



# Rochester Avionic Archives Newsletter

While writing this Newsletter I noted that it was 50 years ago (June 1972) that I joined Elliott Bros at Rochester. Previously I had worked at Standard Telephones & Cables (ST&C) at Fooks Cray in Kent but joined Elliotts to work on the new Head Up Display programmes. The Company has changed significantly since then but it is still leading in the technology of avionics.

In this edition there are articles about the origins of the Gyro and Pitot technology that entered Company products and the history of the Rochester site is continued. A new series starts describing the Queen's Awards that have been awarded to the Rochester site. The clip from the obituary of Iann Barron is an example of the many innovators who started their career at Elliotts.

If you want to know what an 'Opisometer' is go to the end of Page 5.

**Chris Bartlett, Curator**

## The latest acquisitions

BAE Systems was the systems integrator for the hybrid electric ferry specifically designed for harbour tours of San Francisco Bay and the Golden Gate Bridge. The ferry can carry 600 passengers.

The hybrid system can automatically use full electric battery operation at slower speeds and when manoeuvring in and out of the harbour. At higher speeds, the generator will automatically engage and augment the additional power demands of the traction motor. The name '*Enhydra*' stems from the Latin word for otter.

The model is over three feet long and enclosed in a clear plastic case. It was acquired from the Hybrid Vehicle Group at Rochester



## Iann Barron 1936-2022



Iann Barron with a Transputer chip

Ian Barron was a computer pioneer who used the name 'Iann' to stand out from the crowd. He read Natural Sciences at Cambridge and during the holidays, in 1956-7, he worked at Elliott Bros at Borehamwood where the company was developing the Elliott 800 series computers. After a period of National Service in 1961 he returned to Elliotts where he worked for another four years. He helped commission the Elliott 502 computer and then led a team researching the use of tunnel diodes in high-speed logic circuits.

In 1965 he set up a company called 'Computer Technology' and brought a computer to the market which was described as '*the first British compact computer*'. In 1978 he founded Inmos which was established at Newport in Gwent. Inmos is best remembered for the 'parallel microprocessor' known as the 'transputer'.

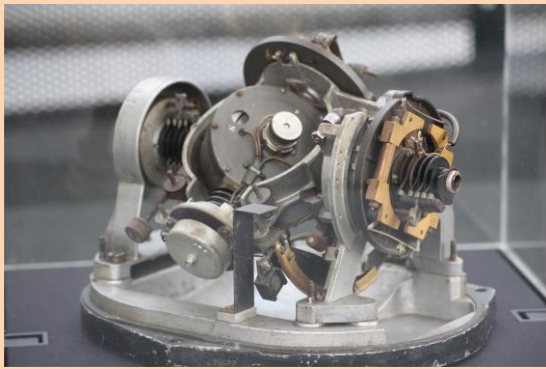
*"History is the ship carrying living memories to the future".* Stephen Spender, Poet

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## It all began a long time ago- Rate Gyro



This Gyro was photographed at the Leicester National Space Centre where the description cites its use in the WWII German V2 Rocket Guidance system.

The original concept of this Rate Gyro was a design by Siemens dating from the late 1930s used in their K12 Autopilot. The concept was developed further in Germany during WWII where it formed part of the rudder control system on the Henschel Hs 129 and in the 'V2' rocket weapon. After the War the design was brought to RAE Farnborough eventually being offered to industry, By 1953 Elliott Bros had developed the auto stabiliser which was, according to FLIGHT Magazine of 1953, necessary to correct the 'snaking' activity of certain high-speed aircraft. This gyro was fitted near to the centre of gravity of the aircraft and operated a remote actuator unit for the rudder servo tab via a control box.

The RAE design was modified by Don Kierley of Elliott Bros. Variants of the gyro were fitted to Elliotts' Flight Control System for the Jindivik in the late 1940s and subsequently to the Lightning (the Type "B") and the FIAT "Flying Bedstead". Although it was proposed for Concorde it was not actually used. The design was further developed into the Type 'B' Autopilot which was used in the Lynx Helicopter.



C0314 on the Left, is the Lynx Type B Rate Gyro Unit from c.1970

C0689 on the Right, is an early Sperry Vertical Gyro from c.1965 showing a similarity to the original gyro

## It all began a long time ago- Air Data Pitot tubes

In 1732 Henri Pitot invented the '*tube de Pitot*' (pitot tube), a device for measuring the speed of fluids, which is still used in the 21st century for measuring the speed of aircraft. He developed the idea when tasked with measuring the water flow of the river Seine.

From 1740 Henri Pitot worked as an engineer for the Languedoc region, creating some remarkable projects.

He drained swamplands along river courses and created anti-flooding barriers along the major rivers of the region, including the Gardon, Vidourle, Orb, Ardèche and Rhône rivers.

In 1743 Henri Pitot built the Pont Pitot attached to the Roman aqueduct Pont du Gard. He built the St-Clement Aqueduct in Montpellier, and restored the Roman bridge of Sommières and the Medieval arched bridge at Pont-Saint-Espirit.

While Henri Pitot had invented the device in 1732, theoretical and design weaknesses had kept it little more than a scientific toy. Starting in 1856 Henry Darcy, with the assistance of Henri Bazin, developed the invention to provide accurate and easy measurements of point velocity for the first time. This allowed advances in open channel and pipe flow hydraulics. Darcy's final design for the instrument tip is reflected today in all of our modern instruments.

A pitot tube contains two holes that each measure pressure from the incoming airflow. The front-facing hole measures stagnation pressure, and the side-facing hole measures static pressure. The difference between these two measurements results in what is called dynamic pressure, which can then be used to calculate airspeed. A pitot tube with both of these holes is also known as a pitot-static tube. The pitot tube is fitted to an aircraft rigidly fixed facing the direction of travel. A helicopter can fly in all directions so the swivelling probe was developed such that the probe can follow the flight path.



C0996 on the Left is a rigid probe made by Rosemount in c.1988 used on the Phoenix UAV

C0322 on the Right is a swivelling helicopter Air Data Probe used on the AH-64 Apache, AH-1S and A129 Mangusta

# The Queens Awards

The Queen's Awards for Enterprise is an awards programme for British businesses and other organizations who excel at international trade, innovation, sustainable development or promoting opportunity (through social mobility). They are the highest official UK awards for British businesses. The scheme was established as The Queen's Award to Industry by a royal warrant of 30 November 1965, and awards are given for outstanding achievement by UK businesses in the categories of innovation, international trade, sustainable development and promoting opportunity through social mobility.



Each award is valid for five years and winners are invited to a royal reception and are presented with the award at their company premises by one of the Queen's representatives, a Lord-lieutenant. Winners are also able to fly the Queen's Awards flag at their main office and use the emblem on marketing materials such as packaging and adverts.

The first awards were made in 1966, on the Queen's birthday (21 April). Awards in subsequent years were announced on the same date. Individual categories have been known in the past as The Queen's Awards for Export, Export Achievement, Technology, Technological Achievement and Environmental Achievement.

The awards became the Queen's Awards for Export and Technology in 1975, with Environmental Achievement added in 1992. More recently the Award was given the overall name of the Queen's Award for Enterprise.

The Company under various names has won 13 Queen's Awards in and this section gives a summary of each award:-

**1966:** For Export achievement by Elliott-Automation Control Valves Ltd., Satchwell Controls Ltd., and Elliott-Automation Computers Ltd.; and for technological innovation in automation by the latter and by Elliott Process Automation Ltd.

**1967:** For Technology. An airborne automatic direction finder and an overseas earth station for satellite communications by The Marconi Co. Ltd., Chelmsford, Essex. Other records show this to be awarded to the Aeronautical Division of Marconi Co. Ltd at Basildon

**1968:** This was the first award made to Rochester for export but the Newspaper does not mention the products which merited the award.



The Company was given a glass block engraved with the category of the award. In this case " The Queen's Award to Industry 1968". Note that in this early award the 'E' for Export is not placed in the centre of the logo.



The May 1968 copy of EFA News has a front page about the Queen's Award. However unlike later awards there is no mention of a celebration at the Rochester site. The report says that 18 Queen's Awards have been won over the last three years by Elliott, Marconi and English Electric. However the Award only started in 1966.

**To be continued.....**

## The Rochester Airport site of BAE Systems

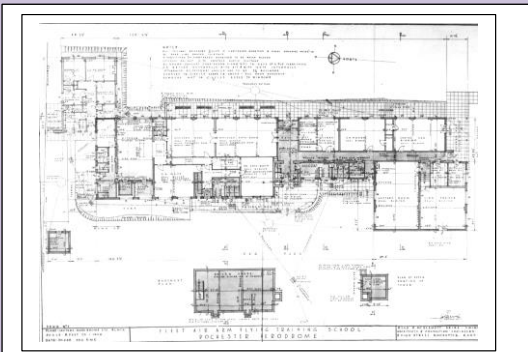
### Buildings at the South end of the site

In 1937 the Air Ministry approached Shorts with a proposal that they manage a flying school (No. 23 EFTS) at the airport to train RAF volunteer reservists and Navy pupils of the Fleet Air Arm. This resulted in the construction in 1938, at the Southern end of the airport, of No.1 Administration Block and No.1 Hangar. Subsequently No.2 Hangar, The Fire Section and a No.2 Administration Block were built. The brick buildings became known as the Top Administration Buildings but were always called the Flying School. These buildings were paid for by Short Brothers but were for the future use of the RAF and Navy student pilots.

The Air Ministry decided that two more Hangars should be provided for twin engine aircraft training, so in 1939 the No.3 Hangar was built and this is still the present Flying Club Hangar. It is believed to be an ex-Admiralty Seaplane F Type hangar taken out of storage for the expansion plans of this period for extra training facilities.

It is believed that the first No.4 Hangar was built in mid to late 1939 and dismantled by July 1940. It was replaced by the small Blister Type hangar which collapsed in 1987 due to the weight of snow that winter. A Control Tower for the Airfield was constructed in 1939.

The Flying School buildings were taken over by Elliotts in 1959 and initially used as sales offices for Swift and Swallow but in 1962 both Hangars 1 and 2 were taken over by the Company and modernised. They were later developed into a very high technology environmental test area which survived until 2009 when the buildings were demolished.



Fleet Air Arm Flying Training School



The 'Flying School' Building in 1969

### The War years

In readiness for the onset of WWII the buildings were camouflaged and Air Raid Shelters were constructed along the edge of the site adjacent to the Airfield. More shelters were constructed on the South-West corner along what is now named as Laker Road and another line of Shelters was built on the North edge of the site along the original entrance road. There are a few of these shelters visible notably either side of the old Fuel Flow Laboratory and Test House and at various times others have revealed their presence during construction of new buildings.

Of particular interest is the large complex built in the South West corner of the site which is believed to be an Underground Hospital or First Aid Centre. The Underground Hospital is currently a BAE Systems Car Park.

Dummy Airfields were constructed at the Hempstead Road/ Lidsing Road area and another at what is now Capstone Country Park to protect Rochester and Detling Airfields.

On September 3<sup>rd</sup>, 1939, War was declared; Air raid warnings were given and all works were speeded up. The RAF, RN and ATC took over the Flying School and a 'permanent' 'black-out' of the office buildings was imposed.

Local Defence Volunteer (LEV), Auxiliary Fire Service (AFS) and Civil Defence Units were raised and trained, and units of the East Surrey Regiment and Royal Air Force Regiment were posted on the airfield to assure its defence. Other RAF personnel and officials from the Ministry became a common sight for the duration of the war.

Short Bros, regarded the Airport and Seaplane Works as very vulnerable to enemy air attack and letters to this effect had been sent in 1937 by Mr Oswald Short to the various Ministries. As a result of which the Under-cliff Tunnels and Air Raid Shelters were already available on the outbreak of war.

Jigs, tools and assembly were duplicated and copied for the sub-contracting of all sections, mainplanes, elevators, rudders, tailplanes and centre-section fixtures. Production of the Stirling bomber took place at both the Airport and Seaplane Works. A new foundry (now Kent Alloys) and Extrusion Factory were set up to supply detail components for the main works.

Trial bombing runs took place on Tuesday, 8th August and on Friday, 11th August large raids were made on Gillingham, Chatham and Rochester by night. Bombs were dropped across the towns (lines converging on Davis Estate and junction of the Chatham-Maidstone and Rochester City Way roads) up to the airport hangar doors.

The main raid on Tuesday 15th August took place at about 2.15 pm when a formation of 15-20 aircraft were seen to approach at 15,000 feet from over the Davis Estate descending to 10,000 or 8,000 feet to attack. High explosive, incendiary, oil-fire and shrapnel bombs were dropped at the Chatham-Maidstone road straight across the airport factory setting fire to the main hangars, Factory-finished parts, oil, petrol and paint stores and the Pobjoy factory. Only a small area of the machine shop at the S.W. corner was saved. Six completed Stirling aircraft were destroyed (N3645, N3647-N3651) and forty sets of finished parts, stores and equipment were lost.

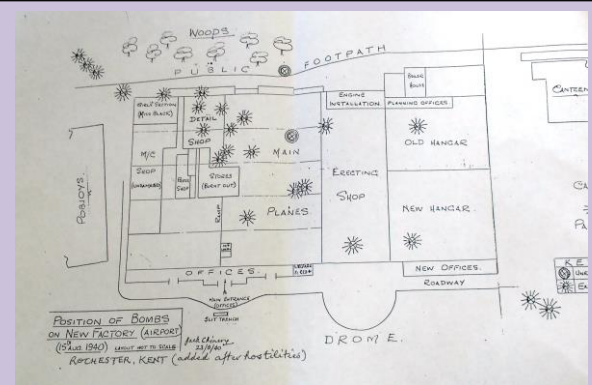
With a small band of willing workers, staff managed to clear up the factory machine shop and keep some machines operating until finally moving to the Seaplane Works. Meanwhile salvage and reconstruction was being organised in spite of further air raids and warnings most of the time.

From the personnel point of view it was fortunate that a new and extra-loud air-raid warning siren had been installed just the previous day as some workers were unable to hear the ordinary warning when a klaxon warning of a test of an aircraft undercarriage was sounded. When the new siren sounded factory personnel were under cover in less than two minutes in their pre-allocated air-raid shelters which were, of course, adjacent to their place of work. All members of LTV, AFS and Civil Defence units were however at their stations and the only fatal casualty sustained in the daylight raid was a Civil Defence Warden at his action station in a steel dome fire-watching.

The buildings and factory were so badly damaged that it was decided to clear the lot out and disperse the work, jigs, tools, machines and personnel to Strood, South Marston in Wiltshire, and Hucclecote in Gloucestershire. Production eventually continued at Rochester and 536 Stirlings were built there but from then on, the Queens Island factory in Belfast became increasingly important, because it was thought to be well beyond the range of German bombers. However, during Easter week of 1941, Belfast and the aircraft factory were subjected to German aircraft bombing.



To be continued.....



The picture on the left shows the Construction of Mk I Stirling Bombers in the 40' Hangar. The sketch above shows the places where bombs were dropped on the factory during the raids of WWII



### The Opisometer

Elliott Brothers included their "Opisometer, or Map Meter, for measuring curved lines" on page four of their eleven page 1868 priced catalogue. Each instrument then cost three shillings. The two English examples shown here were made by Elliott Brothers between 1864 and 1916. The instrument is rolled and rotated along a line on a map- a path, a road, stream, railway, canal, pretty much anything that required measuring