge *'The Depots Rosedale East'.* His display is shown in the following video.

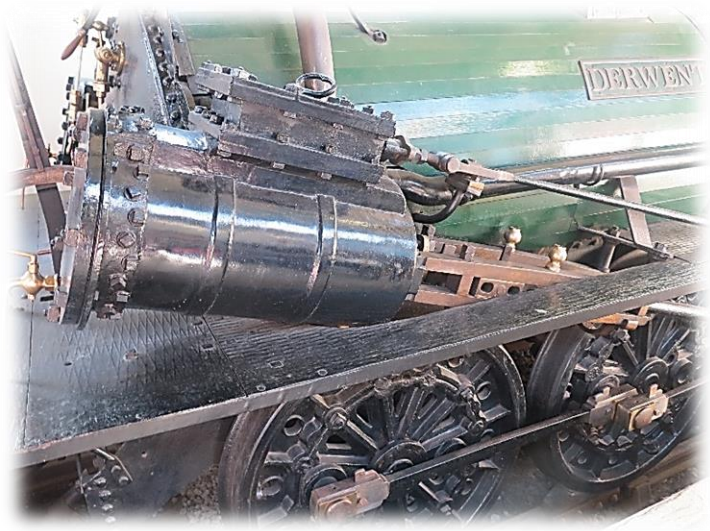
The video of the model railway exhibition is here*:* *https://www.youtube.com/watch?v=VAE4KHOmGXM*

- **North Road Station, A History.**

- The original station was opened in 1842, replacing an earlier structure. The original building was a one storey entrance block, one room deep and 'simple Italianate'. The station was changed in 1853, when the station platforms and roof were extended. The extent of the original station is indicated by plaques inside the museum. In 1856 the station was further extended.
- In 1872 the eastern end of the building was extended to create more office space for the 'Yards Master' and staff who ran the goods station and yard. In 1876 another storey was added to the centre section with offices possibly for telegraph equipment.

There are three locomotives in the museum: *'Derwent'* (1845), '*1463'* (1885), and *'901'* (1919).

- **'Derwent'**



This engine is the oldest surviving Darlington locomotive.

Working Life:

Built by the firm of William and Alfred Kitching at their Hopetown foundry.

- Delivered 1845
- Cost £1160

Hauled coal and mineral trains on the Stockton and Darlington Railway

Preservation:

- 1869 Sold to Pease's West Colliery near Crook.
- 1881 On display at the Stephenson Centenary celebrations in Newcastle.

- 1887 On display in Newcastle to mark Queen Victoria's Diamond Jubilee.
- 1898 Returned to the North Eastern Railway and displayed at Bank Top Station Darlington until 1975.
- 1925 Overhauled at the North Road Works.
- Took part in the Stock and Darlington Centenary celebrations.
- 1961 Overhauled at the North Road Works.
- 1971 Moved to the North Road Museum.
- Part of the National Railway Collection and on loan from the National Railway Museum, York.

- **'1463' ~ North Eastern Railway 'Tennant 2-4-0'**

Henry Tennant was chairman of the committee set up to run the locomotive department and to design the engines following the resignation of the company's engineer Alexander McDonnel.

The locomotive, the first of an order of ten, was built at North Road Works in Darlington, and entered service in 1885 on main line duty.

In the first ten years it was averaging 40,000 miles per annum.

1463 finished its days working from the Darlington shed on trains to Tebay, Saltburn and Richmond. The locomotive was classified as E5 by LNER and withdrawn in 1927.

On loan from the National Railway Museum in York.

Some details:

- Two cylinders (inside) 18" x 24".
- Driving Wheels 7' 0".
- Motion: Stephenson with slide valves.
- Boiler pressure: 160 lb/in².
- Tractive effort: 85% 12640 lbs.
- Total heating surface: 1133 sq ft.
- Weight in working order: 74 tons 4 cwt.
- Water capacity: 2651 gallons.
- Coal: 5 tons.
- Brake: Westinghouse.

- **'901' ~ North Eastern Railway Class T3 0-8-0**

North Eastern Railway Class T3, classified Q7 by the LNER, is a class of 0-8-0 steam locomotive designed for heavy freight. Five were built by the NER in 1919 and a further ten by the London and North Eastern Railway (LNER) in 1924.

The first of the T3s, No.901 was outshopped from Darlington Works in November 1919. A month later the NER organised a test train, over the Newcastle to Carlisle line, including a brake van and the company's dynamometer car to record the locomotive's performance. The engine was untroubled by gradients as severe as 1 in 107 (0.93 %), with 1402 tons in tow.

. Eventually all 15 T3s/Q7s congregated at Tyne Dock depot near South Shields. Here they performed the role they were designed for. This was to haul 700 ton 'rakes' of iron ore hoppers to the steelworks at Consett 1,000 ft (305 m) above sea level. On the steepest section, as severe as 1 in 35 (2.86 %) in places, one 0-8-0 pulled while another pushed. They were eventually retired in 1962.

A Visit To Dick Craven's Collection On Wednesday 14th September.

This was a visit arranged by Ted Fletcher, and some PEEMS members and other guests turned up for what turned out to be a very interesting visit. The museum is situated close to the A64. More details can be found at this link: http://cravencollection.co.uk/ *(To return to newsletter, press back arrow at the top left handside of the screen).*

The museum opened in 1994, but Richard has been here for 40 years. The shed used to be a pig farm, and he had to clear out the sheds, including removing dead carcasses, before he could start. He now has over 270 motorcycles, some of which have featured in the TV shows "*Heartbeat*" and "*Emmerdale Farm*".

The museum is split into various sections:

- Army Section.
- A Police Section.
- Scooter Section.
- British Bikes 1918 to 1987 Section (containing 230 bikes).
- Japanese Motorbike Section (containing 40 bikes).
- A Trials Section.
- A Sidecar Section.

The most interesting fact about the collection is that Richard did not buy anything at auction but from various sales.

Obviously a visit is the only way to fully appreciate the collection, but the following shows some very interesting bikes.

The majority of the bikes are in working order, and get used. Richard sees this as a working museum.

Some pre-restoration projects:

An interesting piece of kit:

1983 Honda CB1100RD 4 Cylinder 16 Valve 1099cc
120 BHP at 9,000rpm 145 mph
In effect, a limited edition: A Homologation Special.
The CB1100R was priced accordingly at £4300.
Ridden by stars such as Ron Haslam, Wayne Gardner, and Roger Marshall, the works bikes thrilled British race goers throughout the early 1980s.
It was built as an endurance racer. This bike has had only two owners since new and is totally original apart from the tyres.

1973 MZ Trophy 250cc Two Stroke Single Cylinder.

1964 Ducati 200cc Elite.
Unique *Desmodromic* valve gear.

1962 Velocette LE Mk 3 200cc
Ex West Riding Police Bike.

A Couple Of Choppers:

The red bike is a 1976 Harley Davidson 1000cc XLCH ‘Hard Tail Chopper’.
The yellow bike is a 1979 Honda 550cc 4 Cylinder Chopper. Rebuilt by the inmates of Full Sutton Prison.

1966 Honda Sports 65cc

1965 Suzuki S32 140cc Two Stroke Twin Cylinder.
Rebuilt by the inmates of Full Sutton Prison.

1926 550cc Triumph Model P.

1950 BSA 125cc Bantam ~ Rear ‘Plunger’ Suspension.

Vincent “Straightliner”.

Some Bikes that featured on “Heartbeat” and “Emmerdale Farm” TV Series:

1924 Triumph SD 500cc.

Appeared in

“Heartbeat”.

1942 Royal Enfield.

350cc Model CO.

First registered to the Portsmouth Admiralty for the use of the Staff Instructor's mess serving aboard HMS 'Excellent'.

The sidecar was put on recently for the TV Series 'Emmerdale'.

'Supposedly' it was a 'rough barn find' and Alan Turner "Richard Thorpe" rebuilt it to its former glory.

It's called a fictitious *'Dalesman's Roadster'.*

It first appeared on the TV in August 1980.

1955 32cc Norman *Cyclemate.*

1951 Excelsior

1954 197cc James

I had one of these!

Nevile Foster

Many thanks to Richard Craven for opening up his collection for our special visit. Also thanks to Richard for checking this article over for errors.

Club Extraordinary General Meeting Wednesday 7th September. Demonstration Of Proposed Audio-Visual Equipment With A View To Buying It For Future PEEMS Meetings.

This was an Extraordinary General Meeting to discuss and see a demonstration of the audio-visual equipment proposed for PEEMS.

Chairman Jonathan Milner started by saying that during Jon Selby's talk on Ground Effect Vehicles, it became apparent that our projector was not compatible with his computer. At the committee meeting, it was realised that as Club funds were quite healthy, as shown to members at the last AGM, the committee thought it would be wise to invest in some new technology basically:

- A lap-top computer with HDMI capabilities.
- An up-to-date projector compatible with the computer.
- A modern screen with better resolution.

As with everything in life, there is 'cheap', 'middle of the road' and 'expensive'.

Jonathan and David Proctor took advice from *Computer FX* in Malton market place. As regards the projector, they advised 'middle of the road'.

- Projector Type Recommended.

The previous projectors we used were 'bulb' types, and the new types are either 'bulb', laser or LED. *FX* said that the laser/LED types were not proven yet and were very expensive. Jonathan said that for what PEEMS wants the projector for, it wouldn't be worth buying an expensive laser or LED projector. The latest 'bulb' types have bulbs which should last for 6,000 to 8,000 hours, and in general PEEMS will use the projector for a maximum of 3 hours per month. That is why the laser/LED projectors were not recommended.

- Recommendation To Buy A Dedicated PEEMS Computer.

The Club doesn't have its own computer. The Club usually relies on guest speakers or members bringing their own lap tops to the meetings. The committee thought it would be good if there was the option that there was a dedicated PEEMS computer with HDMI capabilities, which would be compatible with the projector, so that guest speakers and members could bring their presentation on a memory stick which could be used in the lap top. Of course, personal computers could still be brought to meetings, but the requirements would be that they should have a HDMI plug and a 1080p resolution.

- Recommendation To Buy An Updated Speaker System Along With The New Screen.

The committee also thought that the audio system should be improved, and to that end, a new and lighter speaker should be bought which was better than our current system.

The new screen/projector/speaker system would then allow us to see high resolution films and YouTube videos relevant to our meetings.

Our original projector's bulb was going and Mel Doran had kindly donated his projector to PEEMS over the meantime. That has been brilliant and the Club thanks Mel for that, but his computer is not HDMI and is old technology.

- Voting.

The motion on the evening was:

"Peems members agree to the procurement of a new projector, and a dedicated PEEMS lap-top computer and accessories for a total expenditure not exceeding £X* " .

*Figure given on the evening.

There was a vote by a show of hands, and votes transmitted to the secretary beforehand.

The result of the vote was:

a) For The Motion: A unanimous show of hands. 13
b) For The Motion: Transmitted beforehand. 9
c) Against The Motion. 0
d) For those members not in attendance, their votes were counted as abstentions. 21

The motion was therefore carried.

The intention was to buy the new system before Ivan Shaw's talk at the October Club meeting.

The rest of the evening was spent looking at YouTube Engineering videos on a projector representative of the new purchase.

'Black 5' At The North Yorkshire Moors Railway

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