



**MARCONI
AVIONICS**

**A new facility for precision
hydraulic control systems**

*Press briefing and formal opening
Airport Works Rochester England 10 November 1982*

www.rochesteravionicarchives.co.uk

PROGRAMME
10 November 1982

- 0930 Company transport leaves Fleet Street (Daily Express offices) for Rochester.
- 1045-1115 Guests arrive at Airport Works, (Towers Reception). Coffee served.
- 1115 Presentation in foyer Conference Room.
- Introductions - Mr M F Moulton
 The Hydraulics Facility - Mr C F Pond
 Questions
- 1145-1230 Visit to Hydraulics Facility
- Hydraulics Production
 Visit - Mr D K Webster
 Hydraulics laboratory - Mr C G Pond
- Products on display include electrohydraulic "failure-survival" actuators and a complete "fly by light" control system for aircraft.
- 1230-1245 Unveiling of plaque and formal Opening - Mr. C R Robinson.
- 1245-1415 Conference Room.
(approx) Buffet luncheon and further discussion.
- 1415 Visit ends and transport departs for London.
(approx)

Guest Speaker

Mr C R Robinson, Editor "Design Engineering"

Marconi Avionics Limited Speakers

Mr C G Pond, Technical Manager, Flight Controls Division
Mr D K Webster, Production Manager, Flight Controls Division
Mr M F Moulton, Company Information Executive

INTRODUCTION Malcolm Moulton

I would like to welcome you on behalf of Marconi Avionics Limited to the latest in what has tended to become a series of Opening ceremonies. This time, we are commemorating the formal Opening of our newly-equipped Hydraulics Facility.

It has, I know, come as something of a surprise to some people present today, to learn that our company is involved in hydraulics, and that we have well over a quarter of a century of achievement in this important field.

In a few moments, my colleague, Colin Pond, will recount briefly some highlights of this work, after which we will show you round the new Facility. This will be followed by an unveiling ceremony and luncheon, which will be made ready in this room.

MULTI-DISCIPLINE BUSINESS

Whereas we have come to be known as Europe's foremost supplier of electronic systems for aircraft, we do regard ourselves primarily as an aviation company, and aviation, of course, is a multi-discipline business.

Today, we are as likely to find ourselves making innovations in optics, microwave systems or electro-optical systems, for example, as we are in electronics, and we certainly regard our capabilities in hydraulics, and hydraulic control systems in particular, as very important to our total business.

Indeed, this work has paved the way for very interesting and important achievements over the years in automatic flight control, which has brought valuable business in guidance and control systems for both airliners and military aircraft.

Our policy is to maintain a capability for the design and development of hydraulic control systems as a means of developing our avionics business and, in addition, to develop and manufacture the kinds of hydraulic equipment for which we are most expert, such as control valves and precision servo control systems. It has never been our aim to compete with the principal aviation hydraulics companies and, indeed, our work has often brought us into close partnership with them in aircraft projects.

The success of that policy can be judged by at least four important factors:

- (i) the aviation hydraulics companies are, I am glad to say, represented here today,
- (ii) production of our hydraulic servo equipments has been stepped up lately, as we will shortly demonstrate,
- (iii) our very latest development in control systems for future generations of aircraft, known as "fly by light", has also relied on our abilities in hydraulics, as we will soon be demonstrating to you and, of course,
- (iv) the very fact that we are opening the new Facility, comprising a Hydraulics Laboratory and a Hydraulics Production Unit, shows our confidence for future business in this field.

AN IMPORTANT INVESTMENT

I have touched on the importance of hydraulics in the development of our business and I would like to give you some facts about this.

In automatic flight control, (often the most valuable sub-contracted item for an airliner, next to its engines), we have applied our electro-hydraulics know-how to the design of such systems for the VC10, BAC One-Eleven and Concorde airliners and in the Buccaneer, Lightning and VTOL projects, as well as in "fly by wire" systems for the European Tornado, the Jaguar demonstrator and, as we have recently announced, the Italian-Brazilian AM-X and the new European Agile Combat Aircraft (ACA) projects. Such total business is currently worth well over £25 million annually, which is an order of magnitude more valuable than the sale of the hydraulic components themselves.

The investment in our new Hydraulics Facility thus provides a high indirect yield, in addition to direct sales. Investment in new technology is, indeed, our long-standing policy, as was exemplified recently by the major computer-aided Engineering Facility which we have installed on this site, to boost our competitiveness in exports. Nearly three quarters of the total product of the Rochester factory are now for overseas customers.

New investments, in computer aids, for engineering, design, testing, project control, administration, research and marketing and in new facilities of all kinds, has been a major factor in our continuing development. Over the past five years, we have nearly doubled our share of the world's avionics market and have built up, and sustained, a large work force, now standing at 11,600, about half that number being here, at Rochester.

I hope these few figures will put into perspective for you the wider importance of today's event. To tell you about our involvements in hydraulics, I have pleasure in calling upon Colin Pond.

The new Hydraulics Facility, which we are shortly to show you, is a completely self-contained area, dedicated to hydraulics, with environmental control independent of the rest of the factory. It comprises a Hydraulics Laboratory, with associated workshop and environmental test facilities, plus a separate Production Unit with specialised test equipment, and its own environmental testing room, dedicated to "end-of-production-line" testing.

ORIGINS

Our work began in the 1950's with the development and manufacture of adjustable-lap Servo Valves which we produced at Borehamwood, during the time when our company was centered there. Commercial variants were used in test houses for hydraulics, in test rigs and in educational establishments. The type 610 valve was also used in industrial control systems in what was then a growing field of industrial automation.

With a small but dedicated team of hydraulics specialists, we produced a variant for aircraft flight control and this was applied in the late 1950's to the automatic flight control system for the NA39 project, known today as the Buccaneer. It was associated with that aircraft's powered flying controls in what was to become known as an "integrated flying control" concept, which was to improve the quality of auto pilot control for many types of aircraft which followed. This work also paved the way for the construction of a multiplex electro hydraulic actuator, based on a set of these Servo Valves.

The designer, who extended the concept of hydraulics Servo Valves into the field of multiplex actuation, nearly 25 years ago, was Stafford Ellis, who is now our company's Design Consultant, and is present today. His early quadruplex actuator design paved the way for the evaluation of the aircraft controls systems known as "fly by wire", in which a pilot signals the flying controls, non-mechanically, his commands being dynamically adjusted to give acceptable handling qualities throughout the flight envelope.

FLY-BY-WIRE

This work led directly to the successful flight of a VTOL experimental aircraft, the first ever to be equipped with a full authority, system for automatic stabilisation and capable of surviving failures automatically. The G95/4 project of 17 years ago was indeed carried out by the same companies as are now working on the newly announced AM-X attack aircraft which is equipped with a "fly by wire" control system.

Another notable success for the hydraulics team, using quadruplex actuators, was the development of a "fly by wire" system for the European Tornado aircraft. This development had two very happy outcomes for our company. First, it brought us into a closer working relationship with Fairy Hydraulics Limited who incorporated our actuator concept into the advanced design they produced for the powered flying controls fitted to Tornado and, secondly, it enabled us to win the valuable contract for the electronics involved in that "fly by wire" system and, moreover, to win the order for the auto pilot too. As this was the first digital terrain-following auto pilot ever produced in Europe, it was a key achievement for us. Over the years, we have designed several different marks of Quadruplex Actuator for different applications, and the latest multiplex actuator design is the vital link in an entirely new kind of flight control system, which we have now developed, known as "fly by light". In this, signals representing the pilot's control commands are transmitted via pulses of light, in order to achieve electrical isolation between one part of an aircraft and another. To make this isolation complete, electrical power for actuation is generated locally from the hydraulics supply, using our latest hydraulic-electric generator, (inevitably referred to as HEG) which we will shortly demonstrate to you, with the actuator, in a complete "fly by light" test rig.

- (iii) give us control over the distribution of electrical power throughout an aircraft, so that we can design systems of higher safety and integrity than ever before,
- (iv) enable us to evaluate hydraulic systems which are associated with our own equipment and
- (v) assure us of a full capability to undertake a wide range of future programmes, both for aviation and otherwise.

Having done my best to span very briefly what amounts to more than 25 years of development in this field, I think it is best if we now invite you to see the new Facility, in which we have arranged a special exhibition of the equipments and systems which I have described.