INDUSTRY International

Limelight on Lucas Aerospace

THE AVIATION SECTOR of the Joseph Lucas group of companies a few months ago took the now fashionable step of rationalising itself, emerging with a streamlined structure which should ensure a much better utilisation of its remarkably diverse resources. This was becoming a necessary step in view of the rather disparate nature of the various organisations which have made up the group in recent years. The explicit reason for the reorganisation was to consolidate the activities of Lucas Gas Turbine Equipment, Rotax and its subsidiary Rotax Aircraft Equipment, H. M. Hobson (including Integral), Vactric Control Equipment, Premier Precision and G. & E. Bradley into a new organisation, formed in August last year, known as Lucas Aerospace Ltd. It employs 14,000 people in 18 centres throughout the length and breadth of Britain, and has an annual turnover of about £60 million. It represents the aviation interests of Joseph Lucas (Industries) Ltd, which employs 80,000 people and has an annual turnover of about £300 million. The two other major activities of the group are automotive and industrial companies and overseas manufacturing subsidiaries and associates.

Lucas Aerospace comprises five main product groups:— Hydromechanical, Electrical, Fabrication, Industrial and Product Support. Another subsidiary, G. & E. Bradley, continues to operate under its own name.

The largest single unit is the Hydromechanical Group, with headquarters at Shaftmoor Lane, Birmingham. It comprises largely elements of Lucas Gas Turbine Equipment and H. M. Hobson, and was a logical geographical and product association.

Joseph Lucas entered the infant jet-engine field in 1940 when prototype engines were being built. Nine years later it became Joseph Lucas Gas Turbine Equipment; subsequently it became LGTE in 1960. By getting in on the ground floor, so to speak, this firm built up an enviable background of experience across virtually the entire field of turbine-component technology—fuel-control and combustion systems, flame tubes, thrust reversers and many others. Two other LGTE plants are now included in the Fabrication Group. As an example of the business involved in just one product, 35,000 engine fuel-metering units have been built, and have a total of 90 million flying hours to their credit. Lucas equipment has found its way on to 32 basic types of engine.

Flying-control systems

Hobsons' strength for many years has lain essentially in the field of powered flying-control systems and control-surface actuators (as was that of its associated company, Integral, an offshoot of Hobson which no longer exists) and hydraulic drives for generators. Though part of the Lucas group of companies, H. M. Hobson traded under its own name until last August. Recent orders for this company's equipment have included the variable-feel system on the Lockheed C-5A and the flap and slat operating systems and the tailplane actuator on the A-300B Airbus. Proposals have been submitted for the MRCA wing-sweep actuators, pitch-axis variable-feel system, engine-nozzle actuation and reverse-thrust and wheel-brake systems. The company's traditional interest in carburettors has developed through the years into a profitable outlet for fuel-boost and transfer pumps and fuel-flow proportioners. Among aircraft with Hobson fuel equipment is the Lockheed TriStar, and the company last year gained the contract for the fuel system on the Rolls-Royce RB.199 powerplant for the MRCA.

Also part of the Hydromechanical Group is Premier Precision of Bracknell. As its name suggests, this firm specialises in the manufacture of products requiring fine machining techniques. An example of this is the complex housing for the fuel-control system on the Harrier. The company also interests itself in components for aero and marine engines, and has built wind-tunnel test equipment, for example for the National Gas Turbine Establishment, and is developing a hydrostatic drive for marine application.

Another famous name which, like many others, has been absorbed into a corporate identity, is that of Rotax, which largely accounts for the Electrical Group, with headquarters in Hemel Hempstead. This company was bought by Joseph Lucas (Industries) Ltd during the late 1920s but continued under its own name until the 1971 reorganisation. Rotax is another firm with well defined product lines. It became involved with the aviation market in 1931 when, at the suggestion of the Government of the day, Lucas directed it to concentrate on the design and manufacture of aircraft electrical-generation equipment (the company had already built small quantities of aircraft switchgear between 1917 and 1921). This was part of the efforts made by industry and the Government to bring some standardisation into a rather chaotic components industry. From that time on the name Rotax has been synonymous with motors, generators, starters, starter generators and the varied and comprehensive control and protection equipment needed to generate and manage the huge quantities of electrical power required by large commercial and military aircraft.

Rotax itself has gradually been strengthened by the acquisition of a number of companies. In 1968 it bought AEI's Aircraft Equipment Group and followed this with the acquisition of Vactric Control Equipment in 1969. Vactric, now a member of the Industrial Group, brought an expertise in the design and manufacture of servos and control systems, having been concerned with synchros, small motors and encoders. Today's aeroplanes swallow vast quantities of such components; there are more than 100 Vactric units on Concorde, for example. Other Vactric products which do not fit into this classification include the licence-manufacture of the Tedeco magnetic chip detectors used in the BEA and BOAC fleets.

Also in 1969, Lucas bought out the English Electric Special Products Group, which had also been fielding a strong power-generation team, heavily based on R&D. As a result of all this the Electrical Group of Lucas Aerospace must be considered to be in a very powerful position. It claims to have put into series production the first 12,000 r.p.m. generator in the world, the first oil-cooled and oil-lubricated machine in Europe, and to have secured the first integral-drive generator system in Europe. This last system is under development for MRCA. Other important outlets are the Harrier main generation system (with its new mechanical constant-speed drive, a development of the Perbury drive); generators, drives and control and protection equipment for Russia's Tu-144 supersonic transport; generators for Germany's VAK 191 B experimental V/Stol fighter; and the complete generation system for Britain's Nimrod sub-hunter. Another significant line is the design and manufacture of gas-turbine starter/APUs and mechanical and pneumatic equipment. Examples are the direct-shaft-drive starter with automatic translation to APU mode for the Harrier, high-temperature air-control valves for aircraft and propulsion systems, and diaphragm-type flexible drives.

The group's Engineering and Heating Systems plant at Luton was originally the Flight Development Unit of D. Napier & Son, taken over by English Electric

in 1941. Over the years its function of providing a flight-test service to its parent firm was supplemented by an increasing activity in the development and manufacture of equipment not directly concerned with this task. One of these is the electrical de-icing system Spraymat, another the production of Sierracote electrically heated cockpit transparencies under licence from the American firm of Sierracin, and also Sierraglo electroluminescent lighting for cockpit control panels. The MRCA windscreens and quarter-lights, and the retractable visor windows on Concordes 01 and 02, are noteworthy examples of the transparencies. The firm also became heavily engaged on non-aircraft work for nuclear power stations, which have been manufactured in Britain since 1959. As a result of this diversification of interests the Flight Development Establishment became the Luton Division of D. Napier & Son in 1960. In 1964 the Luton plant became part of the English Electric Aircraft Equipment Division, while its aero-engine interests, such as the Gazelle and Nomad, were either taken over by Rolls-Royce or abandoned (though the firm still manufactures marine and locomotive diesels). In 1966 the new division changed its name to English Electric Special Products Group, whose subsequent history is noted above.

The Electrical Group is sub-divided into four divisions, one of which specialises in defence equipment.

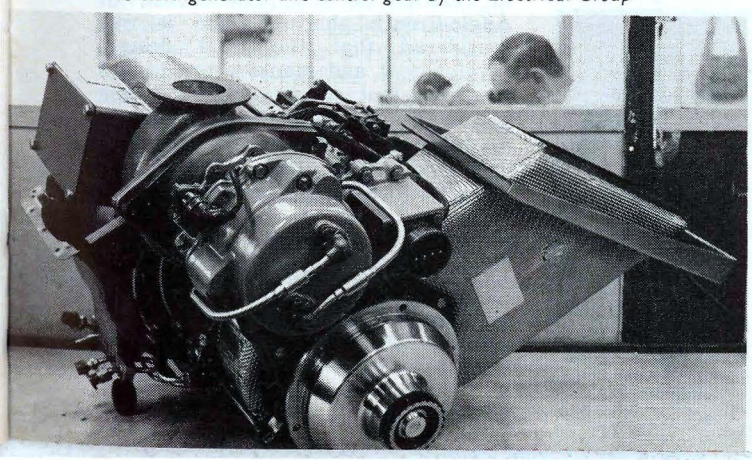
The two other manufacturing groups, Fabrication and Industrial, are primarily concerned with components and hardware manufacture. The first organisation has two main plants, both ex-Lucas Gas Turbine Equipment, at Hargher Clough (the headquarters) and Wood Top near Burnley. The Hargher Clough plant deals principally with high-precision production and assembly, while the Wood Top factory is concerned with machining manufacture but also contains extensive R&D facilities related to combustion processes. Among the Fabrication Group's products is the 9ft cold-thrust reverser for the RB.211, while Dart flame-tubes represent some of the long-standing products.

The Industrial Group is also centred on Hemel Hempstead and includes Vactric Control Equipment at Morden, Surrey, and Cybac Industrial Actuators at the Luton site; Rotax Precision Products, also at Hemel Hempstead, supply ballscrews to the aviation industry.

The Product Support Group has comprehensive facilities in Britain and overseas. It is responsible for the standardisation of the service data within the company, overhaul, repair and spares, service engineering and all aspects of customer liaison, including training. The group has its own manufacturing and test facilities devoted exclusively to overhaul and repair; it also manufactures non-current spares. A major activity is that of providing ARB-approved technical publications.

G. & E. Bradley continues to operate as an autonomous unit within Lucas. Its main concern is with the design and manufacture of a very wide range of laboratory and field test equipment. This extends from purely electronic units, such as oscilloscopes and digital-based equipment, to dynamometers and ground-support sets with electrical, pneumatic and hydraulic facilities. The application of microwave techniques to communication and manufacture is a speciality, as is the extensive calibration service offered to industry, notably the medical field.

This gas-turbine starter/APU for the Harrier is an example of inter-plant co-operation; the fuel system by the Hydromechanical Group, combustion by Fabrication Group, and gear train, mechanical assembly and 6kW generator and control gear by the Electrical Group



One of the biggest advantages of large organisations is the way in which the resources, and particularly the R&D facilities, can be made available throughout the group. In the increasingly competitive world market, a ready availability of such facilities is of very great, if not crucial, importance. Furthermore the minimum size of a research plant, for example a wind-tunnel, is frequently independent of the size of the organisation using it, thus expenditure on R&D tends to represent a smaller fraction of the capital invested as the size of the firm increases. The various companies which form Lucas Aerospace have brought with them a comprehensive and varied range of test facilities, and R&D is therefore treated largely as a total service. A special research centre was set up in 1965 at Shirley, Warwickshire, by Joseph Lucas (Industries) Ltd, where fundamental research is undertaken. Last year R&D expenditure by the Lucas group as a whole was £12 million (nearly 4 per cent of turnover), involving more than 1,000 scientists and engineers. Because of the nature of many of its products, the main emphasis throughout is on the application of advanced electronic control techniques wherever possible. (The Lucas Aerospace development of digital engine-control techniques was described in *Flight* for January 27, page 151).

The Lucas Aerospace test facilities fall into three categories—product, investigation and environmental. The product-test laboratories are largely geared, naturally, with the output of individual groups within the company; for example those associated with the testing or quality control of hydraulic or electrical components and systems. The investigation laboratories also naturally tend to be product orientated (acoustics, flow-visualisation, metallurgy, for example). But pride of place must go to the environmental facilities, some of which have very specialised tasks, such as explosion proofing, de-icing and rain erosion. One of the most noteworthy facilities is the high-altitude chamber at Wood Top, operated by Lucas Aerospace for the Ministry of Defence (Aviation Supply), which simulate conditions up to 50,000ft for engine tests.

Subsidiaries and organisation

Lucas Aerospace has a number of subsidiaries in Europe, including a 49 per cent holding in Fluggeratetechnik (owned by Bosch) and a 34 per cent interest in Pierburg Luftfahrtgerate Union. Joseph Lucas (Germany) is entirely owned by the UK organisation. In France, Lucas Aerospace owns 35 per cent of Auxilec and there are other wholly owned subsidiaries in both that country and in Italy. There are a number of licencees for various products. Siemens, for example, is licensed for certain electrical generation systems, while the Spraymat is built by Westfalische Metall Industrie.

The organisation is controlled by a board of six, headed by the deputy chairman and general manager of Lucas Aerospace, Mr J. J. Righton. Each group is headed by a product general manager who is responsible to the board, but who enjoys a very large degree of autonomy. The company is significantly dependent upon the health of the aero-engine industry, and consequently suffered a setback last year with the collapse of Rolls-Royce. The situation is now much improved, however, and most of the R&D costs associated with the RB.211 programme are expected to be recovered.

Lucas Aerospace is probably the largest organisation of those with a comparable range of products in Europe. It is still too early to assess the total effect of regrouping, but there is no doubt that only large and efficient organisations, with adequate experience and resources, will continue to gain significant contracts over a very wide spectrum in an increasingly multi-national environment. Their well-being is very largely dependent upon collaborative programmes as Jaguar, Concorde and MRCA as well as American projects such as TriStar. M.W.