



MEng 450

Case Study

## **THE CHANNEL FIXED LINK : LE PROJET DU SIÈCLE**

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## INTRODUCTION

If the British and French really have some interest and aim in common, they will find a way of surmounting all those much-trumpeted cultural and traditional differences (Sir Nicholas Henderson, chair of Channel Tunnel Group and former British ambassador to France).

This case study provides a description and analysis of the Channel Tunnel project with the aim of stimulating class discussion on the strengths and weaknesses of the project management of this extraordinary construction project. The data are drawn from both an extensive review of secondary sources, and from interviews conducted with key informants towards the end of 1993 within TML, and during 1995 within Eurotunnel. The case study will present the background to the project, and the complexities of the financial arrangements, before investigating the management of the project and the organisation of TML.

## BACKGROUND

There are few projects against which there exists a deeper and more enduring prejudice than the construction of a railway tunnel between Dover and Calais. Again and again it has been brought forward under powerful and influential sponsorship. Again and again it has been prevented. Governments of every hue, Prime Ministers of every calibre, have been found during successive generations inflexibly opposed to it. To those who have consistently favoured the idea this ponderous and overwhelming resistance has always seemed a mystery. Winston Churchill, 1936.

The idea of a fixed link between Britain and France was first mooted by a French engineer in 1802, much to the horror of the British military, who had recently secured the Peace of Amiens. Little came of the project and many of the others that were proposed over the years, save a collection of entertaining drawings. The first project to actually start digging was a railway tunnel which was begun in 1880 by Watkin, the chairman of the South Eastern Railway in collaboration with the Chemin de Fer du Nord. Watkin's company, which became the Channel Tunnel Company in 1887, received a charter from Parliament for experimental works, in order to test the tunnelling technology. Watkin lobbied hard for a full rights and government finance for his activities, but increasing opposition from military prevented an extension of the charter. Although technologically feasible, on the basis of the triumphs of the railway tunnels through the Alps and the invention of the Beaumont/English tunnel boring machine, the project was defeated by weight of opposition on military grounds, and establishment opinion in cultural circles. The work stopped after an injunction had been served against Watkin in 1883 after some 1800 metres had been bored at both Sangatte and Shakespeare Cliff.

Undaunted, engineers and entrepreneurs from both sides of the Channel put forward a wonderful variety of schemes over the next 80 years. These came closest to fruition in the period after World War I, when elements of military opinion realised that the existence of the tunnel would have been of considerable logistical benefit during the war, and provisions were made in the Versailles treaty for its construction. However, these proposals met a similar fate when establishment opinion mobilised against the project. The convolutions of this opposition on military grounds were extraordinary, but, this opposition was undoubtedly rooted in a cultural insularity that

pervaded many sections of the British establishment. It was not until 1955 that Harold Macmillan, then Minister of Defence, stated categorically that there were no defence objections to the construction of a fixed link, but it still took another 40 years to realise the project.

In 1957, the Channel Tunnel Study Group was formed, including the concessionaire companies of the 1880 attempt, and a White Paper in 1963 (cmnd 2137) proposed an essentially privately funded project. A joint statement was issued by the British and French governments in February 1964 favouring the initiative. Considerable debate ensued, particularly in Britain, and only in October 1972 were agreements signed between the two governments, and the Société Française du Tunnel sous la Manche (SFTM) and the British Channel Tunnel Company (BCTC) for Phase 1 of the works. These two companies combined national banking and the nationalised rail interests (SNCF and BR) and the old Channel Tunnel Company which had led the 1880 attempt. Notably they did not include construction interests; SITUMER and RTZ Development Enterprises, respectively, were appointed as project managers. The agreements provided for the two companies to build a tunnel with a combination of risk capital and loans guaranteed by the two governments in proportions ranging from 10:90 to 30:70 in favour of guaranteed capital. It was to be handed over to a publicly owned corporation upon completion. The estimated construction cost in 1973 prices was £486m.

The project was divided into three phases. The main tasks of Phase 1 were the completion of technical and financial feasibility studies, and the preparation of the legal and financial documentation for Phase 2. A government review of Phase 1 (cmnd 5430 1973) recommended moving forward, and the Phase 2 agreements were signed in November 1973 after the signing of the Treaty between the two governments. Amongst other things, the Treaty and Phase 2 agreement obliged the British government to support British Rail in providing a high speed rail link from the tunnel to London. Phase 2 consisted mainly of engineering design work and preparatory construction works. Full construction works awaited agreement on Phase 3, which depended upon ratification of the Treaty between the two governments. However, political uncertainties and a change of government in Britain in May 1974 delayed the bill, and in the November the new Labour government announced that it would not go ahead with the rail link. After an attempt at renegotiating the agreements, the tunnel's fate was sealed by an announcement from the British government that it was to be abandoned in January 1975.

In essence, the project was sacrificed to the need to gain political stability and reduce public expenditure at a time of considerable crisis for the British state, despite the fact it had joined the (then) European Economic Community two years earlier. Further consideration shows that the structure of the project was flawed in a number of ways. Firstly, there was the lack of a single client - SFTM and BCTC remained independent entities dealing separately with their national governments. Secondly, there lacked a political champion on the British side, particularly after the change of government. Thirdly, although British Rail was a full shareholder in BCTC, it lacked commitment to either the tunnel or the high speed rail link, and saw them as

diversions from providing a commuter service in the home counties. Fourthly, the shareholders of BCTC lacked the incentive to fight for the project at the end of 1974 due to the generous cancellation terms contained in the Phase 2 agreements. Despite the fact that the oil crisis improved the competitiveness of the tunnel against the airlines, the overall political and economic situation of Britain in 1974 meant that these flaws were starkly exposed and led to its cancellation. To these factors can be added the deeply anti-European attitudes of some parts of the British establishment, resting historically on a strong isolation of the UK from continental Europe.

Renewed initiatives followed after the affirmation of British membership of the EEC in the referendum of 1975. These first came from BR and SNCF, but the French were generally very cool towards these initiatives - understandably since perfidious Albion had twice let them down. The change of government in 1979 proved them right, as the incoming administration made it clear that a public sector scheme was not acceptable. The change of government in France and the rapport that was quickly established between Mitterand and Thatcher warmed relations up, and in September 1981 the two governments announced preparatory studies. However, the Anglo/French Study Group report of June 1982 was dismissed by the cabinet. The project was kept alive by the banks who financed their own study with a modest contribution from the European Commission. The breakthrough came with Thatcher's statement of 30th November 1984, which demonstrated that she personally backed the project and thereby silenced opposition within her government.

An invitation to tender was opened on 2nd April 1985, and closed on 31st October of the same year. The announcement of the winning tender was made on January 20th 1986 to the effect that the Channel Tunnel Group and France-Manche were successful. An accord was signed between the two governments in Canterbury Cathedral on 12th February. This provided for matters such as the establishment of the Intergovernmental Commission (IGC) to supervise the project on behalf of the two governments, particularly with regard to the safety of users, and border, customs, and immigration matters. Article 1 specified that the construction and operation of the scheme "shall be financed without recourse to government funds or government guarantees of a financial or commercial nature".

The concession agreement was signed on 14th March for a period of 55 years from the date of ratification of the treaty. It reiterated that the facility was to be financed entirely with private funds without any government guarantees. In return there was to be no regulation of the fares charged, and a commitment not to support any other link with public funds or guarantees for the life of the concession. The service tunnel was to breakthrough within 7 years of date of operation of the agreement, and construction was to be completed within 10 years. The concessionaire agreed to provide at least one shuttle per hour. CTG/FM also agreed to present proposals for a road link before 2000; they then had the option to take up these proposals until 2010. In turn, the governments would not facilitate a competing fixed link before 2020. This offer to investigate a road link was a tactical move made at the last minute in order to fend off competition from the Euroroute proposal for a drive-through bridge and tunnel, as it was believed that both governments favoured such a scheme if it were

feasible.

The concession agreement also provided for the appointment of a Maître d'Oeuvre (MdO) at the expense of the concessionaire to ensure that the works were carried out to the relevant specifications, and to the agreed timetable and cost projections. It was to act not only on behalf of the client, but also on behalf of the IGC, ensuring that the terms of the concession were followed. The treaty was finally ratified after a difficult passage through the British legislature and an easy one through the French, and the texts were exchanged in Paris on 29 July 1987. The British problems were a combination of the more complex British procedures for the scrutiny of proposed legislation, and greater opposition.

## FINANCIAL ARRANGEMENTS

The Board of Trade can have no doubt of the utility of the work if successfully completed, and they think that it ought not to be opposed so long as the English Government is not asked to make any gift, loan, or guarantee (UK Government Statement, 1874).

Throughout the last hundred and fifty years, the attitude of the British government with regard to the financing of the project has changed little. It has always been seen as a wholly private sector concession contract. The only exception to this policy over nearly 150 years was that the two governments were prepared to guarantee a high proportion of the loans required for the 1973 attempt. The successful arrangements reached for the third attempt, and the reasons behind the failure of the second attempt, suggest that it has never been a priority of the British government to improve fixed communications with the rest of Europe. Its attitude has always been one of facilitator rather than initiator; regulator rather than investor. Such an investment, and the associated investment in a high speed rail link to London, has never been seen as a worthy use for public funds. If it was to be built at all, particularly in the political climate of the UK in the early 1980s, it had to be at private initiative, risk and expense.

In July 1981, Tarmac formed Channel Tunnel Developments 1981 Ltd, and was joined by Wimpey in September of that year. In February 1984, this organisation joined forces with the European Channel Tunnel Group (Costain) and the Anglo Channel Tunnel Group (Balfour Beatty and Taylor Woodrow) to form the Channel Tunnel Group Ltd. (CTG). This organisation then sought a French partner. This was France-Manche SA (FM), formed in May 1985, a consortium of 5 French construction corporations who were only with difficulty involved in the project - Bouygues, Dumez, Spie Batignolles, Société Auxiliaire d'Entreprises, and Société Générale d'Entreprises - the problems were mainly due to attempts by Bouygues to hedge their bets between the competing projects during the tender period. These two consortia provided the initial working capital of the aspiring concessionaire and began discussions with banks - CTG worked with the National Westminster and Midland banks, while FM were associated with Crédit Lyonnais, Banque Nationale de Paris, and Banque Indo-Suez. Eurotunnel SA and Eurotunnel PLC were incorporated on the 30th October and 18th November 1985 respectively. On 2nd June 1986 Eurotunnel SA acquired FM, while Eurotunnel PLC had done the same

for CTG on the 30th May 1986. This rather complex arrangement allowed the holding company to circumvent, if needed, the requirement in the concession contract that the concessionaire (ie CTG/FM) be not diversified and have no other business interests. On 5th July 1985, the British contractors formed Translink JV, while the French contractors formed Transmanche GIE on 16th July. These two came together to form Transmanche-Link (TML) on October 18th. However, the consortium members remained significant players in the concessionaire companies throughout 1986.

The original capital of Eurotunnel was provided by the promoters - the founding banks, and the original 10 construction corporations with the latter in the majority. Thus at the time of the signing of the concession agreement in March 1986, the concessionaire was two corporations - FM and CTG - which were then acquired to form a unified corporation - Eurotunnel SA/PLC - upon being awarded the concession. However, when the contracts for construction and the MdO were signed on 13th August 1986, with TML and Atkins Setec respectively, the 10 original construction corporations were the majority shareholders in Eurotunnel. The 10 members of TML held well over half the equity of Eurotunnel, while four of the 11 members of the joint board of Eurotunnel PLC/SA were also directors of the member construction corporations of TML, and one co-chairman was a former chairman of BICC, the parent company of Balfour Beatty. In addition, the senior executives of the company included 6 secondees from the TML corporations out of 15 named in the placing prospectus. This conflict of interest was to dog the project for the next eight years. It was not until September of that year that Eurotunnel was recapitalised with £46m of equity from the original banks - known as Equity 1 - who now formed a *noyau dur* and the construction corporations became minority shareholders. Equity 2 went ahead in October 1986 with a private placing which, after some arm twisting by the Bank of England, raised £212m from a group of institutional investors. Although some of the actors on the French side had wanted greater participation by the construction corporations in the client organisation, this was resisted by the banks on the grounds of a conflict of roles.

Eurotunnel now turned its attention to obtaining loan capital. The *noyau dur* banks, with the exception of Indosuez, acted as the lead banks in this task. In August 1987, 50 international banks agreed to underwrite the loan and proceeded to syndicate it worldwide. A problem here was that the lead banks were also the promoters, and hence were the object of some suspicion by the syndicate banks. In the November, a credit agreement was signed with over 200 banks for £5b, and later that month Equity 3 was launched for public subscription which, despite the stock market crash on Black Monday (19th October 1987), raised the required £770m. A notable feature of these activities was the relative lack of participation by the British. For every two share units sold in France, only one was sold in Britain, while the British banks only contributed 9% of the loan capital against 18% from the French, 13% from the Germans, and 23% from the Japanese. In addition an agreement was reached in the September for £1bn from the European Investment Bank to be phased over 6 years, secured against letters of credit issued by the syndicate. In July 1987, the Channel Tunnel Usage Agreement was signed with SNCF and BR which gave Eurotunnel 50% of the capacity of the tunnel for through train services. Eurotunnel are

reimbursed through a usage charge which is partly a fixed annual amount, and partly a variable charge per passenger or tonne of freight.

It was also at this time that the first signs of the problems in the relationship between TML and Eurotunnel began to emerge. Alastair Morton had been appointed joint chair of Eurotunnel with André Bénard in February 1987. In the run-up to the capital raising activities of that autumn, Eurotunnel was concerned to demonstrate its firmness towards TML. A letter from Eurotunnel to TML was leaked to *The Sunday Times* of September 20th which showed its "no-nonsense" attitude towards the contractor, and Morton became increasingly associated with a public display of toughness. The problem was that the original contract was negotiated without being submitted to competitive tendering, and a senior manager of Indosuez went as far as to say that the new shareholders suspected the members of TML of having signed a contract with themselves while they were majority shareholders in Eurotunnel, while the members of TML believed that they had acted in good faith, and were being rewarded for taking risks before the political acceptability of the project was assured. These mutual suspicions permeated the relations between TML and Eurotunnel as things began to go wrong.

During this period, tensions started to emerge in the role of the Maître d'Oeuvre. From a British point of view, the MdO combines some of the functions of The Engineer under the construction contract and a client's project manager. It also had obligations under the concession agreement to the IGC, and provided an independent view for the investor banks under the credit. However, as relations between TML and Eurotunnel deteriorated, they increasingly communicated directly with each other, leaving the MdO in a difficult position. In order to clarify roles and to strengthen its project management capabilities as a client, Eurotunnel established the Project Implementation Division (PID) in January 1988. This was formed from some of the MdO staff, strongly supported by Bechtel staff, and augmented by new recruits. Thereafter, Eurotunnel was able to exert a more knowledgeable influence over TML. The Atkins-SETEC team was then left in a purely audit role on the project on behalf of the IGC and the investor banks.

During 1988, it became clear that costs would significantly overrun the original budget, and there were also fears about the programme. A war of nerves developed between the two with Morton developing a reputation for aggression. Early progress on tunnelling was painfully slow. In August of 1988, Morton publicly criticised the corporate members of TML for its lack of attention to the management of the project, and in the October forthrightly declared that "we don't have a tunnelling problem. We have an equipment and management problem. Bad ground is not to blame for the delays". The war of attrition between the two parties continued with a series of key documents being leaked to the press by both parties, and came to a head in 1990. Although an accord on the issues in dispute between TML and Eurotunnel had been reached in January 1989, and relations appeared to have improved, the necessity for Eurotunnel to seek additional finance in late 1989 prompted an explosive row which threatened the future of the whole project. Eurotunnel argued that as the original members of CTG and FM had prepared the original cost estimates that had formed

the basis of the winning bid in 1986, they should take responsibility for the cost overruns that were now threatening the project. TML countered that the main sources of cost increases were subsequent design changes, rather than the original estimates.

Eurotunnel and TML had put their dispute to the MdO for arbitration, but when it pronounced in the December largely in favour of Eurotunnel in December 1989, TML rejected its conclusions. An accord was reached on 8th January, but TML reacted angrily to the ensuing press release from Eurotunnel on 11th January which unfavourably compared the British half of TML with its French counterpart. A letter from TML's chief negotiator to Eurotunnel repudiating the statements in the press release was leaked to the press and further soured relations. The later announcement of the appointment of Morton as Chief Executive, a new post which had been intended to provide a buffer between Morton and TML, only compounded the situation. TML took Eurotunnel to court in pursuit of withheld progress payments of £62m, and the court found in TML's favour. However, Eurotunnel had no money with which to make the payments, as the banks were refusing to allow Eurotunnel to draw further funds until the dispute between the parties was settled.

By now, the banks had become disenchanted with Morton's aggressive style. Although relations between Bénard and the French consortium members were difficult, they never deteriorated to the depths of the British side. At the intervention of the governor of the Bank of England, Eurotunnel was persuaded to provide the desired buffer, and a revised accord was finally reached on 20th February "hours before the receivers would have needed to be called in". John Neerhout Jnr was duly seconded from Bechtel to become Project Chief Executive, and the banks unlocked the drawing rights on March 1st. This period also displayed a split between the British and French members of TML - the latter boycotted the meeting with the governor of the Bank of England, and had to be persuaded separately to accept the deal by Bénard.

With relations patched up, and new management in place on both sides, progress on the project rapidly improved. Eurotunnel turned its attention to raising the additional funds that were required. It planned to do this in two ways. Firstly, it returned to the original bank syndicate for further funds. This was not entirely successful, as more than a third of the members banks refused to provide further funds, and the lead banks were obliged to increase their own. In particular, the Japanese banks, reeling from their own stock market crash and constrained by new banking regulations were reluctant, and were only persuaded by a direct appeal by Thatcher to the Japanese prime minister, who in turn cajoled these banks. This exercise raised approximately £1.8b. On this basis, a rights issue was launched to shareholders which was surprisingly successful in raising £577m. The European Investment Bank also provided a further £300m, and the next year £200m was raised from the European Coal and Steel Community as part of the programme of refinancing the project with long-term funds at fixed rates.

In 1990, it still looked as if the tunnel would be open in June 1993, but by 1992, it became apparent that this could not be achieved and a target of December 1993



was announced, and it became clear that Eurotunnel was, again, short of finance. Although Eurotunnel only needed a further £290m to pay for the completion of the project, its financing requirements were badly hit by the delays in the opening of the tunnel due to the lost revenue. The official opening finally took place on May 6th 1994, 12 months later than the original date which, together with the settlement of the outstanding disputes with TML and Bombardier cleared the way for a second rights issue and further requests to the banking syndicate. In May 1994, £693m from the core banks, and a further £50m from a separate banking syndicate was agreed. On this basis the rights issue was underwritten for £816m. In order to tempt investors to invest in a company that was not promising to break even until 1998, the rights issue had to be heavily discounted, and a new class of senior debt on more favourable terms than the main debt had to be created. These sums increased the total funds raised by Eurotunnel to over £10b (approx 3.3:1 loan:equity), in contrast to the £6b (5:1 loan:equity) originally defined in the response to the invitation to tender.

Despite the fact that the tunnel was now officially open, there were a number of delays to the launch of revenue earning services, and the full range of services (rail freight; HGV shuttle; Eurostar; tourist shuttle) was not available until 22nd December 1994. Once these services were launched they failed to meet the revenue projections due to increased competition on price from the ferries and the airlines. The most obvious manifestation of this was a marketing war that broke out between the ferries and Eurotunnel in the summer of 1995 which further damaged revenues. The turnover to Eurotunnel's year end in December 1994 was £30.6m against the projection in the May 1994 rights issue of £137m. This resulted in a loss of £386.9m, against a projected loss of £191m, coupled with predictions from the board that the relationship with the banks would have to be renegotiated. Turnover running at around half the predicted level for the first half of 1995 meant that further losses of £464.5m were accumulated. While the company easily covered its operational costs, interest payments of £60m per month were swamping the revenues generated and the debt burden had mounted to £7.8b. Negotiations with the bank consortium to resolve this situation moved slowly, and on 14th September 1995, Eurotunnel announced that it was suspending payments on all debts, except the senior debt, for up to 18 months to allow the situation to be resolved.

The future of Eurotunnel was in the balance. The suspension of interest payments was only a breathing space. Its attempts to recoup the situation by launching claims against the members of TML, and against the national governments for unfair treatment in comparison to the ferries, even if successful, would provide only partial relief. Meanwhile, a £2.5b claim against BR and SNCF aimed at a renegotiation of their agreement with Eurotunnel, was rejected by the International Chamber of Commerce. The options facing the banks in relation to their delinquent debtor were to:

- 1) take possession of the asset on which they had a charge - the tunnel and its systems - but it was of little intrinsic value.

- 2) take over the management of the tunnel, but the effectiveness of the current management was not in question, and there was no sign that the banks could do any better themselves.
- 3) call in the administrators, but this have would meant that they loose control of their asset, and the same problems of option 1 would emerge.
- 4) swap debt for equity, but this would have wiped out the value of the equity currently held by investors.

A further option canvassed in France was to nationalise the tunnel. This was advocated by the Association pour l'Action Eurotunnel, which consists of individual shareholders in the scheme in France, where 79% of the shareholders are located. This was later moderated to the taking of a symbolic holding in the company by SNCF. However, this approach would, apparently, have been in contradiction to Article 1 of the treaty because SNCF is owned by the French government. Following the brinkmanship that was by now commonplace for the project, an agreement was proposed in October 1996 that the banks should take an increased equity stake in Eurotunnel, raising their share to 45.5%. This would both directly reduce Eurotunnel's debt by £2b from £9.1b, and lower the interest payments on the rest. The task then started of convincing both the 225 syndicate banks and the 750k shareholders of the merits of the proposal, which relied heavily on improved turnover from operations. The deal was finally approved by the syndicate banks in November 1997, following approval by the shareholders in July. The deal was facilitated by the two governments' willingness to increase the discounted value of the asset by increasing the length of the concession by a further 34 years, subject to improved conditions for freight transport and the payment of 40% of the operating profits after 2052 to the governments.

## PROJECT MANAGEMENT

The project was "assembled round a hole like a Polo mint...[there was] no client driving it forward with a vision of what the operator needed to have" Sir Alastair Morton, Co-chairman, Eurotunnel.

"Le premier problème est qu'il n'existait pas de maître d'ouvrage, c'est-à-dire de client, face au constructeurs" André Bénard, co-Président, Eurotunnel

There is, I believe, a fundamental error in the nature of the construction contract which led to lack of trust on both sides. Colin Stannard, Managing Director Eurotunnel.

"The project price ..... was put together to convince the governments, it was a viable price, a promoter's price. What it was not was a contract price. We should never have undertaken to do the work for anything like the sums that were in the submission to the governments". Taylor Woodrow executive

The contract signed between Eurotunnel and TML in August 1986 was based on the standard FIDEC form for international construction contracts, and provided for three main elements of works, each let on a design and build basis:

- 1) The tunnelling works were let on a target cost basis. TML would work on a cost-plus basis, and be paid a fee of 12.36% of the target cost including adjustments for variations and inflation. Any cost overruns would be paid for on a 70:30 Eurotunnel:TML basis, up to a cap of 6% of the target cost adjusted for inflation and variations. Eurotunnel would pay 100% of any cost overruns over this cap. TML would also receive a bonus for completing the works below the target cost of 50% of the amount saved. Liquidated damages were payable at a rate of £354k per day for the first 183 days and £536k thereafter up to a cap of £162m for failure to meet specified milestone dates and the final completion date. It was planned that the French would bore at a rate of 500m each month and the British 1000m, and milestone dates were included in the contract.
- 2) The terminals and the fixed equipment in the tunnels were let on a fixed price lump sum basis, subject to adjustment for inflation. This included items such as railway tracks and catenary systems, terminal buildings, and tunnel safety installations.
- 3) The rolling stock for the shuttle trains was let on a procurement basis. TML would manage their acquisition on behalf of Eurotunnel, and be paid a percentage fee for this service.

The contract period was to run for 84 months from May 1986. After the issue of the Certificate of Completion, the maintenance period was to be 12 months for the building and civil works, and 24 months for the electrical and mechanical works. Defects liability lasted 10 years for the building and civil works, but less for electro-mechanical equipment that had a shorter design life. Preparatory works for tunnel access, precast lining segment manufacture, and spoil disposal started in late 1986, and the construction of the permanent works started in December 1987.

Eurotunnel was just finding its feet and was little more than a paper organisation at the time the construction contract was signed. Effectively, the contract was negotiated between the banks and the contractors. The banks continually tried to move the contractor onto a fixed price in order to reduce their own risk. However, this was impossible given the inherent uncertainties of the project. The only source of cost information and an estimated outturn cost the banks had was TML, yet it was with TML that they were trying to negotiate. The banks therefore worked on the basis that TML's estimates were high. Conversely, TML worked on the basis that the estimates had to be low enough to ensure that the project went ahead. As Eurotunnel's managing director put it: "In banking you bid high and then trim your margin: in contracting you bid low and then get your profits on the variations". This fundamental difference in negotiating practice only enhanced the tensions between the two sides.

The original programme was that the completed facility would be handed over to Eurotunnel in December 1992 for commissioning and an opening in May 1993. Progress payments were to be made on a forward-funding basis - each month's

claim was for the value of the works planned to be completed the following month, subject to a retention of 5%. The project was, therefore, inherently cash-positive from TML's point of view. The members of the TML consortium were also obliged to place a 10% performance bond subject to the issuing of the Certificate of Completion. The Eurostar and freight trains were the responsibility of the three railway companies and beyond the scope the contract between TML and Eurotunnel. The MdO was appointed on a fee plus disbursements basis with responsibilities to the IGC under the concession contract, and responsibilities to Eurotunnel for inspecting and checking the engineering design and construction work of TML, as well as monitoring progress and expenditure. The overall contractual structure of the project is shown in figure 1.

The budgeted value of the contract, in 1985 prices<sup>1</sup>, was £2.71bn, an increase on the £2.6bn cited in the UK White Paper (cmdn 9735 1986 appendix C), and the even lower figure of £2.33bn in the CTG/FM proposal of the previous autumn. To this figure has to be added Eurotunnel's costs of land acquisition, running costs, consultant's fees, inflation, and most importantly of all, interest charges which, with a contingency allowance, more than doubled this sum to the original £6bn capitalisation. The first increase in costs was announced in October of 1988 - some 7% in the tunnelling costs. On both sides of the channel the tunnellers had been giving problems, and these were particularly severe on the British side. The British machines were designed to operate in dry rock, and so when wet rock was unexpectedly encountered on the seaward service drive problems mounted - hand finishing was required behind the machines and progress was slowed. The damp atmosphere also adversely affected the operation of the Hunslet site transport locomotives. By August 1988, the French were 12 weeks behind programme, and the British 5 weeks. Further cost increases were incurred when the Robbins/Markham machines on the British side were shut down for three weeks and extensively reengineered below ground in Autumn 1989. Although they had been modified based on the experience of the Howden in the seaward service tunnel, this proved inadequate, and considerable further work was required.

Once these problems had been resolved, tunnelling speeds increased rapidly. The service tunnel drives broke through in December 1990, the north running tunnel in May 1991, and its southern partner in June. Although the British had tunnelled much further than the French, these breakthroughs took place a little nearer England than planned as the French had been able to make up more ground against the original programme. These last two breakthroughs were both ahead of schedule, but this had been achieved at a cost of greatly increased manpower and expensive modifications to the tunnellers amounting to £781m.

The procurement items were mainly obtained from a variety of suppliers in a loose Eurostuttle consortium. The British company Brush, in association with the Swiss/Swedish company ABB, supplied the locomotives. The Canadian company Bombardier led a consortium which supplied the passenger railcars, with much of the assembly work being carried out by its French subsidiary ANF Industrie, and BN of

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1 In the following text, all prices are constant 1985 prices, unless indicated by an asterisk.

Belgium. Breda and Fiat of Italy supplied the railcars for carrying freight vehicles. These items also presented problems. The first was inflation - the tenders for the rail equipment were coming in much higher than had been expected in 1985. By 1989 the chair of TML was arguing that the depression in the railway equipment industry in the mid eighties meant that estimates made then were depressed, and hence misleading. Enhanced safety features specified at the instigation of the IGC following a series of railway accidents in Britain and France also raised costs. A decision was therefore taken to reduce costs by reducing the speed of the trains from 160km/hr to 130km/hr. This meant that the railcars designed to carry the trucks could be open-sided rather than enclosed.

The IGC, after considerable debate, accepted in December 1989 the principle that car passengers could stay with their vehicles during the shuttle journey. However, in April 1991 it announced that the fire doors in the railcars carrying these passengers had to be widened by 10cm. This led to considerable redesign, increased costs, and delays in delivery of the railcars. Eurotunnel claimed £1b\* from the IGC in compensation for a number of costly decisions, including some £40m\* for the lateness of the decision on the doors. In turn, Bombardier claimed FF 3.4b\* from Eurotunnel. The former claim was settled with a 10 year extension of the concession in December 1993, while the latter was settled in the same month by giving Bombardier FF700m\* (around £80m) and 25m share units in Eurotunnel, but only after Bombardier had stopped work in protest for 3 months. Bombardier thereby became Eurotunnel's largest shareholder. Due to these factors, costs rose by £460m.

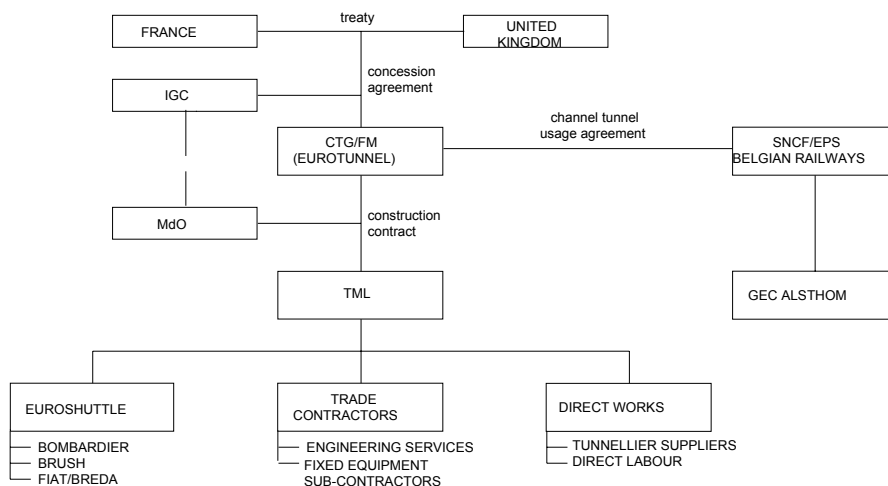


Figure 1 The Structure of the Project Coalition

Although these two elements of the contract, and the management of cost and time associated with them were the subject of tough negotiations between TML and Eurotunnel, it was the lump sum works that generated most of the public displays of acrimony. While the target cost contract shared the risks between Eurotunnel and

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TML, with the former taking most of the risk, and the procurement contract allocated all the risks to Eurotunnel, the lump sum contract allocated all the risks to TML. Therefore, once changes became necessary in the specification of these works, TML worked hard to protect its position, especially as it looked as if it was going to incur additional costs and also penalties on the tunnelling contract.

There were a number of changes required to the items specified in the contract of August 1986. Many of the problems arose because the project was organised on a fast track basis in which construction started before design had been completed. A TML representative argued that "the project was not properly designed in advance by Eurotunnel, and they developed a habit in the early days of asking for the best of everything, whether or not it was needed". Perhaps the most important change was that as the design of the trains was completed it became apparent that a cooling system would be required in the tunnels. Initially, it had been expected that the air

drawn in by the trains would provide adequate cooling, but it this proved inadequate, and 400mm chilled water circuit through half the length of the running tunnels was specified. The reduction in the speed of the trains allowed savings due to the simplification of systems for controlling air pressure in the tunnels, and the lower power supply requirements allowed a reduction in the electrical substations but also meant further renegotiations of the contract. As a result of these and other changes, costs rose by £512m for the fixed equipment.

	1986 Budget	1990 Forecast	1994 Outturn	%Increase
Tunnels	1329	2009	2110	59
Terminals	448	491	553	23
Fixed Equipment	688	814	1200	43
Rolling Stock	245	583	705	188
<b>TOTAL</b>	<b>2710</b>	<b>3897</b>	<b>4568</b>	<b>69</b>
NOTES				
All figures in millions of pounds at 1985 prices.				
Source: Eurotunnel Rights Issue Documentation 1990 and 1994				

Table 1 Project Budget Performance

Changes were also made to the termini. Considerable additional earthworks were required at the awkward Cheriton site due to IGC imposed changes in arrangement of the access roads for passenger shuttle loading. Petitioners against the parliamentary bill also forced Eurotunnel to authorise changes to the site access roads and drainage. The search for savings meant the loss of a £10m *grande arche* spanning the road approach to Sangatte. As a result of these and other changes, costs rose by £105m for the terminals.

The overall picture is given in table 1, which gives the figures in constant 1985 prices

broken down by the main categories of work. The overall budget overrun in constant prices is 69%, the largest proportional increase being the rolling stock. The three construction elements of the overrun amounted to 58%. To these figures needs to be added the £72m paid in performance bonuses to TML under the terms of the original contract. Additionally, Eurotunnel paid £36m for direct works undertaken outside the contract with TML. However, these figure cannot be taken as authoritative as they were produced before all claims were settled. The project was finally handed over on the 10th December 1993, some 12 months late, a programme overrun of 14.2%.

Although the tunnels were completed on time, the installation of the fixed equipment and construction of the terminals suffered significant overruns, and the lack of trains with which to commission the fixed installations, led to expensive delays in offering a cross-channel service. Through freight and commercial vehicle shuttle services built up in the month after the opening, but full passenger services were not available until the end of 1994. Although a figure of £50m\* per month was denied by Eurotunnel as the cost of the delays, the difference between the original opening date of May 1993 and the commencement of something approaching a full service in late 1994, which missed the 1994 holiday season, may have cost in the order of £650m\* in lost revenues on Eurotunnel's own figures from the 1994 Rights Issue documentation. This figure includes losses from the lack of revenues from the Eurostar and through sleeper services for which Eurotunnel claimed £1b\* from BR and SNCF; against this, the two railway authorities counter-claimed for delays in offering the freight service facility. The dispute was settled largely in favour of the railways.

Following the issuing of the Systems Acceptance Certificates for the fixed equipment and the rolling stock, commissioning could begin, but was not fully completed by the issuing of Tests on Completion until January 1995. The original commissioning period planned was 6 months from December 1993 to May 1994, but, effectively, it doubled to 12 months. As problems mounted it was decided to prioritise the commissioning of the freight services. Freight shuttle services started in May 1994, and a full 24 hour service in November of that year. The through freight came into service in the June. The IGC finally gave approval for the operation of limited Eurostar services in August 1994, but a full public service was delayed until the November. The IGC finally gave approval for the commencement of limited passenger shuttle services (Le Shuttle) on an invitation-only basis in August 1994, but full services for the public were not implemented until December of that year, and the final train was not received from Bombardier until July 1995, over 24 months late. Only the rail freight service met the deadlines that had been stated in the Rights Issue prospectus of May 1994, and even the launch of this service was behind the programme envisaged earlier in the year of a March start for freight, and a May start for passengers.

Patrick Ponsolle, the co-chairman of Eurotunnel placed the main source of these problems with the IGC. However, many of the problems with the commissioning were generated by the way the project was managed. Ponsolle admitted that the time required to commission the system was underestimated. The problems were that due to the tortuous negotiations between TML and Eurotunnel, there was for a

long time no clear date for the handover. Due to the delays to the construction programme, the commissioning was then fast-tracked in order to bring forward the revenue-earning period. This meant that construction and commissioning were taking place simultaneously, with one shift on construction and the other on commissioning. The complexity of the system was also underestimated. In particular, the number of fail-safe elements in the system made it very difficult to operate partially. If someone was working on an element, an alarm would go off which would shut the system down. This was compounded by the fact that a central part of the commissioning is the training of operative staff, so system shutdowns could not be overridden as this would have effectively trained staff to ignore warning signals.

Throughout the life of the project, relationships between TML and Eurotunnel were punctuated by a number of formal agreements which allowed the project to keep going, even if they did not resolve all the outstanding issues. The first of these was the Joint Accord in January 1989, when it was agreed to extend the original opening date of the tunnel by one month to June 1993, to settle all outstanding payments, and TML promised to improve the quality of its management. However problems continued through 1989 as disagreements over the cost of the lump sum works grew, and by June 1989 some £384m was in dispute between the two sides. A second accord was reached on 20th of February 1990 which resolved a number of areas of contention. The main points were that, firstly, it provided for a reduction of 25% in the staffing of Eurotunnel's 350 strong PID which had long been resented by TML as its presence was seen as reflecting Eurotunnel's mistrust of TML. Secondly it provided for the capping of TML's commission on the procurement items. As rolling stock costs had soared, the percentage fee had proved a goldmine to TML. Thirdly, the cap on TML's liability for 30% of extra costs incurred on the target cost contract of 6% of total project costs was removed, although the baseline for the calculation before TML incurred such costs was raised by nearly £300m to take into account cost increases already agreed. Finally, changes were agreed in the senior management of Eurotunnel.

From February 1990, relations between TML and Eurotunnel improved. However, hostilities again broke out in October 1991 over progress payments. Some £1.2b was at stake - £800b on the fixed works, and £400b on other items. Because these payments did not reflect the cost increases, TML risked going cash-negative. The issues were put starkly by the chair of Dumez - "we are determined to see Eurotunnel take responsibility for their extra costs. The contractors will not finance the project". This message was reinforced at a press conference held in Paris by all ten heads of TML's constituent companies. They backed their claim by threatening to stop work on those elements which were the subject of dispute - in particular the cooling system. The matter was taken to the Disputes Panel, which found in favour of TML in March 1992, and ordered an additional £50m\* each month to be paid over the existing £25m\* monthly payment. This decision was overturned in September 1992 by the Arbitration Panel, but TML were not obliged to repay the additional £200m\* which had already been paid.

Negotiations were to continue for the rest of the life of the project. In October 1992, Eurotunnel offered a settlement which included payment of approximately £200m in



shares and other paper, in addition to £1b in cash was, but further discussions brokered by the Bank of England led to a working truce on 27th July 1993. This protocol, for which Neville Simms, the chief Executive of Tarmac is accorded much of the credit was crucial, for it laid out the agreed commissioning programme, and the conditions for the handover of the facility to Eurotunnel. Henceforth, the parties promised to "undertake best efforts to ensure cooperation over the commissioning and early operation of the project, working together towards the achievement of the common goals identified in the Protocol".

Although the fixed installation and terminal works were finished in April 1993, some four months late, they could not be commissioned due to the lack of rolling stock. After August 15th 1993, TML would incur serious penalties for late delivery costing some £240m in the first year. Eurotunnel agreed to waive these penalties so long as TML handed over the completed works on December 10th. However, no agreement was reached on the outstanding lump sum costs at this time, although Eurotunnel agreed to advance TML £235m\* pending final settlement of the dispute. TML met this target, and the tunnel was finally opened officially on May 6th 1994, 12 months after the date originally planned. Agreement was finally reached on 5th April 1994, on all claims except those related to procurement items with a payment of between \*£50 and \*£60m. However, in September 1995, Eurotunnel announced that it was making a fresh claim against the members of TML for around \*£1b, despite the fact the Tests on Completion were complete and the contractors' performance bonds had been returned.

## TML ORGANISATION

Of course there are difficulties, but nothing insurmountable. There is of course the language difference, but they are very talented in this respect, whereas we're just abysmal. There is also the way they think - I can't explain what it is, but our minds seem to work differently. It must be a national characteristic - one thing for sure, its not bloody-mindedness! We can sit around a table with our opposite numbers and within minutes reach an absolute agreement on any objective, and then in as many minutes both sides will arrive at precisely the opposite means of achieving it

The lack of certainty and real finance was a great brake on the project. All through this period we were working from hand to mouth to decide what we could afford to buy.

We had to blast on with the tunnel design as a matter of priority. but we were held back on the terminals and the fixed equipment for lack of cash (John Reeve, Directeur-Général TML)

TML was an integrated consortium of two consortia - Transmanche GIE and Translink JV - with a common capital, and distribution of the profits in equal shares; its overall structure is illustrated in figure 2. Initially, it operated with a nationally based twin structure with British and French Directeurs Généraux reporting to a chief executive. In the early stages, the organisation was highly centralised, and each Directeur Général could keep control of most activities on his side of the Channel. Once the project went on site in the summer of 1987, the organisation grew rapidly and decentralised to five main Directorates. This structure, as it was in February 1988, is illustrated in figure 3. While engineering functions were integrated in the Engineering Directorate and Transport System Directorate, construction functions

were completely separated on national lines. Within this structure, each area of operations was treated as a profit centre, or sub-project. For instance, Transmanche's Construction Directorate was divided into sub-projects for tunnelling, terminals, and concrete lining prefabrication. These sub-projects were supported by an engineering capability, and administrative, commercial, quality assurance, human resources, and project management functions. Each sub-project director was responsible for establishment, client relations, choice of construction techniques, choice of subcontractors, safety, and the achievement of sub-project objectives.

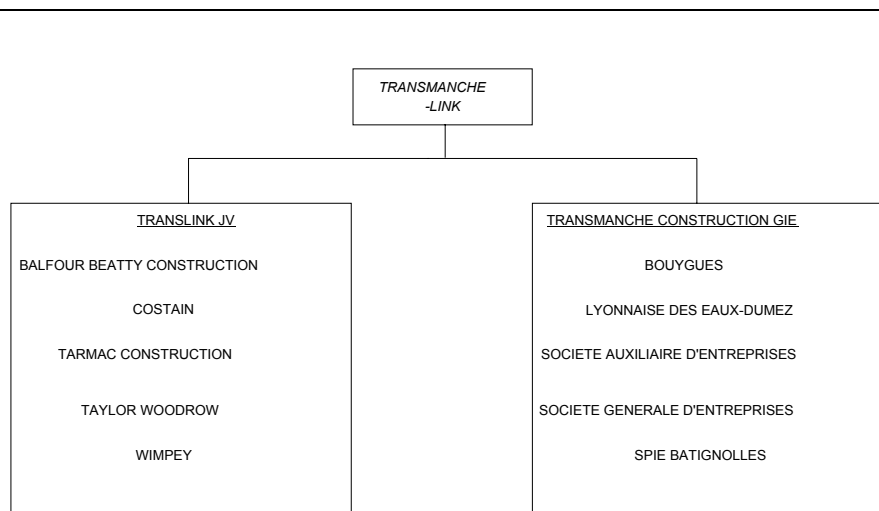


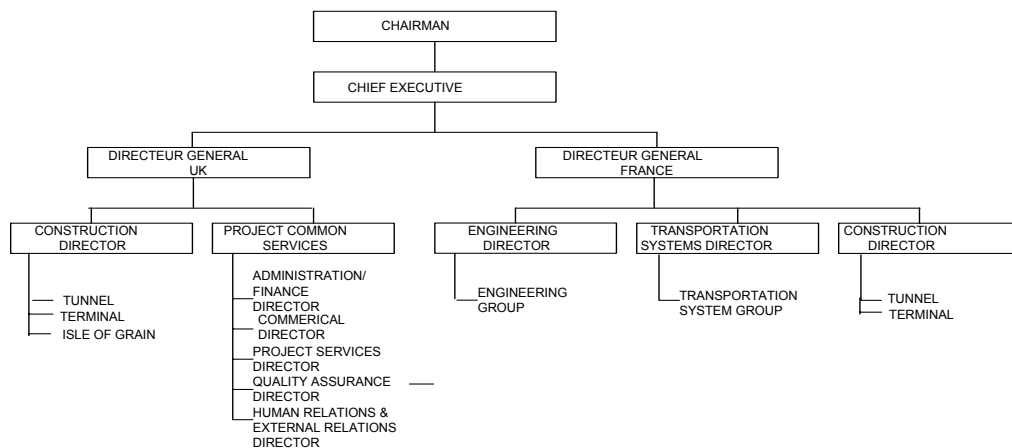
Figure 2 The TML Consortium

Senior management were seconded from the consortium mother companies. Despite this the complexity of the project effectively gave TML a degree of liberty from the member organisations in terms of principles of organisation and procedures, and the Directeurs Généraux operated with very little supervision from TML as a whole. In this period, TML was staffed mainly with secondees from the mother companies, and there was a suspicion that they were not the best staff available - these were retained by the mother companies for getting new work

Engineering design was located in a joint office in Sutton under the Engineering Director where the anglo-french Engineering Group coordinated the engineering design process. The provenance of engineering expertise reflected structural differences between the two national construction industries. On the UK side, TML relied heavily upon engineering consultants such as Mott Macdonald, BDP, and Kennedy Henderson. On the French side, in contrast, integrated teams drawn from the in-house *bureau d'études* of the TML member companies did much of the engineering work. For the civils works, the Engineering Group carried out all design work; for the fixed equipment, which was subcontracted, they took the process up to

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definitive design before handing it over to the Transport Systems Group (TSG) who managed the tendering process and detailed design by the sub-contractors. For the procurement items, TSG took over after the preparation of performance specifications by the Engineering Group. Until the Royal Assent was received for the bill that enabled the project in November 1987, the engineering effort was, effectively, starved of cash. This lack of attention to the fixed equipment design was to cost the project dear.



source: Byrd (1994)

Figure 3 TML Organigramme, February 1988

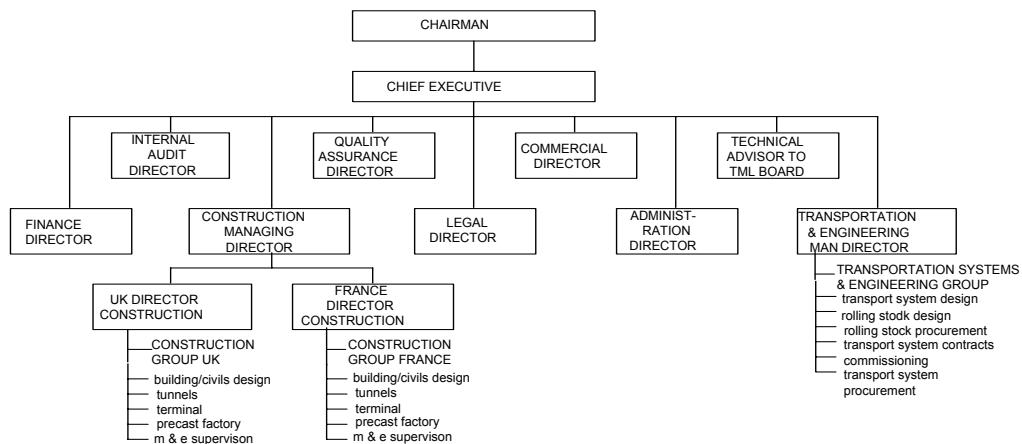
The human resource management policies for the tunnelling workers were very different on the two sides of the Channel. The British recruited their labour widely. Over 50% of the workforce were "travelling men", housed in a temporary camp which presented considerable problems of recruitment and retention. Tensions with the local community were also generated by this implantation. Many came from the depressed mining regions of the country. Unlike on the French side, there was little attempt to favour local workers. 95% of the operatives on the French side, however, were recruited in the Nord Pas de Calais region, itself a depressed region. These workers were seen as part of an employment generation and retraining effort for the region, and offered comprehensive help in finding jobs as their time on the tunnel came to an end. Due to space constraints on the British side, many of the operatives were based at the factory for tunnel lining segment production on the Isle of Grain, some 100 km away from the main Cheriton site, and the segments were transported by rail. The French segment factory was on the site at Sangatte.

The British side of the tunnelling operations, despite an apparently easier task, experienced many management problems during 1988 when it hit unexpectedly bad ground. This compounded the existing organisational problems and prompted

outbursts of frustration from Eurotunnel. The essence of the problem was that the senior managers seconded from the UK members of TML had great difficulty in working together. An ex-Mowlem manager was appointed to resolve this problems as someone from outside the consortium member companies. As he put it, "I diluted the cliques and and made us more a team. Before that we were bunches of Taywood people, bunches of Costain people and so on", and the management of the tunnelling operations and the site transport system were integrated. These weaknesses in construction management were also responsible for the relatively poor safety record of the UK tunnelling operations.

Under pressure from Eurotunnel, it was decided to strengthen the Supervisory Board which was placed under the eye of the Members' Assembly which consisted of the

Chief Executives of the member companies. A unified management structure to reflect the shift from the tunnelling phase of the project to the fitting out was developed, which is illustrated, as it was in December 1989, in figure 4. The most notable feature is the reinforced role of Chief Executive, and the grouping of operations responsibilities under the Construction Managing Director. The new structure disbanded the Engineering Directorate and devolved its civils responsibilities to the Construction Groups, which now reported to the common Construction Director. Transportation system engineering became the responsibility of the Transportation Systems and Engineering Group (TSEG). TML's headquarters were also moved from Sutton to Folkestone to improve liaison between the engineering functions and site operations. Over this period almost all of TML's senior management were eased out or quit. The two Directeurs Généraux - John Reeve and François Jolivet - resigned in June 1989. They followed the Chairman and Chief Executive of TML, Andrew McDowall who was demoted to Deputy Chairman in the February and replaced by Philippe Essig of SNCF as Chairman.



source: Anderson (1992)

Figure 4 TML Organigramme, December 1989

The rationale for these changes was that the tunnelling operations could be separately managed from each side of the Channel, but once the fitting out started,

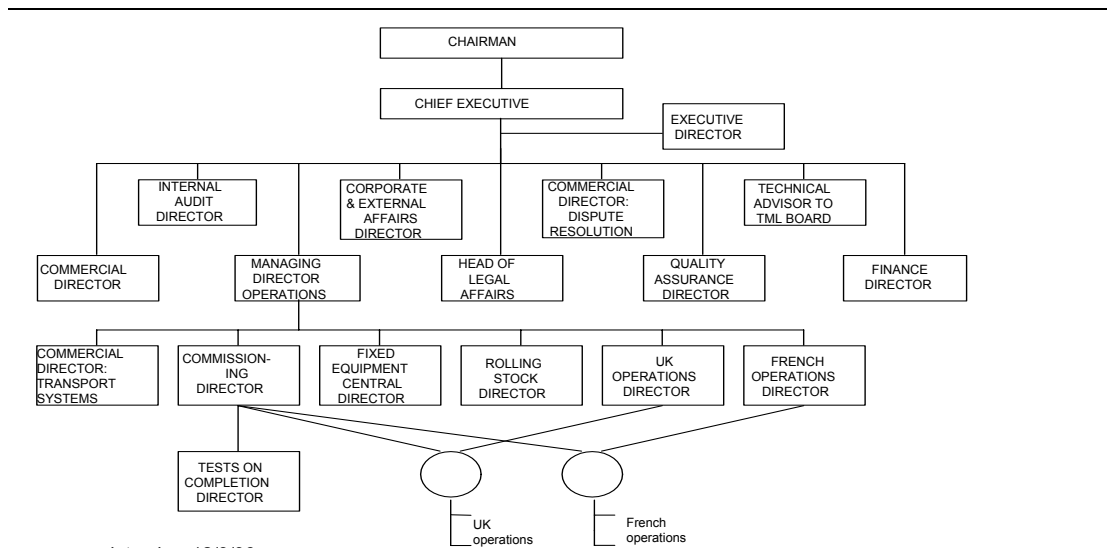
they had to be treated as a common operation. Similarly, the integration of the Transport Systems and Engineering Directorates followed the shift of emphasis from civil to mechanical and electrical engineering. While these developments followed the overall evolution of the project, it is also clear from the level of staff turnover that a more fundamental transformation of TML's senior management was also taking place in response to the demands of Eurotunnel. Staff increasingly came from organisations such as SNCF, Morrison Knudsen and the British Department of Transport. Following the 1989 accord, Jack Lemley, who had been a Morrison Knudsen vice president before working in his own consultancy practice, was appointed chief executive of TML in July 1989 to complement Philippe Essig as chair.

As the project moved to the fitting out phase, TML increasingly subcontracted the bulk of the work, placing subcontracts in the name of either Transmanche GIE or Translink JV. Many of these subcontracts were, however, with other divisions of the mother companies. For instance, Tarmac Construction, in consortium with Montcocol and other French companies won the contract for installing the railway tracks, while Balfour Beatty Power in consortium with Spie Batignolles installed the catenary systems. Many subcontractors were encouraged to form a consortium with an opposite number from the other side of the channel. For instance, due to a desire for a commonality of image through the system, BDP came together with Groupe 6 to work on the design of the two terminal buildings at Sangatte and Cheriton.

TML was reorganised again during early 1991 as the project moved fully into the fitting out phase in a move towards greater centralisation. The immediate problem was the coordination of the mechanical and electrical installations, but these reflected deeper cultural problems between "office" and "site". TSEG were responsible for design, with all the uncertainties thereby entailed. They also had to cope with delays caused by Eurotunnel's slow approval of designs and lack of clear definition of requirements. The Construction Groups, on the other hand, complained of lack of design information and the pressure of programme constraints. TSEG had a flatter matrix organisation with a longer term perspective, while the Construction Groups were more hierarchically organised with short term goals. Initially, TSEG had retained overall responsibility for the M&E installations in terms of programming and commercial control, while the supervision of installation was carried out by M&E departments within the Construction Groups. This led to coordination problems between both the Transport Systems and Construction Groups, and within the Construction Groups between the Civils and M&E departments. The M&E departments were disbanded, and the Construction Groups took direct overall responsibility for the M&E installations from Transport Systems, however the pressures on the M&E programme had led to the departure of the Director of TSEG in September 1991 and his replacement by Keith Price, a Morrison Knudsen main board director, shortly after the resignation of Essig.

As the project moved fully into the commissioning stage at the beginning of 1992, a further reorganisation took place, and the organisation became much flatter. The Groups were abolished, and all the operational aspects were brought under a single

Director of Operations. Many of the remaining Directors were responsible for financial, legal, and commercial matters - a reflection of the level of dispute with Eurotunnel. This structure, as of March 1993, is shown in figure 5. This type of structure was retained by TML for the rest of the life of the organisation, although it was continually adjusted as TML wound down during 1993.



source: interview 12/3/96

Figure 5 TML Organigramme, March 1993

TML ceased to exist with the handover of the facility to Eurotunnel in December 1993, although a number of TML staff remained to help Eurotunnel with commissioning. It had peaked at an employment of 11700 people in late 1989, and had designed and constructed one of the largest built facilities ever conceived. Its achievement is one of the wonders of the modern world.

## ASSIGNMENT QUESTIONS

- 1) In what ways did factors from the external environment influence the client, and shape the establishment and behaviour of the project coalition?
- 2) Describe governance of the project coalition. In your opinion, how appropriate was the choice of the three different incentive structures in motivating TML and its supply chain?
- 3) Conduct a stakeholder analysis of who benefited from the fixed link's construction.
- 4) How and why did the organisation design of TML change over the life cycle of the project?
- 5) What lessons can be learned from this account for the management of future large infrastructure projects?
- 6) On what basis can the project be considered a success?
- 7) On what basis can the project be considered a failure?

## FURTHER READING

Anderson, G. and Roskrow, B. (1994) *The Channel Tunnel Story* London, E. & F.N. Spon.

Fetherston, D. (1997) *The Chunnel : The Amazing Story of the Undersea Crossing of the English Channel* New York, Times Books.

Hunt, D. (1994) *The Tunnel* Upton-upon-Severn, Images Publishing.

Kirkland, C (ed.) (1994) *Engineering the Channel Tunnel* London, E & F.N. Spon.

Lemoine, B. (1994) *Le tunnel sous la manche* Paris, Le Moniteur

Winch, G. M. (1996) *The Channel Tunnel; le Projet du Siècle* Le Groupe Bagnole Working Paper 11.

Proceedings of the Institution of Civil Engineers (1992-5) *The Channel Tunnel : Part 1 Tunnels; Part 2 Terminals; part 3 French Section; Part 4 Transport Systems* Special Issues, *Civil Engineering* vols 97-108.