THE PROTEUS BLUEBIRD

GOODWOOD - JULY 1962

In September 1960 the first Proteus BLUEBIRD crashed on the Bonneville Salt Flats, Utah. The car, using less than 80% of the full power available from the Bristol Siddeley engine, had accelerated from a standstill to nearly 400 m.p.h. in 24 seconds, over a distance of 1½ miles. At that point the left hand road wheels encountered a patch of wet salt in the area of the crude oil black guiding line. This surface was slippery and the tyres lost adhesion. The car half spun and was immediately airborne. Travelling at some 530 ft. per second the vehicle was in the air for more than 1,000 ft., and was rolling rapidly through the longitudinal axis. The tail struck the ground first, causing the machine to rear skywards; it then pitched forward and landed on the right hand front side, shearing off both front and rear wheels. The vehicle then slid on its undershields for a further 2,000 ft., finally coming to rest more than half a mile from the point at which it had left the course.

When the rescuers reached the car the engine was still running. Subsequent examination of the Recording "G" Meters showed that the BLUEBIRD had been subjected to accelerations of 16G; this is about twice the force exerted on an astronaut on re-entry into the earth's atmosphere. The car itself was destroyed although the engine, one gearbox, instruments and other components survived with only minor damage.

My injuries were confined to a severe fracture at the base of the skull; a rupture of the right middle ear, a burst eardrum and sundry other minor lacerations. That a human being could survive such an extraordinary accident was primarily due to two important factors: (1) the immense strength of the new chassis structure and (2) the safety harness—without the latter the crash would certainly have been fatal.

Subsequently, in hospital in Tooele Valley, Utah, I was greatly cheered by the many telegrams received from the associated British Industrial Companies who re-affirmed their confidence in the endeavour and assured me of their continued support. Sir Alfred Owen, with characteristic sportsmanship and generosity, cabled offering to build a new car and, in fact, work actually started before I left hospital.

The entire design was meticulously checked by K. W. Norris, the Chief Designer, and after most careful reappraisal, only very minor changes were made; these simply related to the repositioning of charging points and similar details intended to facilitate operation. Basically the new car is identical to the original.

A tail fin was tested in the wind tunnel and is fitted today; it may or may not be used during the Record Attempt, depending on the results obtained during the full scale trials. The protection round the driver's head has been greatly increased, the perspex canopy having been replaced by an extremely strong fibre-glass structure able to withstand a load of 50 tons. The instrument recording method has been changed from Telemetry which involved a very complex radio installation, to the Hussenot system which is carried completely within the vehicle. The instrument measures, to very fine limits, every aspect of the car's behaviour and simultaneously records such factors as pitch, roll, yaw, linear acceleration, power, speed and the degree and rate of movement of the suspension and steering systems.

The course conditions at Utah in 1960 were far from ideal, the surface was comparatively rough, whilst the maximum length of run was limited to 10½ miles; this is perilously short when contemplating speeds in excess of 400 m.p.h.

In January 1961 the British Petroleum Company very kindly undertook a world-wide survey in an effort to locate an alternative course; the ideal was to find a hard flat surface, level to plus or minus ¼ in. in 100 yards, 20 miles long by 2 miles wide and accessible to civilisation. The search narrowed to Lake Eyre in Australia. Lake Eyre is situated some 500 miles approximately North of Adelaide and is in the same general region as the Woomera Rocket Range. The area, which is classified as desert, is uninhabited, remote, desolate and sterile. The nearest habitation is a Sheep Station (Muloorina) some fifty miles to the South.

The initial surveys were conducted by South Australian representatives of the British Petroleum Company, in conjunction with Mr. Warren Bonython, President of the Southern Australian Branch of the Royal Geographical Society, who was responsible for the exploration of the region during the time of the great floods of 1950.

In August last year the Dunlop Rubber Company despatched a Research Team to assess the surface characteristics in relation to the special tyres which the Company had developed for the BLUEBIRD. This involved exhaustive trials with half scale tyres. The reports were most encouraging and showed that the adhesive factor at times approximated that of a dry asphalte road, and certainly was much in excess of the factor obtainable at Bonneville in 1960.

I visited Australia last October and it was immediately apparent that Lake Eyre could provide an ideal site for the next World Land Speed Record attempt, since the surface was hard and level and would permit a track 18/20 miles long and 1½ miles wide. However, a number of problems had to be satisfactorily overcome and an incalculable risk with the weather accepted. Lake Eyre is normally dry but has been flooded twice this century. The surface, although first class and amazingly level is occasionally and irregularly obstructed by "Salt Islands" which in effect are outcrops of growing salt standing a few inches proud of the main surface. Attempts have been made to remove these islands by means of graders; this however was unsatisfactory for it glazed and wounded the surface.

After consideration, a small experimental Mobile Milling Machine was fabricated and with this device a number of islands were satisfactorily removed within very fine limits.

As already mentioned, the area is remote and barren, it is without roads or communications, without water or habitation.

The project has been given every possible encouragement by the Australian Government and the South Australian Authorities, who have agreed to assist with the provision of a graded road and causeway onto the Lake, with transport, communications and rescue facilities. Indeed the magnitude of the task is such that it would be quite impossible without this support.

I am deeply appreciative of the welcome which Australia generally extended to this British endeavour and I hope and believe that Lake Eyre will provide a track which will enable us to achieve our goal—a new World Land Speed Record in excess of 400 miles per hour.

The expedition will sail from England towards the end of this year and I hope that we will commence Record Trials towards the end of March next, in order to take advantage of the calm weather normally expected in that region during April and May.

The World Land Speed Record is officially governed by an International Authority, the F.I.A. whose Headquarters are in Paris. The rules require a contending vehicle to be propelled and steered through the road wheels. Jet or rocket propulsion is prohibited.

The BLUEBIRD is the first car, designed for an attempt on the World Land Speed Record, to use a gas turbine engine. The unit is the Bristol Siddeley Proteus 755, technically known as a free turbine engine but often colloquially referred to as a "turbo-prop".

In the case of the BLUEBIRD the Proteus drives all four road wheels and, at full throttle, delivers 5,000 brake horsepower. The transmission is "fluid" or "automatic" in that the power turbine automatically absorbs the energy in the gas stream exhausting from the primary turbine; the greater the throttle opening the greater the energy in this eflux. In practical effect this provides "two pedal control": there is no clutch. Drive shafts are taken from either end of the power turbine to a fixed ratio gearbox and thence through half shafts and Birfield constant velocity couplings to the road wheels. These constant velocity couplings each have to transmit 1,250 horsepower.

The BLUEBIRD is a superlative example of British engineering skill and ingenuity; the car has been built by Motor Panels Ltd., of Coventry, a Company within the Owen Organisation; whilst Norris Bros. Ltd., were responsible for the design. A total of seventy-two British Industrial Companies have been directly concerned with the endeavour.

The BLUEBIRD has been designed to reach speeds far in excess of 400 m.p.h. and this has entailed the solution of many formidable engineering problems. The knowledge gained from all the associated research is applicable to a broad spectrum of Industry. By example, each of the David Brown gearboxes has to transmit some 2,500 horsepower, yet the units which are small and compact barely weigh 240 lb.; at peak power each generates the equivalent of 40 kilowatts of heat. It is not difficult to imagine the research with which the British Petroleum Company were involved in order to develop a lubricant which would stand up to the tremendous gear tooth loads, as well as to the very high temperatures imposed.

The BLUEBIRD was designed to run on a course eleven miles in length in order to safely stop. From 450 m.p.h. 76 million foot pounds of energy had to be dissipated in 60 seconds. The power operated Girling disc brakes are, on their own, able to deal with 36 million feet pounds of energy every minute. The brake discs run at a maximum temperature of 2,200°F., in other words, almost at white heat. The brake linings, or friction pads, were developed by Ferodo Ltd., and here again it is not difficult to imagine the tremendous stresses and strains to which this material is subjected at these amazing temperatures and pressures.

The development of the tyres was an equally formidable task and this was tackled by the Dunlop Rubber Company, who also produced the special steel wheels. In 1960, despite the savage treatment to which the tyres were subjected during the accident, not one burst.

The instrumentation system in the BLUEBIRD imposed special requirements. In addition to the normal instrument panels which closely follow aircraft practice, it was necessary to evolve a method of presenting the vital readings to the Pilot without deflecting his vision. This has been achieved through a complex development whereby speed and linear acceleration is reflected on to the windscreen; the figures are transparent and are focused on infinity. This system which was specially developed by S. Smith & Son (England) Ltd., has since been applied in the aeronautical field to high speed aircraft.

The above are but a few examples of the developments which have been undertaken by British Industry to produce this vehicle; they are simply quoted to illustrate the magnitude of the task.

The industrial co-ordination of this vast project has been, for me, a fascinating and exciting experience. The project which has now cost an estimated total of 1½ million pounds, has been entirely based on the generosity, goodwill and tremendous enthusiasm of the many Companies and individuals involved.

It is my belief that only in England could such a project be tackled in this way, and I fervently hope that it will play its part in maintaining British initiative in this field.

Bluebird Leading Dimensions

Overall Length:	30ft.	Wheelbase:	13ft. 6ins.
Overall Width:	8ft.	Track (front)	5ft. 6¾ins.
Overall Height (excluding fin)	4ft. 6ins.	Track (rear)	5ft. 6ins.
Overall Height (including fin)	7ft. 8ins.	Operational weight:	9,600 lb.