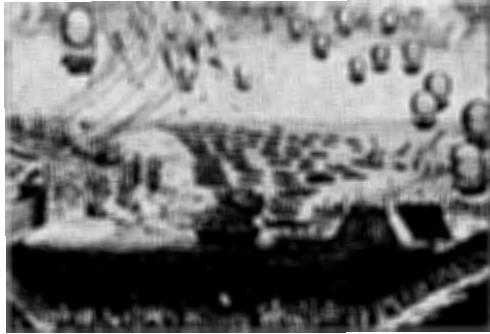


## A VIEW FROM DOVER CASTLE: THE ENGLISH CHANNEL TUNNEL

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(Presented at a meeting of The Boston Society of Civil Engineers, May 17, 1965.)

In addressing the oldest engineering society in the United States, it is some comfort to reflect that the project which gave rise to your invitation has, itself, a history reaching back more than two hundred years. In 1751, a prize was awarded by the Amiens Academy to Monsieur Desmarests for an



outstanding design of a channel tunnel.<sup>1</sup> A half-century later, Mathieu Favier, a young French engineer, had his sketches brought to the attention of Napoleon Bonaparte, who showed them approvingly to Charles James Fox.<sup>2</sup> And in 1878, actual excavation of galleries was commenced by channel tunnel companies formed in the United Kingdom and in France.

After the British government cancelled authorization of the project in 1883, following the vigorous objections of Lord Wolsley, a prolonged debate ensued as to the desirability of a channel tunnel. The matter was not finally settled until the historic exchange of messages between Queen Elizabeth II and General DeGaulle on February 8, 1964.

As many of you are aware, the Channel Tunnel Study Group, under the supervision of the Joint Commission of Surveillance, has been carrying out the final engineering and geophysical survey for the British and French Governments. This work has been under way for many months. As a non-engineer, it would be invidious on my

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<sup>1</sup> French Technical Bulletin 7-8, 1964, p. 1.

<sup>2</sup> T. Whiteside, "Tunnel under the Channel," Simon & Schuster, 1961, p. 15.

part to attempt to describe the technical alternatives and problems of this vast and historic undertaking: should any of you have occasion to visit Dover Castle during the summer months, you will readily observe for yourselves the scope and quality of the effort directed from our field headquarters, with its array of ships and special devices.

The results of the geophysical survey which began last summer are still being studied and interpreted. However, the continuity of the lower chalk stratum across the channel has been confirmed, and the limits of this geological layer have been defined with sufficient accuracy to determine the alignment of a bored tunnel. Of course, a

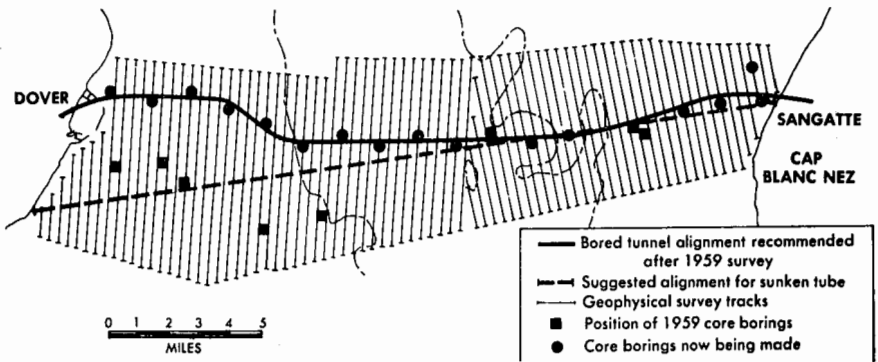


FIG. 1.—POSSIBLE TUNNEL ROUTE AND LOCATION OF EXPLORATORY WORK.

further purpose of the supplementary program of investigations has been to obtain sufficient information in order to choose the type of tunnel to be built (bored or immersed). Perhaps both types will be found technically feasible: proposed routes for an immersed tube are under investigation.

The program of core borings commenced last autumn with several converted tank landing craft, using ex-navy boom defense vessels as mooring vessels for the drilling ships. The accelerated arrangements put in hand for the coming months include a new type of ship belonging to the French Institut de Pétrole, the "Terrebel," which uses a drill controlled by a flexible tube from the surface. In addition, drilling platforms will be employed for the shallower bore-holes and agreements have been concluded for the use, starting in June 1965, of the "GEM 111" and the "NEPTUNE I" drilling platforms. The

"GEM 111" platform belongs to the "Compagnie Générale d'Equipements pour les Travaux Maritimes" (G.E.M.), affiliated with the Hersent and De Long groups. The "NEPTUNE I" platform, which belongs to the Neptune Company, has been put at the disposition of the Channel Tunnel Study Group during a short period on its way to oil-drilling operations for the North Sea French group, through Total Oil Marine Limited.

Consulting Engineers for the Channel Tunnel site investigations are: Sir William Halcrow & Partners; Livesey & Henderson; Rendel, Palmer & Tritton; Société d'Etudes Techniques et Economiques (SETEC) and Société Générale d'Exploitations Industrielles (SOGEI).

The core borings are being accomplished by an Anglo-French joint venture consisting of George Wimpey & Co., Limited, and Forasol. Position fixing equipment has been supplied by Decca Navigator Co., Ltd. Geophysical work is being carried out by scientists from Edgerton, Germeshausen and Grier, Inc., of Boston. Earlier studies have benefited from American as well as European technology. Parsons, Brinkerhoff, Quade & Douglas of New York reported on the feasibility of a bridge or of a combination tube-bridge. Marine Geophysical Services and Alpine Geophysical Associates undertook an early Sparker survey, following a useful sonar survey made by Telephonics Corporation (of Long Island). A basic report on a bored tunnel was prepared by the Bechtel Corporation, Brown and Root, Inc., and Morrison-Knudsen Company, Inc., and a consortium including Raymond International, Inc., Kaiser Engineers and Constructors, Inc., De Long Corporation, Healy Tibbits Construction Co., Macco Corporation, Peter Kiewit Sons' Company, and Tavares Construction Co., Inc. submitted a useful report on an immersed tube. Prior to the decision by the Joint Commission and the Governments in favor of a tunnel, as opposed to a bridge, Steinman, Boynton, Gronquist & London prepared an independent calculation of the cost of constructing a bridge.

Boston has contributed in many ways to the success of the study program. The Sparker survey carried out by Edgerton, Germeshausen and Grier, Inc. has been an outstanding success. American Research and Development Corporation was an early investor in Technical Studies, Inc., and General Doriot himself serves on the company's Board of Directors. Monsieur Arnaud de Vitry, Chairman of Technical Studies, Inc. and a member of the supervisory committee of

the Channel Tunnel Study Group, was graduated with high honors from M.I.T. and from the Harvard Business School.

The entire project has been an example of effective international and interprofessional coöperation. Since 1957, the program of studies

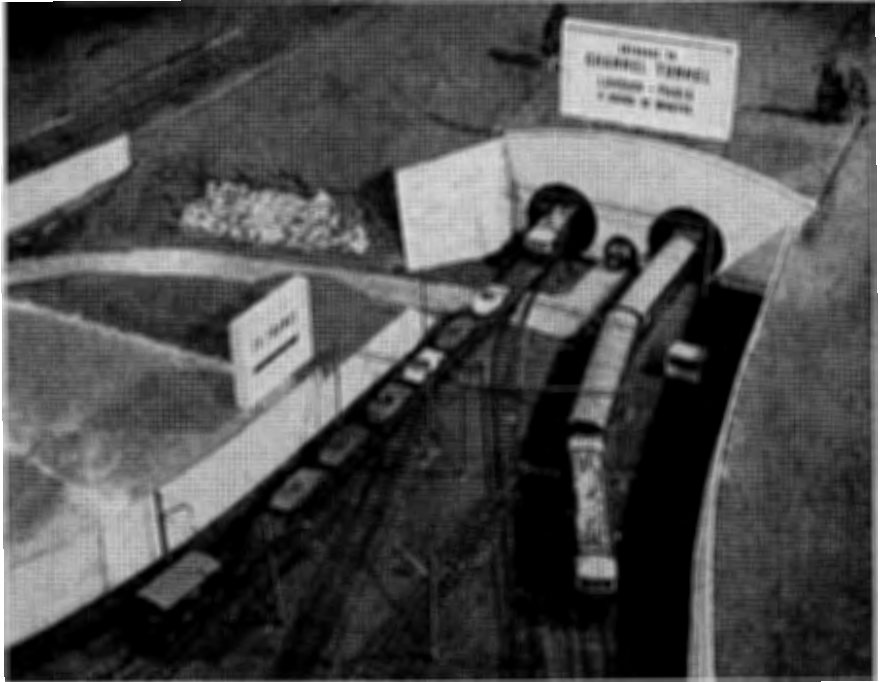


FIG. 2.—THE TUNNEL ENTRANCE. THERE WOULD BE TWO SINGLE TUNNELS WITH A SMALL MAINTENANCE TUNNEL SANDWICHED BETWEEN THEM. THE RAIL TUNNELS WOULD BE LARGE ENOUGH FOR CONTINENTAL TRAINS AND WOULD BE INTERCONNECTED AT SEVEN-MILE INTERVALS. ACTUAL RAIL LAYOUT AT APPROACHES WOULD DIFFER FROM THAT SHOWN IN THIS MODEL. COVERED SINGLE AND DOUBLE-DECK CARRIERS WOULD BE USED TO CARRY CARS AND THEIR PASSENGERS RATHER THAN OPEN VEHICLES AS SHOWN IN THE ILLUSTRATION. MODEL WAS BUILT BY THE BRITISH TRANSPORT COMMISSION'S PUBLICITY DEPARTMENT.

has been planned and supervised by Monsieur René Malcor, Ingénieur en Chef des Ponts et Chaussées, and Horace J. B. Harding, president of the Institution of Civil Engineers in London. The international consortium reporting on traffic and revenue included De Leuw, Cather & Company, of Chicago, Société d'Etudes Techniques et Economiques (SETEC), of Paris, and the Economist Intelligence Unit, of London.

The international Channel Tunnel Study Group itself was formed in Paris during the month of July, 1957, to investigate, with all the resources of modern science, the feasibility of a cross channel link and to assist in its realization should a practical program emerge. The Study Group includes the two companies founded for this purpose in the nineteenth century (the Channel Tunnel Company, Ltd. and the Société Concessionnaire du Chemin de Fer Sous-Marin entre la France et l'Angleterre) together with the International Road Federation (Paris office), the Suez Financial Company (formerly the Universal Suez Canal Company), and Technical Studies, Inc., of New York. The European participants benefited from the membership in their companies of governmental elements: the French National Railway System owns a fifty percent interest in the Société Concessionnaire; the British Transport Commission is perhaps the principal shareholder of the Channel Tunnel Company and, as a result of Disraeli's famous action in 1875, Her Majesty's Government is the largest single shareholder in the Suez Financial Company.

Although Technical Studies, Inc. is privately held, its former directors include the present United States Undersecretary of State, and the present United States Secretary of the Navy. The Board of Directors today includes the Honorable Lewis W. Douglas, former U. S. Ambassador to the Court of St. James's; the Honorable Warren L. Pierson, former president of the Export-Import Bank; General Georges F. Doriot, former Deputy Director (research and development), War Department General Staff; Lewis A. Lapham, chairman, Executive Committee, Bankers Trust Company; N. Dean Jay, a director of Morgan Guaranty Trust Company of New York; Cyril C. Means, Jr., Esquire, former Arbitration Director of the New York Stock Exchange; Alfred E. Davidson, Esquire, former general counsel of the U. S. Foreign Economic Administration; and the speaker. As mentioned earlier, Monsieur Arnaud de Vitry is chairman of the company.

As the final survey nears completion, and the various arrangements for finance and management are perfected, the project is almost certain to encourage other large transportation links throughout the world. It may be that not the least service rendered by the channel tunnel will be the practical demonstration of a management system conducive to effective collaboration between national governments and the international capital markets.