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reading to any extent in the French press, as one must on such an occasion as the ceremonial opening of the French Chain, it becomes apparent that, across the Channel, they do not easily forget or forgive accidents in the air. When the Saigon airliner came down in the Basses Alpes last September, a leader-writer in Le Monde devoted many columns to possible causes, eliminating everything, finally, except that the aircraft was many miles off course. (Extracts from this article are given on page 13.) In their account of the French Chain opening, Paris-Presse make the bold prophecy, '—le brouillard d’hiver et les sommets alpestres sont, désormais, dompté'. (—winter fog and the Alpine peaks are, from henceforth, conquered.) Many other French papers took the same line, and that the new Chain will be a great help to European flying no one can deny.

Apart from the French Chain Opening, a feature of special interest in this issue is the article on oil survey with the aid of a transportable Decca chain in the Persian Gulf, written by the senior Decca engineer on the spot. If coal was the ‘black gold’ of an earlier era, oil is a veritable river of wealth to-day, and its location has become a highly skilled and rewarding science. Over desert and sea, or in any ill-surveyed land, one of the great problems faced by prospectors is that of knowing exactly where it is that they are working at any time and how to return to the same spot. For this, a Decca network of position lines is the obvious and easy answer, and how it has been, and still is being used by one of the Shell group of companies is explained on page 2.

In Europe, both at sea and in the air, the most difficult period of the year for navigation is now upon us. While all are hoping that this winter will be kinder than last with its storms and loss of life, every device that helps to make for safety and uninterrupted service redoubles in value. Among these the Decca System will, there is no doubt, continue to play an important role.
RECENT INTERNATIONAL events have emphasized the vast effort and resources which go into the refining of oil products before they can be put to everyday use. One point which is usually overlooked, however, is that mineral wealth represents capital and capital once used is lost for ever. Present known oil reserves at today's rate of consumption will last only a matter of another fifty or sixty years: it is thus not only a wise but also a very necessary policy for the major producing oil companies to spend large sums annually in seeking new sources for their raw material, crude oil.

Large sums are mentioned because oil exploration, in recent years, has become a highly competitive business calling for the services of many skilled scientists and engineers together with a large amount of very valuable equipment. This was not the case in the early days, when surface oil seepage was a simple guide to locating the first wells, but soon the prospectors were forced to seek 'fresh woods pastures new' and so began 'wildcatting'. 'Wildcatting' was a method of well location based on a mixture of local information, rough geology and pure chance in varying proportions. There were even those claiming to find oil with a twig like a water diviner, but all these methods brought their crop of expensive dry holes more often than the spectacular and rewarding 'gusher'.

All this time big strides were being made in surface and subsurface geology; the types of structural faults beneath the surface most likely to contain oil were being recognized and the whole accompanying technique of geophysical prospecting was developed and put into practice in areas where no surface indications of possible oil deposits were evident.

Crude oil does not accumulate in the form of a subterranean lake, but exists as a porous rock saturated with oil. Above this bed, which usually consists of sandstone or limestone, there must be a layer of hard impervious 'caprock' to prevent the oil from leaking away. There are certain geological formations or structures which are known to produce this trapping effect and the whole science of geophysics is bound up with presenting an approximate picture of how and where these strata lie and, albeit even more approximately, their composition.

Any property which is measurable on the surface and is affected in a consistent manner by the type or position of these underground layers will help the exploration man to visualise the formations several thousand feet beneath him without the effort and expense of drilling a large number of small diameter test holes.

Three main methods of carrying out this work have been evolved, depending in the first two cases on measuring variations in the earth's magnetic and gravitational fields and, in the third, noting the time taken for explosive shock waves to be reflected or refracted from the various layers below; this is known as the seismic method.

These exploration techniques have been listed roughly in increasing order of accuracy, complexity and cost. An airborne magneto-meter survey can be carried out over a wide area quickly and cheaply but the results usually do little more than indicate where to probe with the sharper tools of the gravity and seismic parties.

Some highly sensitive gravity instruments have been developed which depend on the principle of a mass suspended from a spring
balance; any change in the earth’s gravitational pull is thus reflected as a change in the extension of the spring. Measurements at chosen intervals apart on either land or sea can be made with equal ease and from these can be drawn contours of constant gravity. On studying the contours the geologist decides whether the gravity ‘highs’ or ‘lows’ are indicative of an oil-bearing formation or not and whether more detailed examination by, perhaps, the seismic method is likely to prove fruitful.

If a charge of explosive is detonated on or just below the surface of either land or sea, a pressure wave is radiated downwards into the earth and may be partially reflected or refracted from the boundaries between layers of different types of rock. On reaching the surface, this secondary energy is picked up on instruments called ‘geophones’, several of which are spread out along the surface. The geophones transform the shock energy into electrical variations, the magnitude of which are recorded from each instrument simultaneously on a moving film. From irregularities and discontinuities in these records, the skilled interpreter can produce cross sections which indicate the nature and position of the underlying formations.

So much for the various means used to probe thousands of feet below the earth’s surface. But how does the geophysicist determine the true geographical positions of all his observation points, without which he cannot piece together his results? As time goes on, oil exploration has been forced into more barren and relatively unknown territories where the absence of existing geodetic control has made necessary the expenditure of large amounts of time and money in establishing a suitable system: in fact, the survey time may greatly exceed that required to complete the geophysical observations themselves. This is especially so in any undersea work where a highly costly system of floating buoys may have to be laid down, surveyed and maintained over a wide area.

Since most of the larger oil companies are either actively engaged in, or are at least contemplating such a marine project, attention has been focused on the increasing use of radio aids in solving the survey problem. The value of the Decca System in this field was soon recognized and in 1949 a Transportable Chain of stations was supplied to the Bahrain Petroleum Co. for use in the Persian Gulf.

At the end of last year the Shell group of

*A Decca Navigator Transmitting Station in the desert.*
companies successfully negotiated an agreement with the Sheik of Qatar which permitted a large scale investigation of oil prospects beneath the waters surrounding his territory, a barren sandy peninsula lying to the east of Bahrein Island. The absence of any overall survey system and the size of the area concerned made some form of radio aid a necessity if the complete concession was to be explored in the time available, so early this year a contract was placed with The Decca Navigator Co. to supply and operate such a system. Three months later a three-station Survey Chain, complete with all operating personnel, was supplying ‘fixes’ for a variety of purposes ranging from marine gravity work to general land reconnaissance.

The problems associated with such a venture are not all technical but include many things which are usually taken for granted in more civilized conditions. Each transmitting station is self-contained, being run by one Decca engineer with Arab assistance. Apart from the radio link, his only outside contact is the arrival of the truck or dhow—one Slave station is on a small island—bringing water and supplies. Temperatures during the summer months are high enough to make some form of air-conditioning essential but even this does not overcome the sudden winds which spring up bearing sand, dust and burning heat. However, most of the sites offer excellent bathing together with an enormous variety of multicoloured fish, which, it has been discovered, are easy prey for a station engineer equipped with underwater goggles and flippers.

Near Doha, the largest town, is based the fleet of survey vessels nesting under the wing of their mother ship, the Shell Quest, which carries all manner of equipment and workshops and at the same time provides recreational facilities for the crews. Ashore, the oil company offices together with the Decca Monitor Station and receiver workshops stand beside the fortified walls of the Sheik’s palace. All round the area is activity: houses are springing up overnight and roads and waterworks are being constructed.

Development in Qatar during the last year or so has been so rapid, in fact, that the average Arab accepts such things as radio and radio aids in the same way as he accepts oil lamps. The goatskin tents of the Bedouin stand beside modern power stations, the ancient cries of the market now include that of ‘Coca Cola’ and Qatar, thanks to the recent discovery of her oil fields, may indeed lay claim to its nickname—‘The Land of Camels and Cadillacs’.

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Monitoring in tropical heat.
Three transmitting stations are used in the Qatar chain, one of them being on Halul Island in the Persian Gulf, the others on the mainland. (This picture, and the one on the previous page, was taken by the Shell Photographic Unit.)
One of the most important shows of the year for the shipping industry is the Engineering Marine and Welding Exhibition. Here is the Decca stand, as it was seen and admired by many visitors to Olympia in 1953.

At the Exhibitions...

In spite of an electricians’ strike which led to the anachronism of paraffin oil lamps shedding light on the latest electronic devices for much of the time, the Engineering Marine and Welding Exhibition at Olympia in the autumn of 1953 was a great success. The Decca stand, on which both Navigator and Radar were demonstrated, was designed as the superstructure of a modern ship, with three decks providing comfortable accommodation for equipment, demonstrators and clerical staff. Many old and new friends were welcomed, from all parts of the world.

Air interests were being taken care of at about the same time at Farnborough where the S.B.A.C. show lived right up to, if it did not surpass, its previous high reputation. On the Decca Navigator stand there, the air versions of receivers and decometers were shown, and the Flight Log with its automatic chart selector. These, as usual, aroused the greatest interest in all who saw them. The Navigator Company’s aircraft, G-AGWE was kept fully occupied giving demonstrations to the more serious enquirers.

One other exhibition, still open, is ‘Navigation To-Day’ at the Science Museum, South Kensington. Begun as a temporary exhibit, its closing date has already been several times postponed and it looks like becoming semi-permanent. Here the Decca Navigator can be seen in company with other modern navigational devices, the whole giving a striking collective picture of the progress made in this ever more vital art of position finding without landmarks.
m.v. KUNGSHOLM, the fine new flagship of the Swedish American Line. She is of 22,000 tons and made her maiden voyage to New York at the end of November.

THEY USE THE NAVIGATOR

The COROMANDEL, one of the P & O liners that uses the Navigator (see page 12).
The LAVOISIER, owned by Cie Maritime des Chargeurs Réunis, Paris.

I.S.S. OLYMPIA, another fine new ship which has been much in the news. She is the flagship of the Greek Line, and is on the North Atlantic Service.
'MONSIEUR DEVINAT’s finger pressed a switch, pilot lights glowed, Tours-Chargé the Red Slave of the Decca Chain was on the air, and with it all the stations of the French Chain.‘

In such phraseology, with photographs, diagrams, explanations and prophecies for a great future, practically every national newspaper of the French press gave enthusiastic welcome to the first permanent French Chain of the Decca Navigator System, inaugurated on October 24.

Performing the ceremony, the official mis en marche of the Chain was Monsieur Paul Devinat, Secretary of State for Public Works and for Civil and Commercial Aviation. The Red Slave was chosen as the venue for the occasion because, of the four stations, it is the one nearest Paris and so most suited to the convenience of visitors. The others are at Montluçon (Master—or Mistress as the French prefer to call it), Aurillac (Green Slave) and Châlon-sur-Saône (Purple Slave), which is M. Devinat’s own constituency.

About a hundred and fifty guests had been invited to the ceremony, hospitality and organizing being in the friendly and capable hands of Société Française Radioélectrique of Paris, who are the French concessionaires for the Decca Navigator. Except for certain items of control gear which were made in the Decca factories in London, S.F.R. manufactured all the transmitting equipment and were responsible to the French Government for the building and installation of the Chain. The Chain itself, like the German, is State owned, and was ordered by the Government.
As at all Decca Chain openings, the gathering was cosmopolitan, emphasizing the international application of the service provided. In addition to the many French statesmen and officials there were representatives of Marine, Air and Military interests, and of the Press, from Italy, Spain, Sweden, Switzerland, Norway, Germany, America, Denmark, North Africa, Holland and South America. The British party, which flew over from London Airport in a chartered Skymaster of Air France, included reporters from all the principal journals, the B.B.C. Sound and Television, and officers of the Ministry of Transport, Ministry of Civil Aviation, British European Airways, British Overseas Airways Corporation, the Navy, the Merchant Service and the Royal Air Force.

M. Devinat was received at Chargé by Monsieur Tabouis, President of S.F.R., and by the Prefet d'Indre et Loire and Mayor of the locality, and after listening to a brief explanation of the Decca system given by M. Pierre Grenier, of the French Ministry of Civil Aviation, pressed the switch that formally indicated the opening of the Chain. A tour of the station followed, then lunch, and after lunch one or two short speeches.

M. Tabouis, in welcoming the Minister, forecast great success for the Decca System over France, ‘—a success’, he said, ‘which will become more and more apparent as it is more and more widely used’. He saw in it also a further step towards that lasting peace which both England and France were always so
Une nouvelle chaine de radio-navigation a été inaugurée près d’Amboise
par M. Paul DEVINAT

Après avoir permis le débarquement de 1944
Le navigateur « Decca » trace sur la carte la route suivie par les avions et les navires

1944 FRANCS PAR AN
La montagne ne tuera plus les avions

A Nos Lecteurs Français

CHERS AMIS—permettez-nous de vous renouveler nos plus vifs remerciements pour le chaleureux accueil que nous vous avez réservé lors de notre récente visite dans votre beau pays, et dont nous gardons le plus agréable souvenir.

Nous nous félicitons qu’après plusieurs années de coopération sincère entre la Cie Société Française Radioélectrique et la Cie Decca Navigator, la Chaine Française ait été établie. Nous souhaitons ardemment voir une expansion rapide de notre système dans toutes les branches intéressées; c’est une sauvegarde indéniable pour ceux qui l’emploient et qui est grandement appréciée aussi bien sur mer que sur les routes aériennes.

Nous sommes fiers de savoir que notre rayon d’action s’étend maintenant des pays Scandinaves à la Méditerranée, grâce aux Chaînes établies en Grande Bretagne, au Danemark, en Allemagne, et en France. Nous avons le ferme espoir que cette liaison dont le but est de faciliter la navigation, facilitera en même temps la cordialité des relations entre les pays adhérents, et à tous nous offrons nos vœux les meilleurs de pleine réussite.

La sécurité aérienne
Installation d’une chaîne Decca en France

Depuis samedi, il n’est plus permis à un avion survolant la France de se tromper de route

Nearly all the French newspapers carried big headlines welcoming the French Chain and forecasting a great future for it, especially in the navigation of aircraft.
earnestly striving for, 'For', he concluded, 'all Governments owe it to themselves to extend a welcome to such a device as this, which, unhampered by frontiers, offers to Western Europe and to Africa—its logical extension—a new factor of safety and facility in communications and trade'.

M. Devinat spoke of the '—breathtaking progress made in aviation in our time', and added '—but as we conquer the air, so follows the necessity for maintaining equal progress in safety measures. It is a pleasure as well as a duty to compliment our friends from Britain on perfecting, out of the tragedy of war, this new system of radio navigation. France was quick to realize its value, and we lost no time in deciding to erect a Decca Chain in our country. This ceremony to-day shows that France is determined to keep her rightful place in the front ranks of progress in aeronautical techniques'.

'The popularity of air travel', the Minister concluded, 'demands the highest standards of safety, for public favour goes hand in hand with public confidence.'

Mr. E. R. Lewis, head of the Decca group of Companies, made the final speech of the day, thanking S.F.R. for their hospitality and congratulating them upon the successful outcome of their labours on the French Chain. It had been a great pleasure to co-operate with them in this work, and he hoped and believed there would be even more successes ahead. The Decca Navigator System had never ceased to expand since the first Chain, the English, was laid down soon after the war. He hoped it would now go on from France to Spain, Spain to Italy, North Africa, and even further. For the part they had played in the present phase he would like to say Thanks and Good Luck to their French colleagues.
RELIABILITY is one of the qualities that have always been inherent in the Decca Navigator, a desirable feature in any electronic equipment but one which is not invariably to the forefront. This quality in Decca is the more remarkable when it is remembered that the equipment is run for long periods at a time without being switched off even momentarily. In a near-water fishing trawler for instance, from the moment of leaving port to the moment of return, which might be fourteen days later, the set will be running the whole time. An example of the high degree of reliability is instanced by the coastal vessel Glamis (owned by the Dundee, Perth & London Shipping Co. Ltd.) on which the Navigator has needed service only six times since it was first fitted in February, 1948. No service at all was required in 1950, one was carried out in July, 1951, and after that there was one in October, 1953. The Glamis operates between Dundee and London, making some 48 voyages a year, and this means that between the last two services her Decca Navigator equipment totalled 10,000 operational hours.

AMONG OTHER recent home fittings are those to the Jonathan Holt, of the John Holt Line; the Waterland, and Foreland, belonging to the Shipping & Coal Company Limited; the British Railways' ship Normanna, Craggs & Jenkins's Royalgate and the United Baltic Corporation's Baltavia. In Ireland, the Ballymoney, belonging to John Kelly Ltd., of Belfast, has been fitted.

MANY FRENCH orders continue to be received, some of the more recent being for the Croisset, Contelis, and Caumont, all belonging to Cie France Navigation. Louis Lumiere, and Claude Bernard, owned by Cie Maritime des Chargeurs Réunis and engaged in the South American trade, have also been fitted. Others trading to South America are the Charles Tellier, and Leemnae, of the Cie de Navigation Sud Atlantique. The Pont Aven, owned by Union Industrielle et Maritime and trading to Portugal and Morocco, is another recent French fitting. Many trawlers are now being fitted from the Bay of Biscay ports, following the new coverage provided by the French and the South-West British Chain.

IN GERMANY more trawler fittings are reported, including the Johann Klaute, owned by N. Ebeling, and Ferdinandor, by Fisser & Van Doornumm. Other Continental fittings are to the new Dutch ship Trilo, owned by Maatschapij Zeever; the Belgian trawler Francois Musin, of N.V. Motorvisscherij; and Nils Gorthon, of Gorthon Lines, Sweden. In Norway, A/S Halvorsen's Valby, and the Samelet Irax new vessel Irax, managed by A/S Hans Kiaer & Co., are being fitted.

PENINSULAR & ORIENTAL Steam Navigation Company have recently ordered five Navigators for deployment in their fleet; one of their vessels is shown on page 6. Another fleet fitting comes from Milford Haven, where Jenkerson & Jones are now equipping their nine trawlers with Decca Navigators.
AT THE recent International Fishing Boat Congress in Paris, Mr. Basil Parkes, Managing Director of St. Andrew’s Steam Fishing Co. Ltd. of Hull, one of our leading trawler owners, presented a paper on the suggested specifications from the owners’ point of view for deep-sea, middle and near-water trawlers. Regarding navigational equipment for near-water trawlers and drifter-trawlers he said, ‘Many of the ships are now fitting the Decca Navigator, which is of great assistance to them in keeping their position on the fishing grounds and keeping clear of wrecks, etc., also for navigation to and from the grounds in fog and thick weather’. The Conference met in October to discuss all aspects of commercial fisheries under the auspices of the Fisheries Division of the United Nations, and brought together leading authorities from seventeen countries. To date, over 400 trawlers, seiners and drifters are using the Decca System which has, during the past few years, become one of their most important navigational aids.

TO USERS—Operational Data

An up-to-date list of Decca charts will be issued shortly under Data Sheets Group 4. The lattice drawn on the following charts covering the Bristol Channel have been corrected for fixed errors in this area: L1178, L1152, L1179, L1176, L1165, L1076. It should be noted, however, that there may be small remaining errors not included in these charts and these are shown in Data Sheet 2D. They are applied of course in the normal way.

The following extracts, mostly verbatim, are taken from an article which appeared in the French newspaper Le Monde in September. That the tragedy of the Paris–Saigon air-liner is not forgotten by the French was apparent from the number of newspaper references that were made to it six weeks later, in connection with the Decca French Chain opening.

PARIS—SAIGON

When the Paris-Saigon airliner crashed near Barcelonnette in the Basses Alpes in September, Le Monde’s leader-writer, Bertrand Delpech, blamed lack of navigational facilities. ‘One is dumbfounded at the thought’, he wrote, ‘in this age, when aircraft cross seas and continents in a few hours, traverse the pole, land in total darkness, that they can still be fifty miles off course without knowing it. Progress in fitting radio-electric aids has not been so rapid as progress in aircraft design; accidents are less and less attributable to failure of material, and statistics show that the greater part of to-day’s mishaps are due to navigational errors. The 1947 crash in the Isère of a Paris-Nice plane was due to a wrong calculation of longitude; in the two crashes of November, 1950, on Mont Blanc and in the Massif of Obiou both machines were off course.’

Delpech pointed out that the Paris-Saigon airliner had reported herself over Montelimar only six or seven minutes before the crash, and had asked Aix-en-Provence airfield for permission to land there, which was normal. How then, did the crash occur on Mont Cemenet? (The map shows Barcelonnette about 90 miles west of Montelimar, Aix-en-Provence about 80 miles south).

‘The catastrophe again draws attention to a tragic gap in air transport’, is his conclusion. ‘The short-wave radio installations on which the aircraft which cross our territory depend, are no longer sufficient... (but)... new processes of radio navigation are to hand; radar which can indicate to pilots any obstacles around them, or the Decca system on long waves which gives the navigating officer his position with extreme precision. At the last Aeronautical Salon there was even an ‘automatic route tracer’ on view, using the Decca System, which gives ships and aeroplanes a visual record of their track. British, Danish and German territories are covered by the system’s land transmitting stations.

‘Will the Paris-Saigon accident cause those in charge of Public Works to bring about the operational use of the Decca stations already in France, and gradually to enforce their use?’
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