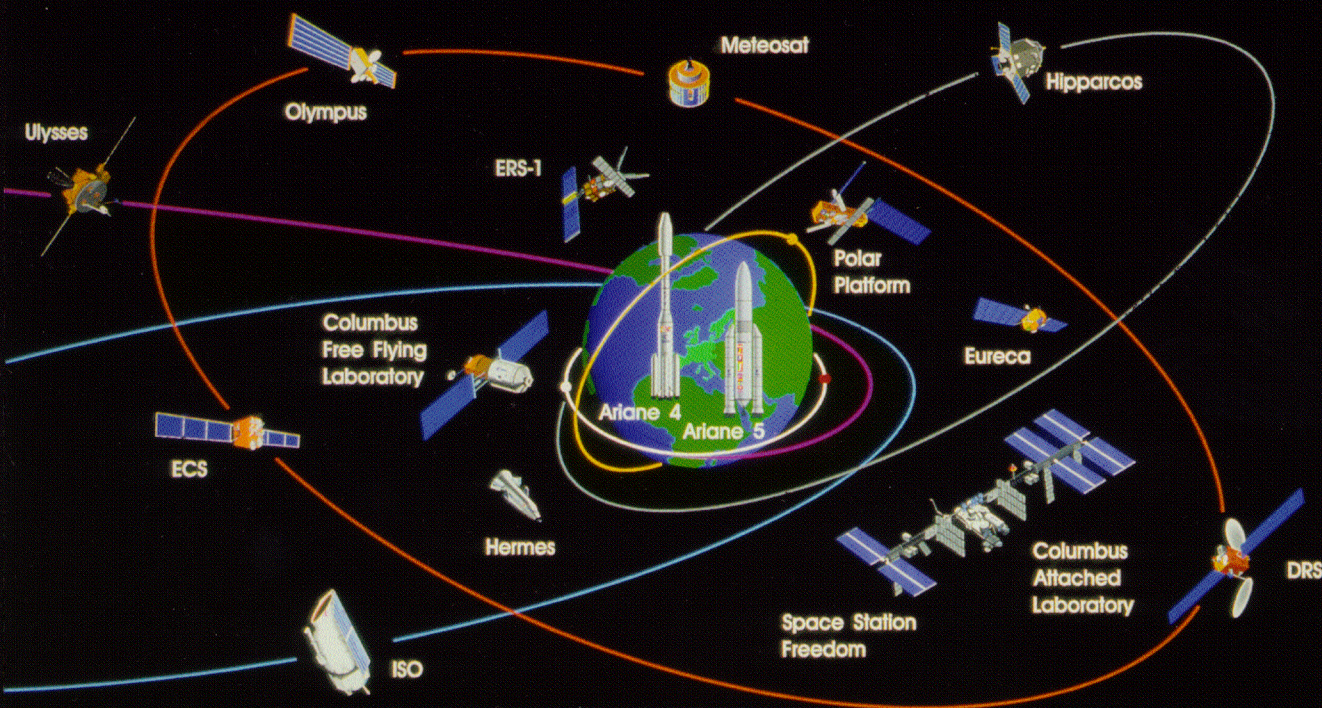


The launch of ELDO
by John Krige



The ESA History Study Reports are preliminary reports of studies carried out within the framework of an ESA contract. As such they will form the basis of a comprehensive study of European Space activities covering the period 1959-87. The authors would welcome comments and criticism which should be sent to them at the appropriate address below.

The opinions and comments expressed and the conclusions reached are those of the authors, and do not necessarily reflect the policy of the Agency.

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The Launch of ELDO ¹

John Krige

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In a previous report we explained how, during 1959 and 1960 the European space science community took a number of initiatives directed towards establishing a collaborative enterprise in their field. ² We stressed that, while the original idea was that Europe should have just one organization dedicated to both the development of launchers and of satellites, by the end of 1960 it was generally accepted by scientists and politicians alike that these activities should be split from each other. The deliberations among scientists and administrators in 1960 took place against a background of important political negotiations between Britain and France over the desirability of developing together a European heavy launcher. The cost of this venture, the technical and managerial risks that it entailed, its unavoidable military connotations, and the availability of American launchers all persuaded scientists that their space research organization should be kept quite distinct from the Anglo/French rocket project.

We have already described the steps taken in 1961/62 to place European space science on a sound footing within the framework of what came to be known as ESRO, the European Space Research Organization.³ In this report we will explore in greater depth the intergovernmental negotiations which led to the signature of a convention in April 1962

¹ This paper is based predominantly on documents in the Public Record Office, Kew, London, supplemented by material from the Archives Nationales, Mission Recherche, Paris, and the papers of Edoardo Amaldi at the University of Rome, "La Sapienza". I am grateful to Neil Whyte, Lorenza Sebesta and Michelangelo De Maria, respectively, for providing material from these sources.

² Krige (1992a).

³ Krige (1992b).

establishing ESRO's sister organization, ELDO, the European Space Vehicle Launcher Development Organization. The initial programme of this organization foresaw the construction of a three stage rocket capped by a satellite test vehicle, with the work on each component spread between the four major western European states. After describing the British military origins of the first stage, called *Blue Streak*, we shall go on to explore how the UK managed to persuade first France, then Germany, and finally Italy to participate in the programme. We shall argue that it was a programme which was determined far more by political aims than technical realities, a programme which only managed to take shape because of the very specific political situation prevailing in Europe at the time, and in particular because of the simultaneous negotiations underway for Britain's entry into the Common Market.

1 *The military origins of Blue Streak*

In spring 1954 the US Secretary of Defence, Charles E. Wilson, suggested to the then British Minister of Supply, Duncan Sandys, that the UK might like to collaborate in the development of long range ballistic missiles. The British, said Wilson, could concentrate on a missile with an intermediate range of 1500 miles (an IRBM). The Americans, for their part, would work on an intercontinental ballistic missile of 5000 miles range (an ICBM).⁴

While it is difficult to be sure about American motives, it does seem that the division of responsibility proposed by Wilson may have been suggested to him by Trevor Gardner. Gardner was a recently appointed special assistant in research and development to the Secretary of the Air Force. A passionate believer in the importance of ICBMs, Gardner was most reluctant to see scarce resources diverted to IRBMs. He was aware that the Air Force was looking seriously at the possibilities of a 1000-mile range ballistic missile. Anxious to avoid a competition for human and material resources with his preferred ICBMs, "and cognizant of the fact that a missile of intermediate range would serve British strategic needs, [Gardner] suggested that investigations be undertaken to determine whether the British were capable and willing to assume responsibility for its development."⁵

The stimulus from Britain's side for this invitation can apparently be traced back to a reassessment of the country's interest in IRBMs which occurred at about this time. The

⁴ Unless otherwise stated all of the information in this section is derived from Krige (1992c), where a lengthier account with more detailed references may be found, and from Twigge (1990), chapter 7, and section 8.3.5.

⁵ See Armacost (1969), pp. 59-60.

idea of developing such a missile had been mooted in military circles since the end of the war. None of the early discussions however came to much. The technology was sophisticated and costly, nuclear warheads were relatively heavy and would require an enormous thrust to launch them from the ground, and there was the inevitable opposition from the Royal Air Force, who saw missiles as a threat to their V-bomber force and to their monopoly on Britain's nuclear deterrent. In summer 1953, however, a systematic appraisal was made of the issue, and it was apparently concluded that an IRBM development programme was within Britain's capabilities, particularly if US help was forthcoming.

Sandys' interest in an IRBM also occurred against the background of a decision, taken in June 1954, that Britain should build its own H-bomb. Only if Britain had such a bomb, it was argued, could she hope to influence US policy in its use, and prevent its possibly "misguided" deployment. Fears were also expressed that the US could not be counted on to defend London from a nuclear attack once the Soviets could retaliate against New York with their ICBMs. Policy makers realized that the V-bombers would remain the major weapons delivery system for some time to come. But they also felt that they would have to be supplemented in the medium to long term by long range missiles capable of hitting Soviet targets from British soil. In short, British interest in building an IRBM was an important, if not central component in a renewed determination to develop an independent nuclear deterrent.

When Sandys first went to Washington to discuss the mutual development of a missile programme with Wilson, he was both optimistic and enthusiastic about the possibilities of UK-US collaboration. He felt that a 1500-mile range weapon would be of immeasurable strategic importance to Britain, and that it might be possible to agree on a "joint project" with the Americans in which the UK would have "complete access to their expertise." These hopes were soon dashed. For one thing the US Joint Chiefs of Staff quickly imposed security restrictions on certain crucial, militarily sensitive technological data. For another, mutual inspection of the facilities available for missile development on both sides of the Atlantic quickly revealed that, technically speaking, Britain was behind the US in most areas of interest. Indeed on 8 November 1955 Defence Secretary Wilson, spurred on by reports of America's vulnerability to surprise attack, decided to go ahead without the British. He informed all the armed services that an IRBM was to be developed at the "maximum speed permitted by technology." Within weeks Werner von Braun and his Army team had their *Jupiter* IRBM project authorized. The Air Force, not to be outdone, quickly advanced plans for their rival *Thor* missile, whose structural configuration was frozen by January 1956. In parallel, probably sometime in 1955, Britain too embarked on an independent IRBM programme, the product of which was the *Blue Streak* missile.

Though Britain embarked an IRBM programme of its own, it maintained important technical links with the US on some aspects of the project. de Havillands collaborated closely with Convair on the structure of the rocket. Rolls Royce acquired the design rights on the engines developed by the Rocketdyne division of North American Aviation. And an official forum for an exchange of technical information was established where the British design of the rocket was evaluated by American experts.

While assisting the UK develop its own IRBM, the US also made a number of informal approaches in 1956 suggesting that its *Thor* IRBM should be deployed on British soil. One reason for this was the determination by some US officials not to "turn the control of the IRBM over to the British," so giving the US greater control over the deployment of the weapon in the European theatre.⁶ The initiative was also partially intended to persuade Britain to abandon the development of *Blue Streak*, so avoiding duplication of the American effort, and reducing British R & D in a sector where it was lagging behind the USA.

The American offer was attractive. It would enhance UK-US collaboration in the nuclear field. It would give Britain access to design information in the *Thor*, which would be useful for the development of *Blue Streak*. And it would provide the UK with an IRBM capability some five years before its own missile was due to be operational. The outcome of these discussions was an agreement in February 1958 for the installation of four squadrons (60 missiles) of *Thors* on British soil. At the same time, to avoid "duplication", *Blue Streak's* range was increased to 2500 miles, so bridging the gap between *Thor/Jupiter* and the *Atlas* ICBM, and provision was made to house the missile underground.

These modifications were not however enough to save the missile. For one thing, *Blue Streak* was a first-strike weapon. Being liquid fuelled, it took 30 seconds to fire from a state of readiness, and about seven minutes otherwise. The fact that it was not mobile made it even more vulnerable to enemy attack. The resulting dilemma, as Twigge puts it, "was that in a time of crisis a choice would have to be made, to either show caution and risk being disarmed, or react immediately and risk starting a nuclear war."⁷ Secondly, there was the question of cost. An internal British document circulated in February 1960 estimated that, in addition to some £60 million already spent on the missile, about another £240 million of research and development money would be needed to complete it. Added to this it was estimated that a further £200 million-odd would be needed by 1967/8 to

⁶ The quotation is from Clark and Angell (1992), p.155. This paragraph draws heavily on this paper, particularly pp. 153-9.

⁷ Twigge (1990), p. 347. What follows owes much to his section 7.3.

produce and install 125 missiles in hardened underground silos.⁸ In sum the deployment of *Blue Streak* as an element in Britain's independent deterrent was going to cost (at least) £500 million spread over eight years.

To assess the future of the rocket a special committee was set up in 1959 to report on all aspects of Britain's nuclear strike force. It submitted its report to the Chiefs of Staff early in February 1960, who in turn submitted their findings to the Defence Committee. This Committee met on the 24 February 1960. There was a general consensus that, as the Minister of Defence put it, "both militarily and politically it was unacceptable to rely on a "fire-first" weapon" and that, if better alternatives could be provided by the United States, *Blue Streak* should not be deployed operationally. The alternatives particularly favoured by the Minister were the WS 138A (*Skybolt*) missiles which could be fired from V-bombers and *Polaris* missiles which would be housed in nuclear submarines. The attraction of these systems was that, provided they were kept on patrol in times of tension, there was no need to use them as first-strike weapons.

Despite the feeling that *Blue Streak* was too vulnerable and costly as a weapon, the Defence Committee was loath to cancel it outright. They put forward several arguments for not doing so, of which the most important, in the Minister's eyes, was that the rocket could be used for conducting a wholly British programme of satellite space research. Indeed the possibility of using *Blue Streak* as the first stage of a satellite launcher, rather than just as a ballistic missile, had been actively considered by the engineers involved in the project for some time. This alternative was not only of potential interest for the UK's already well-advanced (civilian) space research programme. It would also serve the military's requirements for reconnaissance and telecommunications satellites.

A month later a British delegation headed by Prime Minister Macmillan himself visited the USA to seek further information on the American plans for *Skybolt* and *Polaris*. They were led to believe that the former would be deployed by the US Air Force in 1963, and that Britain could have the weapon a year or two later. As for *Polaris*, the Americans indicated that a first model would be introduced by the navy in 1961 to be followed by a longer-range version in 1964. On returning home the British delegation found the Royal Navy unenthusiastic about *Polaris*. The Air Force, however, saw in *Skybolt* the means of preserving the operational life of its V-bomber force. In the light of these attitudes the

⁸ For these figures see the document reproduced in Twigge (1990), p. 353.

Cabinet formally decided to cancel *Blue Streak* as a military weapon and to purchase in its stead the *Skybolt* air-to-ground missile from the United States.⁹

The decision was announced to Parliament on 13 April 1960. It was justified by the new minister of defence, Harold Watkinson, on the grounds that an immobile *Blue Streak* protected in silos would be very vulnerable to Soviet missiles and that it were best replaced by weapons of considerable range which could be launched from mobile platforms. In the uproar that followed the main objection was not that *Blue Streak* had been cancelled as such, but that the decision had not been taken earlier. It was an argument which was to weigh heavily on the minds of those who sought to preserve the rocket in a new role.

2 *Converting Blue Streak into a civilian satellite launcher*

The cancellation of *Blue Streak* as an IRBM was followed by a detailed assessment inside the UK government of whether it should, indeed, be developed as a civilian satellite launcher. The issues at stake were spelt out in a long report of senior officials in the various departments concerned which was produced shortly after the April decision.¹⁰ The best path to follow was far from clear; the costs and benefits of the various options were difficult to assess and sometimes incommensurable. A decision on this matter, said one of Prime Minister Macmillan's closest advisers early in July, is "like trying to do a calculation in imponderables" because the various factors involved could only be estimated "in the vaguest terms."¹¹ Predictably perhaps the ministers played it safe. Rather than take a decision with irreversible consequences they chose to let matters drift while seeking partners for a joint cooperative effort.

In deciding on what to do with *Blue Streak*, wrote the government officials, one had to bear in mind that space research was "opening a new field of human endeavour, which [might] have significant commercial, military, scientific and technological implications." Satellite communication systems, as well as meteorological satellites, were interesting for both civil and defence purposes. International telecommunications traffic was expanding rapidly, and "the high potential capacity and great flexibility" of satellites made them ideal candidates to supplement cables, which had a limited capacity and were

⁹ For this paragraph see Pierre (1972), Chapter 9.2 and Newhouse (1970), chapter 7. These authors describe the later drama surrounding the *Skybolt* offer in detail.

¹⁰ The memorandum *Space Research: Blue Streak. Report by Officials* is on file FO371/149657 in the PRO, London.

¹¹ Memo headed *Blue Streak* from FB, doubtless Freddy Bishop, one of Macmillan's Private Secretary's, to Macmillan dated 5/7/60, file PREM11/3098, PRO, London.

susceptible to accidental or deliberate interruption. Satellite communication systems were also "the most promising means yet available for the worldwide relaying of television." In the purely military sphere there were potential applications in the field of photographic and electronic reconnaissance for intelligence gathering and as early warning systems against surprise attack by ballistic missiles. The interest in satellite applications was indeed so great that the Post Office had already started funding a development programme for items like the large steerable aerials and the radio equipment needed for a pilot satellite communications system; and the Minister of Defence had let it be known that his department would consider contributing up to £5 million a year to a space programme based on *Blue Streak*. Some scientists too were enthusiastic about the prospects opened up by having a research programme based on the use of heavy launcher, which would also "provide potentially valuable growing points for the physical and engineering sciences, replacing those provided in the past by the development of radar and nuclear energy." ¹²

The exploration and exploitation of space by satellite was then clearly of great importance to a major world power like Britain, a national imperative even. Far more problematic was the policy to be adopted for the launchers needed to achieve these objectives. Here Britain was faced with two main alternatives: either to cancel *Blue Streak* altogether, and to rely on America for her future space needs, or to convert the missile into a civilian satellite launcher.

Several arguments were adduced for not cancelling the British rocket programme altogether. It would be a blow to national prestige. It would provoke a "row in some newspapers and from a small but vociferous body of starry-eyed space enthusiasts." Considerable sums had already been spent on the rocket, and these would simply have been wasted if the programme was halted. There would be some technological benefit. ¹³ It would create a delicate situation with Australia, whose range in Woomera was being prepared for *Blue Streak* launchings. By keeping *Blue Streak* alive, Britain would "retain current first-hand experience of the design and construction of large rockets, and would be free to develop them for military purposes," should this prove desirable at a later stage. ¹⁴ Finally, it would avoid dependency on the United States. Not only would the

¹² For this paragraph see the *Report by Officials* cited in note 10, section II.

¹³ For these arguments see a briefing paper for Macmillan dated 5/7/60, file PREM11/3098, PRO, London.

¹⁴ The argument of building up a strong inhouse technical capability is in the *Report of Officials* cited in note 10, p.11.

British have to fit their launches into the American schedule. More importantly there was no guarantee that the US would launch British telecommunication satellites at all. It was, the officials thought, unlikely that the Americans would impose "unfair conditions" on the use of one of their launchers in such cases, but there was always the risk "that they would pay some regard to their own interests, particularly if commercial applications emerged."¹⁵

For each of these arguments in favour of continuing the development of *Blue Streak* there was an argument against. Considerations of prestige cut both ways. The successful launch of a large satellite using a British rocket would undoubtedly be to the country's credit. On the other hand, if the development of *Blue Streak* as a satellite launcher "obviously strained our resources, it could be positively harmful to our prestige," warned the government officials.¹⁶ The spinoff argument was weak. Technological spinoffs accruing from continuing the programme were difficult to evaluate, while cancellation would certainly "release valuable scientific and technical resources for other work." The claim that developing the rocket would preserve a useful technological capability was also of dubious merit. As the Chief Scientific Advisor, Sir Solly Zuckerman stressed, *Blue Streak* was a liquid fuelled rocket, and this was now an obsolete technology.¹⁷ As for dependency on the US, its dangers were difficult to assess, as the costs and benefits fluctuated with the overall state of Anglo-American political relationships. Finally, and importantly, there was the danger that the continuation of the rocket programme, particularly if funded from the civilian science budget, would completely distort the pattern of science expenditure. Zuckerman was particularly emphatic about this, preferring, as he put it, "to spend the money on better instrumentation and better satellites using American launchers."¹⁸ At the same time a vigorous debate was conducted among the British space science community through the columns of *New Scientist*, pitting two of the most eminent members of the field against one another. Bernard Lovell (Jodrell Bank), was in favour of developing an independent British

¹⁵ See the *Report by Officials* cited in note 10, p. 6 and section VI.

¹⁶ These latter arguments are in their *Report* on pp. 11 and 12.

¹⁷ Zuckerman's rebuttal is in the document cited in the following note. Macmillan's advisers seemed to have laid great store by Sir Solly's claim — see the note for the Prime Minister dated 5/7/60 in file PREM11/3098, PRO, London.

¹⁸ For Zuckerman's views a *Note for the Record* dated 5/7/60 reporting a meeting between Macmillan, Zuckerman and Bishop, file PREM11/3098, PRO, London.

launcher, while Fred Hoyle (Cambridge University) felt it would be "ridiculous" to devote so much money to one field of science.¹⁹

In the absence of unambiguous arguments as to how to proceed Macmillan and his cabinet decided in July 1960 to continue the development of *Blue Streak* on a provisional basis until the end of the year, and to explore the possibilities of continuing thereafter in the framework of a cooperative programme with European countries and, at least, Australia. At an abstract level their reactions were typical of decision-makers faced with alternatives neither of which was particularly better (or worse) than the other: they decided not to choose.²⁰ More concretely, political considerations seemed to have dominated their thinking. On the one hand the Prime Minister was reluctant to abandon a key symbol of British prestige, autonomy, and great power status, originally intended to keep Britain abreast of the latest developments in defence technology. "If we now cancel Blue Streak altogether", mused Macmillan, "will the decision generally be regarded as a further step in the direction of prudence and realism, or will it be held to mean that we are becoming increasingly, and to an undesirable extent, dependent on the USA."²¹ On the other hand a joint European programme was perceived as a move towards closer cooperation with the continental powers, and with de Gaulle in particular. "Many recent developments confirm my belief," wrote Bishop to his Prime Minister "that we should consider the possibilities of closer collaboration with the French, not excluding collaboration in military fields and in policy towards NATO."²² A cooperative effort around *Blue Streak* certainly fell within these spheres.

* * *

The first jointly developed launcher which Britain proposed to her potential European partners was based almost exclusively on UK technology. The launcher, it was suggested, would have three stages.²³ *Blue Streak* would be the first. *Black Knight*, a

¹⁹ For their arguments see Hoyle (1960) and Lovell (1960).

²⁰ For a discussion of this feature of decision-making behaviour, see Schilling (1961).

²¹ See the note by the Prime Minister headed *Blue Streak*, written around 25/7/60 in file PREM11/3098, PRO, London.

²² See a memo to the Prime Minister dated 5/7/60 headed *Blue Streak*, and signed FB, file PREM11/3098, PRO, London.

²³ For this information see, for example, telegrams 3498 and 3499 from the Foreign Office to Washington dated 12/8/60 in File FO371/149654, PRO, London.

rocket which the UK had been developing for four years, and which had already undergone some test firings, would be the second. The third stage had still to be developed, though privately the UK government knew that this was not a significant part of the work.²⁴ The development of the first and second stages and the facilities required to test them had cost £60 million to date. Britain had no intention of recovering these costs. What she was hoping for was a participation by other countries in the cost to completion of the project, claimed to be some £50 million spread over five years.²⁵ In return, member countries would acquire the right to fire satellites (which might otherwise be denied them by the Americans).²⁶ Partners would also acquire first hand knowledge of the development and production of powerful rockets and their associated technology. "Each participating country," it was stressed, "would have rights of access to and information on the work proceeding in the other participating countries."

At the same time the British government sounded out reactions to its proposal in Canberra and in Washington. The Australians, while not objecting to Britain making a preliminary approach to European powers, had three main concerns. Firstly, they were worried that, if *Blue Streak* were cancelled, Britain might abandon rocket development not only for civilian but also military purposes. Secondly, they wanted assurances that if they participated in the further development of, say, a telecommunications satellite, the UK would not "hold them to ransom in any commercial exploitation [...]," and that they would have full partnership rights. Thirdly, and most importantly, they wanted assurances that the UK would not strike a deal in which Woomera was sacrificed for Colomb-Bechar, France's Saharan launching base. Such a deal, the British were warned, would have a "disastrous effect" on Anglo-Australian relations.²⁷

²⁴ See the *Report by Officials* cited in note 10, section IV.

²⁵ This figure is five times less than the estimate, made only a few months before, of what it would cost to develop *Blue Streak* as an IRBM. It seems, and indeed turned out to be, hopelessly unrealistic. The satellite launcher obviously did not need such a sophisticated guidance system as the missile, nor did it need a nosecone able to withstand the searing heat of re-entry into the lower layers of the earth's atmosphere. It is hard to believe that these features of the weapon composed some two-thirds of the overall R&D expenditure though.

²⁶ The weights and orbits of the kind of satellites that could be launched by the envisaged rocket were added by way of illustration. It was estimated that a further £12 million would be needed to develop them.

²⁷ For these first Australian reactions see the telegram 827 from Canberra to the Commonwealth Relations Office, 31/8/60, in file FO371/149675, PRO, London.

Clearance from the United States was required on the commercial, political and military aspects of any collaborative European programme. North American Aviation and Convair had made major contributions to the development of *Blue Streak's* rocket engines and frame. And the State Department would have to be persuaded that there were no risks in having France and Germany, in particular, as partners. This was a delicate point as it was US policy not to do anything which might help either nation develop an independent IRBM capability.²⁸

None of these difficulties seemed insurmountable in British eyes. In anticipation of Australian reactions they had told the French from the start that the UK regarded the use of Woomera as essential in any cooperative programme involving the use of *Blue Streak*.²⁹ To meet potential US objections, they undertook not to divulge any United States commercial information or classified defence information embodied in the first stage of the envisaged rocket. More to the point they stressed that, in converting *Blue Streak* from a missile to a satellite launcher, it would be stripped of its military characteristics. The civilian version would have no inertial guidance or re-entry properties, and would not embody any US classified information above the "confidential" level.³⁰

The United States reacted very positively to the British initiatives. Consistent with its prevailing policy of encouraging collaborative European ventures, it was reported from Washington that the Department of State not only had no objection, but "might react favourably, to the proposed European organization, including the United Kingdom [...]." The Americans saw no objection to the transformation of *Blue Streak* into a satellite launcher, felt that there was no great risk of military information being divulged if the vehicle was used for civilian purposes, and agreed that UK firms could have exploratory discussions with their American counterparts about the "Europeanization" of the programme.³¹

The initial reactions of Britain's potential partners on the continent were also positive. It was the position of the French though, regarded by Minister of Aviation Peter

²⁸ See Telegram from Washington to the Foreign Office, 27/7/60, in file PREM11/3098, PRO, London.

²⁹ See aide mémoire sent to the French on 25/7/60, file PREM11/3098, PRO, London.

³⁰ See telegram 3497 from the Foreign Office to Washington, 12/8/60, file FO371/149654, PRO, London.

³¹ See telegram 1722 from Washington to the Foreign Office, 1/9/60, file FO371/149655, PRO, London.

Thorneycroft as "the potential cornerstone of an international organisation [...]," which mattered most, and which we shall now consider in some depth.³²

3 *Bringing the French on board*

The idea that France may like to collaborate with Britain in the joint development of a launcher had been floated in Paris as soon as it was decided to abandon the rocket as a weapon. The issue was left on the back burner while the UK established the American position. Then, from September onwards, according to a French source, the pressure on Paris to reach a favourable decision increased substantially. Several French technical teams visited Britain and there were discussions at the ministerial level. The French space science community also looked into the British proposal in mid-November. Soon thereafter the Quai d'Orsay had clarified its position.³³

The French were cautious. Certainly, they thought that it would be of "great interest to study the possibilities of producing in Europe a system of rockets to permit the placing of heavy satellites in orbit."³⁴ But they had serious technical and financial doubts about Britain's proposal. According to an internal French document, the use of *Black Knight* as a second stage was without interest. It would not accelerate existing developments, it would be of no use to French national military projects, which were judged to be more modern and technically very different, and it would be of little benefit to French industry. Then there was the problem of cost. The space scientists were particularly emphatic about this, insisting that if France entered this venture the funds for it — estimated at 250 MFF over five years — should not come from the allocations just made to the national scientific space research programme. At the same time to bring home to their government their lack of interest in the scheme, they pointed out that, like their British colleagues, they would be looking into an offer by the Americans to launch

³² The quotation is from Thorneycroft's memorandum for the Cabinet Ministerial Committee on *Blue Streak* dated 28/11/60 in file CAB134/1428, PRO, London.

³³ See *Examen de la Proposition Britannique par le Comité des Recherches Spatiales*, 16/11/60, *Rapport personnel du Professeur Auger*, 16/11/60, and *Proposition Britannique de collaboration dans le domaine spatiale*, unsigned, from the office of Le Délégué Général of the Délégation Générale à la Recherche Scientifique et Technique, 21/11/60, all in file Re130/31, liasse 620, Archives Nationales, Paris (cf. note 1).

³⁴ Telegram from Paris to the Foreign Office, 24/11/60, file PREM11/3513, PRO, London.

national satellites.³⁵ And indeed in December 1960 one of their number, Jacques Blamont, made a trip to Washington to discuss arrangements for a collaborative effort with the NASA authorities.³⁶

The answer from the Quai d'Orsay reflected these concerns. The French government was willing, they said, to make a joint approach along with Britain to other European governments to discuss, without prejudice as to the final result, the possibilities of producing a heavy launcher in Europe. Their eventual participation however, depended on two considerations. Firstly, one of the stages of the launcher, preferably the second one, should be built in France. And rather than it being *Black Knight*, "they would want it to correspond to a type for which the French military authorities had already made provision in their plans." Secondly, the cost of any joint programme would "have to be made the object of a most precise study."³⁷

The French wish to replace *Black Knight* with one of their own rockets did not worry the British unduly. The pairing of *Blue Streak* with *Black Knight* had already been criticized by G. Pardoe, a chief engineer at de Havillands at the time, on the grounds that it underexploited *Blue Streak's* capabilities.³⁸ During the following two or three weeks technical missions from both Britain and France visited the installations of their potential partners across the Channel to explore the possibilities of building an Anglo-French launcher. On 12 December Thorneycroft himself came to Paris to spell out the UK's position, a position which, in the eyes of the French at least, completely changed the terms of the debate. The Minister's main point was that a launcher with a French second stage would cost more than one based on the *Blue Streak—Black Knight* combination. He was certainly in favour of the two countries declaring an interest in building together a launcher based on *Blue Streak* as a first stage, a French second stage, and a third stage to be built on the continent. However he felt that, in this case, costs would have to be shared on a 50/50 basis between Britain and France, the financial burden being reduced by contributions from other member states who might want to participate in the project.

³⁵ The material in this paragraph is based on the documents cited in note 33. The government had agreed to spend 130 MFF over five years on the national research programme. The French contribution to ESRO was likely to cost a further 100 MFF between 1961 and 1965.

³⁶ Minutes of the meeting of the Sous Comité des Programmes Scientifiques held on 24/2/61, an annex to the minutes of the meeting of the Comité des Recherches Spatiales held on 8/3/61, Re 130/31, liasse 620, Archives Nationales, Paris.

³⁷ For this response see the telegram cited in note 34.

³⁸ See his remarks cited by Goldring (1960), p. 1333.

The French reaction was immediate and firm: they were not willing to pay 50% of the cost of such an operation — except perhaps under one condition.... The money for the launcher could not come from the science budget. The minister responsible for scientific research (Guillamat) pointed out to Thorneycroft that at the Meyrin conference of plenipotentiaries which had just been held it had been suggested to hive launchers off from satellites. His ministry was only prepared to take responsibility for the latter. It was therefore up to the Ministry for the Armed Forces to foot the bill. And as the representative of this ministry (General Lavaud) made clear, there was simply no way in which he could find 50% of the costs of a heavy launcher in the money that had been set aside for the development of rockets for space science. Savings of this magnitude were only possible from the military side of the balance sheet — notably in the areas of inertial guidance and nose cone re-entry. In sum, then, what the French were demanding was access to highly sensitive military technology in return for their participation in a joint venture to develop a heavy launcher with the British.³⁹

French military interest in such a project came as no surprise in London. In line with de Gaulle's wish to develop an independent "force de frappe", in 1960 Parliament voted funds for the so-called "precious stones" rocket programme (Emeraude, Topaze, Saphir for the military and Diamant for the civil programmes). When the British first proposed a joint venture in spring that year, the French immediately sought to have a team appointed by their Ministers of Scientific Research and of the Armed Forces "to have access to some precise facts about certain technical questions connected with the missile [...]", and to establish the extent to which the British were prepared to share their know-how with their French counterparts.⁴⁰ In similar vein, the British government officials who had explored the arguments pro and contra the continued development of *Blue Streak* had remarked that Paris was likely to be interested in a joint venture "because the large rocket techniques involved [were] relevant to the delivery of nuclear weapons and other purposes," and more broadly "as promising closer Anglo-French activity in the nuclear field, and in aviation and weapons generally."⁴¹ It was not the military dimension as such, then, that wrong-footed the British. It was rather the specific request for

³⁹ These two paragraphs are based on the (apparently verbatim) report of the meeting with Thorneycroft made by François de Rose at the 22nd meeting of the Comité des Recherches Spatiales held on 14/12/60, Re 130/31, liasse 620, Archives Nationales, Paris. For the process leading up to the splitting of satellites from launchers at the Meyrin conference and to the birth of two European space organizations, see Krige (1992a).

⁴⁰ Aide-mémoire from the French government dated 31/5/60, file FO371/149654, PRO, London.

⁴¹ For these quotations see the *Report by Officials* cited in note 10, pp. 7 and 9.

technical information on inertial guidance and the characteristics of re-entry heads, and the coupling of the provision of this information with French participation in a joint project.⁴²

The diplomatic implications of acceding to the French request caused considerable concern in Britain. As one of Macmillan's private secretary's put it, to divulge militarily sensitive information on ballistic missiles to them would be "a reversal of current Anglo-American policy and could certainly not be done without deep consideration here and consultation with the United States authorities [...]." The Foreign Secretary, for his part, was sure that the Americans would be very unhappy about any such arrangement. "Do we and the Americans want France to get ahead quickly with the military side of rocketry?", he asked in alarm. "The Americans would certainly not give France information if there was the least danger she would hand it on, and who would say she would not?"⁴³ To circumvent these objections the proponents of the scheme pointed out that, in fact, Britain had made important contributions of her own to the key military components of *Blue Streak*. In particular, it was said that the re-entry head was of British design and that, although the guidance system was American, UK firms were producing similar equipment which might be of equal value to the French. The opinion thus gained ground that it might be possible for Britain to draw up a bilateral arrangement with France for the transfer of that part of the militarily sensitive information which was "technically within our own disposition", so hopefully satisfying Paris without unduly offending Washington.⁴⁴

As the British grappled with the implications of their request for military technology, the French became increasingly unwilling to commit themselves to a joint project. In mid-December 1960 Thorneycroft and the French Minister for the Armed Forces (Messmer) agreed that an intergovernmental conference should be called for the second half of January, and that the invitations would stipulate its aim as being to study the development in common of a launcher based on *Blue Streak* as first stage, a French second

⁴² For the growing realisation in Britain of the importance of the military interest of the heavy launcher to the French, see minutes of the meeting of the Cabinet Ministerial Committee on *Blue Streak* held on 30/11/60, document BS(60), file CAB134/1428, PRO, London, and note for Macmillan signed PdZ (Philip de Zulueta) and dated 15/12/60, file PREM11/3513, PRO, London.

⁴³ For these reactions see the note for Macmillan signed PdZ and dated 15/12/60 and the memo from the Foreign Secretary to the Prime Minister dated 30/12/60, both in file PREM11/3513, PRO, London.

⁴⁴ For this paragraph see minutes of the Cabinet Ministerial Committee on *Blue Streak*, meetings held on 19/12/60 and 17/1/61, documents BS(60) and BS(61), file CAB 134/1428, PRO, London.

stage, and a third stage to be built on the continent. When it came to settling the wording of the joint invitation, however, the French would not agree to the inclusion of any reference to their building the second stage. What is more, according to UK sources, they refused to allow the visit of a British technical team who wanted to estimate the effect on the project in terms of time and money of substituting a French second stage for *Black Knight*. As a result there were also no specific proposals in the invitation as to how costs might be shared.⁴⁵

Then, within days of the conference, scheduled for 30 January in Strasbourg, the French attitude changed. A British technical team was invited to Paris on 27 January. And on the eve of the Strasbourg conference they withdrew the condition that all funds for the new organisation had to be found from their military budget i.e. the release of military information was no longer a precondition for French participation in the project.⁴⁶

There is no single, or simple, reason for this change of heart. Perhaps the French always intended to join in the venture, and their request for military information was simply a bargaining card to be withdrawn at the last minute if it proved too difficult to satisfy.⁴⁷ They sought key technical data that the British had. They also knew that Britain's position was weak, and that the longer the negotiations dragged on the more concessions Thorneycroft would have to make. It was costing £350,000 a month to keep the *Blue Streak* team and facilities on hold, and there would be serious domestic political repercussions if the rocket was finally cancelled. It was only natural that they would try to take advantage of the situation, and wring ever possible concession out of Thorneycroft and his team.

Even then one must be careful. In mid-December one British observer remarked that the French had "now come out into the open and made it quite clear that what they [were] *really* interested in [was] knowledge about ballistic missiles (so-called inertial

⁴⁵ For this material see the documents referred to in the previous note, the brief for the United Kingdom delegation to the Strasbourg conference, prepared by the Cabinet's Official Committee on *Blue Streak*, document BS(0)(61)6, 26/1/61, and a document labelled SECRET from about February 1961 on file PREM11/3513.

⁴⁶ See the minutes of the meeting of the Cabinet Ministerial Committee on *Blue Streak*, 1/2/61, document BS(61) 2nd meeting, in file CAB134/1428, PRO, London.

⁴⁷ For example Messmer told Watkinson, the UK Defence Minister, that "he thought his government was in general willing to support the idea of joining with other European nations in using *Blue Streak* as a space launcher [...]", record of a conversation between the two on 17/12/60, file PREM11/3513, PRO, London.

guidance and re-entry)." (my italics).⁴⁸ This is too simple. The explicit request for this knowledge arose in response to the scientist's demand that their funds not be cut, with the implication that the money for the Anglo-French launcher would have to be found in the defence budget. And, as the Minister for the Armed Forces explained, to have the French Assembly accept that some £20-30 million be spent from his budget for "a project that had no possible military application at all," it would be useful if Britain could "make some gesture with regard to the re-entry head or the guidance system [...]"⁴⁹ The request for military know-how was thus less a point of principle than of domestic political need and, as the British soon realized, the precise content of the military technology that was transferred was negotiable.

But the most important reason why the French position changed was that de Gaulle himself intervened. From 27-29 January Macmillan and the French President held confidential talks at Château du Rambouillet. The climate was cooperative: within six months the British Premier would announce that the UK would apply for admission to the EEC. The two men discussed the heavy launcher during a walk on the afternoon of the 28th. According to a British record of their conversation, de Gaulle was "attracted by the idea of Europe becoming "the third space power." He would take a constructive line about Blue Streak at Strasbourg. He did not mention the military aspect."⁵⁰ Confirmation of the importance of this meeting is provided by the remark, made many years later by a French source, that de Gaulle personally, and "against the advice of all the experts", took the decision in January 1961 to associate his country with the *Blue Streak* project.⁵¹ Indeed even at the time the British believed that the General's intervention had been crucial. Later in that year the view was expressed that the conversation between Macmillan and de Gaulle at Rambouillet in January "had been decisive in persuading the French to join with us in sponsoring E.L.D.O."⁵²

⁴⁸ From the note from PdZ to his Prime Minister cited in note 42.

⁴⁹ See the record of the conversation between Messmer and Watkinson, the UK Minister of Defence, in Paris on 17/12/60, in file PREM11/3513, PRO, London.

⁵⁰ See document headed *Rambouillet 3* on file PREM11/3513, PRO, London.

⁵¹ See Rhenter (1992).

⁵² See the minutes of the Cabinet Ministerial Committee on *Blue Streak* held 24/11/61, document B.S. (61) 8th meeting, file CAB134/1428, PRO, London.

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De Gaulle's support for Macmillan at Rambouillet in January 1961 was informed by very different motives to those of the British Premier. De Gaulle and the French were keen to have access to British advanced technology for their "force de frappe." Collaboration in the development of a rocket, parts of which had been built under license from the USA, was a useful channel for gaining access to UK and, indirectly, US know-how which could be used for both civil and military purposes. Technological exchange was far less important for the British. In the 1950s they were one of the leading nuclear powers in the world, and had a very advanced aeronautical industry. There was little that the French could teach them. Their objectives in seeking a joint venture with the French were primarily political. London had originally stood aloof from the negotiations surrounding the formation of the Common Market and, indeed, had spearheaded a campaign to form an alternative free trade area (EFTA) with the "outer six" plus Portugal.⁵³ Doubts about the wisdom of this move, and the view that Britain should also actively seek full membership of the European Community, became increasingly widespread in the country in 1960, as the Common Market began to take shape. By the end of the year Macmillan had decided that an application should be made. His meeting with de Gaulle at Rambouillet in January 1961 was the first occasion he had to sound out the General's attitude to his plan. Correlatively, de Gaulle's willingness at Rambouillet to take a cooperative line at the Strasbourg conference doubtless encouraged Macmillan in his view, which grew increasingly immune to contradictory signals, that the French President would favour UK membership of the EEC. The French, or at least de Gaulle, decoupled technological collaboration from economic and political union. The British, or at least Macmillan, did just the contrary. Technological collaboration was one dimension of a wider strategy aimed at closer integration with the Six, and was seen in Whitehall as an important "proof" of Britain's (new) European credentials. It was a fundamental difference in perception for which Macmillan, in particular, was to pay a high price.⁵⁴

⁵³ The seven members of EFTA were Britain, Norway, Sweden and Denmark, Austria and Switzerland, and Portugal.

⁵⁴ For a concise account of the circumstances surrounding Macmillan's application for EEC membership, see Ward (1992). For the importance to the French of having access to UK technology, see e.g. Newhouse (1970).

4 *The Strasbourg conference*

The jointly called Anglo-French conference was duly held in Strasbourg from 30 January to 2 February 1961 with Thorneycroft in the chair. Invitations were sent to Austria, Belgium, Denmark, Germany, Italy, Netherlands, Norway, Spain, Sweden and Switzerland. All of these countries were represented at the conference bar Austria, who sent an observer. Australia did not attend. In anticipation of the meeting the British Minister of Aviation made a tour of European capitals. He stressed the importance of not allowing the USA and the USSR to have a monopoly in the launcher field, the "unrepeatable opportunity to take a decision to go into space" provided by the cancellation of *Blue Streak*, the possible television, navigational and aeronautical applications of satellites, and the "immense political advantages in Europe getting together on a project of this kind which would straddle the existing divisions between Six and Seven."⁵⁵

Granted the complexity of the issues involved, and the short time which most delegations had had to prepare themselves, it was understood that the meeting would be essentially exploratory in character. After three days of deliberations the text of an Anglo-French memorandum summarised the main conclusions reached. It defined the initial programme of the envisaged organization, should it be set up, as "to study, plan, develop and manufacture a rocket system using Blue Streak as the first stage and a French rocket as the second stage. The development and manufacture of the third stage," the memorandum went on, would "be carried out on the Continent." The programme would also include the planning and construction of a first series of satellite test vehicles. The existing facilities already created would be put at the disposal of the member states, who would only be asked to pay the additional capital expenditure and running costs arising from the programme. The contracts for carrying out this programme would be placed by the participating governments themselves and not by the executive of the organisation itself. However all technical information arising from the work already done on *Blue Streak* and the French second stage, as well as from the initial programme itself, would be freely available to the participating states. These arrangements were not necessarily binding on any subsequent programmes, nor would any member state be obliged to take part in any such programmes. At the request of delegates from Belgium,

⁵⁵ See the record of Thorneycroft's talks on *Blue Streak* with German, Danish and Norwegian ministers presented to the Cabinet's Official Committee on Blue Streak, document B.S.(0)(61)4, 23/1/61. The reference to straddling the divide between the Six and the Seven is, of course, to building a bridge between the EEC and EFTA member countries — see note 53.

the Netherlands and Spain, the memorandum specifically allowed for the possibility of there being a merger between the launcher organization and ESRO.⁵⁶

The British faced two particular problems at the meeting. Firstly, there was the position of Australia. The Australians had agreed to put Woomera at the disposal of a European launcher "club," and would continue to pay their share of the costs of the range as agreed in the existing UK-Australia Joint Project (i.e. £9.5 million per annum). This, they felt, was to be regarded as a contribution in kind to any future European heavy launcher organization which would entitle them to full membership rights. Britain agreed to stand by this position. And while it appears that most other delegates did not object to this idea, they were less convinced that Australia could continue to participate in any subsequent programmes on this basis. She too would have to begin to make direct financial contributions to the costs of the organization.⁵⁷

The second main area of difficulty concerned the basis for sharing the costs of the initial programme. The British estimated this at £70 million spread over five years.⁵⁸ The original UK proposal was that this amount should be shared in the same way as were contributions to CERN, i.e. proportionally to gross national income with a maximum of 25% for any one country. On this scheme the UK would have paid just under 25% of the overall cost, and France just over 20%.⁵⁹ It rapidly emerged that other countries did not like this idea. The small countries were not prepared to commit themselves to expenditures of this magnitude. France offered to share only 15% of the burden which, it claimed, would amount to less than half of the actual costs of developing the second stage of the launcher.⁶⁰ And the British delegation found themselves forced to telegram

⁵⁶ For this paragraph see the final version of the memorandum by the French and British delegations dated 2/2/61, and attached as Annex I to the report of the proceedings at Strasbourg prepared by the committee established to consider the administrative, organizational and financial aspects of the proposed joint venture, document B.S. (0) (61)7, 6/2/61, PRO, London.

⁵⁷ For this paragraph see the brief for the UK delegation cited in note 45, and the telegram sent to London from Strasbourg that was discussed at the Cabinet Ministerial Committee meeting on *Blue Streak* held on 1/1/61, document B.S. (61) 2nd meeting, file CAB134/1428, PRO, London.

⁵⁸ This figure was made up as follows. The original estimate for a rocket with all three stages built in the UK was £35m. With a 50% contingency and with £6m added for a satellite test vehicle, this brought the cost of an all-British project to £58m. It was thought not unreasonable to add £12m to this figure if the other stages were not British, though it was remarked that "we have no valid basis for estimating the additional cost of other than U.K developed 2nd and 3rd stages." See brief for the UK delegation referred to in note 45.

⁵⁹ See Annex IV to the report dated 6/2/61 cited in note 56.

⁶⁰ For the French position see the first paragraphs of the annex to the final version of the joint Anglo-French memorandum dated 2/2/61 which was cited in note 56.

home for authority to pay up to 40% of the budget of any new organisation. ⁶¹ In the event Britain undertook to pay 33.33%, on the understanding that France, Germany and Italy should pay the same percentages as they were contributing to CERN for 1961/62, i.e. respectively 20.57%, 18.92% and 9.78%. The remaining 17.4% would be divided among the other eight participating countries proportionally to their gross national incomes. In effect this meant that the UK was willing to pass on its "excess" contribution of something over 8% to the smaller countries. It was agreed that if nevertheless any of these decided not to join the new organization, the "big four" would negotiate among themselves as to how its percentage was to be made up. ⁶²

This was not the only concession that the UK had to make in order to tempt its European partners to join in the scheme. Before the Strasbourg conference British officials had thought, rather naively, that the ongoing costs of maintaining the *Blue Streak* programme should be shared by potential partners. These should be asked to begin payments two weeks after the conference, and to decide by the end of May whether they wanted to be full members or not. This was softened after the Strasbourg meeting, and a memorandum was drafted suggesting that other parties might be invited to share costs as from 1 April 1961. As far as we can establish, no one did so. ⁶³

* * *

The Strasbourg conference provided the first opportunity for a thorough exposé of the Anglo-French heavy launcher project among the dozen potential European partners. Too much could not be expected. The meeting was called in haste and, until the last minute, it was not clear on the UK side just what line Paris would take — they even allowed beforehand for the possibility that the French might try to "sabotage the Conference from within." ⁶⁴ Certainly, after the meeting the British could be sure of French financial and political support up to a total of some 20% of the budget.⁶⁵ That was

⁶¹ See the telegram mentioned in note 57.

⁶² See the paper on financial contributions annexed to the final version of the joint Anglo-French memorandum dated 2/2/61 and cited in note 56.

⁶³ For this paragraph see the brief for the UK delegation to Strasbourg cited in note 45 and Annex V to the report of 6/2/61 cited in note 56.

⁶⁴ This is from the brief for the UK delegation cited in note 45.

⁶⁵ In the minutes of the meeting of the *Comité consultatif de la recherche scientifique* held on 10/2/61 we read that "la participation française, de l'ordre de 22%, paraît acquise.", file 28/CC, 2/D27 PV, AN810401 art 54 liasse 123, Archives Nationales, Paris.

reassuring, but it was not enough. In fact, in a sense, it simply increased Britain's vulnerability. To cancel the *Blue Streak* programme now would involve a loss of face for Macmillan, who had personally prevailed on de Gaulle and who was preparing Britain's application for EEC membership. On the other hand to continue the programme on a purely national basis for much longer while searching for additional partners was also likely to be embarrassing, both at home and abroad. The Labour opposition could be guaranteed to demand justifications for continuing to spend £350,000 a month on a militarily obsolete rocket. And, as Macmillan himself pointed out to Thorneycroft in April, there was "a point beyond which we cannot hawk this around Europe without becoming slightly ridiculous." ⁶⁶ What British Ministers wanted above all was that matters came to a head quickly. They were to be disappointed.

5 *German and Italian objections*

The main parameters shaping Germany's position on the Anglo-French venture had been explained before the Strasbourg meeting to Thorneycroft. Foreign Minister von Brentano expressed his strong support, this being "dictated by the political advantages which would accrue from the joint project." Minister of Economics Erhard did not foresee any financial difficulties. It was on the technical aspects of the envisaged launcher that the Germans had their doubts. Though awaiting confirmation from their experts, they felt that "serious thought should be given to whether it might not be preferable to use American rockets." This line of argument subsequently gained ground. In March the Federal Republic informed the British government of its "willingness to participate in the consortium for building launchers and satellites." At the same time they suggested "that there should now be discussions on whether the consortium should construct a launcher based on Blue Streak or an American launcher under license." ⁶⁷

This move was most unwelcome for Britain. If the idea was widely accepted — and there were already signs that many European countries favoured the German line — it would completely sabotage the British project. It was therefore agreed that under no circumstances should the UK contemplate participating in a consortium to build Ame-

⁶⁶ Personal minute from Macmillan to Thorneycroft, 24/4/61, file AIR8/2255, PRO, London.

⁶⁷ For this paragraph see the document cited in note 55, the record of a conversation between the Secretary of State (Home) and the German Ambassador on 20/2/61 (file PREM11/3513, PRO, London), the record of a meeting between Macmillan and Adenauer on 23/2/61 (*ibid.*) and the minutes of the Cabinet Ministerial Committee on *Blue Streak* held on 29/3/61, document B.S. (61) 3rd meeting, file CAB134/1428, PRO, London.

rican launchers under licence, nor in a second Strasbourg-like conference to discuss such a project. Instead Britain pointed out to Germany that the new US administration had just confirmed that the "mass of technical data" embodied in *Blue Streak*, much of it of American origin, could be disseminated to any new European organization which used the rocket, and that there would be scope for further collaboration as regards the third stage and the satellite test vehicle. At the same time it was argued that the existing Anglo-French project would be better value for money than any alternative, as Britain was offering it the work already done on *Blue Streak* as a "free gift".⁶⁸

As time dragged on so the pressure on Germany to take a favourable decision mounted. A meeting was arranged between Strauss and the UK Minister of Defence in May "to press the advantages of the project." It was suggested that Macmillan send a personal note to Kennedy "asking him to tell the other governments concerned, and in particular the Germans, that the United States administration was well disposed towards, or at least saw no objection to, the formation of the proposed consortium." Close contact was maintained with Adenauer, who had already told Macmillan that he supported the idea of a cooperative venture "with all his heart; Europe must play its part."⁶⁹ At the same time the British Cabinet, realizing that cancellation would now be even more damaging than these seemingly interminable delays, pondered proposing again a joint venture to the French on a 50/50 basis in return for "certain information relating to guidance systems and to some aspects of the design of re-entry heads, which was not of the highest secrecy [...]."⁷⁰ In the event this did not prove necessary. The high-level lobbying paid off. On 29 June Adenauer personally informed Macmillan that the Federal Government had approved German participation the day before provided, as a commission of experts had put it, "that German science and industry [were] given an adequate share of the work to be done." He hoped, Adenauer added, that this agreement would pave the way for the establishment of a European organization "to secure for European science and technology a proper place in the field of space travel and space research."⁷¹

⁶⁸ For this paragraph see the minutes of the meeting on 29/3/61 cited in the previous note.

⁶⁹ See record of a meeting between Macmillan and Adenauer on 23/2/61, file PREM11/3513, PRO, London.

⁷⁰ For the information in this paragraph other than that just cited, see minutes of the Cabinet Ministerial Committee on *Blue Streak* held on 10/5/61, document B.S. (61), 4th meeting, file CAB134/1428, PRO, London.

⁷¹ Letter Adenauer to Macmillan, 29/6/61, file PREM11/3515, PRO, London.

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To encourage Germany's participation in the Anglo-French project they were promised the third stage of the launcher. That left Italy. And the Italians, like the Germans before them, were most unenthusiastic about the scheme: there was, as CERN and ESRO pioneer Edoardo Amaldi put it, "solid opposition" to it in the country. He explained the grounds for his opposition, and that of the majority in Italian scientific and technical circles, to an Anglo-French technical delegation who visited the Foreign Ministry in Rome on 21 September 1961.⁷²

Amaldi had three main objections to the project. Firstly, he stressed that there was nothing of interest in it for Italian industry. Each stage of the envisaged "European" rocket would, in fact, be built in the country to which it had been attributed. This would effectively exclude not only Italy's industry from the most important parts of the project, but also her scientists and technologists. The situation, Amaldi went on, was to be contrasted with that at CERN. Here scientists and engineers from all the participating countries had been involved from the very start in defining the project, designing the machines, and bringing them to completion. Industrial contracts were awarded competitively on the basis of merit. In the Anglo-French proposal, by contrast, industrial contracts would be awarded "a priori, for either historical or political reasons, but not on the basis of scientifico-technological arguments."⁷³

Amaldi's second concern regarded the management scheme. Large projects of this kind were difficult to coordinate. These difficulties would surely be far greater in an arrangement which had stage one of the rocket built in the UK, stage two in France and stage three in Germany. "Any reasonable person", he wrote later, "sees the difficulty of matching three stages and the satellite made in 4 different countries and one can easily foresee the disputes that will arise if these do not fit well together."⁷⁴

⁷² Minutes of this meeting entitled *Verbale della riunione che ha avuto luogo al Ministero degli Esteri in data 21 corrente con la missione tecnica Anglo-Francese per il progetto Blue Streak*, as well as a report of Amaldi's personal contribution (*Intervento del Prof. E. Amaldi...*) to that meeting are in the Amaldi Archives, Box 210, Università di Roma "La sapienza". The quotation is taken from a meeting of scientists held a few days later, *Verbale della riunione tenuta a Roma il 25 settembre 1961 presso l'Istituto di Fisica dell'Università*, in the same box (cf. note 1).

⁷³ See the personal intervention by Amaldi at the meeting on 21/9 cited in the previous note. De Maria (1993) has analyzed Amaldi's position on the European space effort in great detail.

⁷⁴ See Amaldi's intervention in the meeting held on 21/9/61 cited in note 71 and letter Amaldi to Adams, 15/12/61, Amaldi Archives, Box 210, Università di Roma "La Sapienza."

Finally, there was the projected rocket itself, which Amaldi judged as not being worth the money to be spent on it. Europe, he pointed out, was being asked to make a major investment in a rocket which would use a technology which was already available in other countries. Echoing the sentiments of Sir Solly Zuckerman, he stressed that this technology would undoubtedly be obsolete by the time the rocket was ready, in five, or more likely seven years. In sum, Amaldi concluded, the Anglo-French project would not contribute to "the scientific and technical development of Europe. For Italy it [was] essentially a form of friendly contribution to the development of U.K. (and French) industry in this field." If his authorities wanted to participate, he added, they should be clear that they were doing so purely for political reasons.⁷⁵

Amaldi's statements were informed by the determination to protect an Italian national space programme which was being spearheaded by Luigi Broglio. Broglio was both the director of the Institute of Aeronautical Engineering at Amaldi's University of Rome 'La Sapienza', and a colonel in the Italian air force.⁷⁶ Already in July 1960 the Italians had succeeded in building an American *Nike* sounding rocket under licence. In August 1961 the government approved a three year space programme which included the construction, in collaboration with the USA, of the *San Marco* near-equatorial launching platform. And indeed, ten days after the meeting with the Anglo-French team in Rome, Broglio left for the United States to define the details of the *San Marco* project with his NASA colleagues. In short, in September 1961, the Italian experts' main concern was to place their national programme on a sound footing within the framework of collaborative ventures with the United States.

The implications of Italy refusing to join the proposed organization had serious consequences for Britain, from a financial and above all a political point of view.⁷⁷ By mid-September 1961 Austria, Norway and Switzerland had all let it be known that they were not interested in membership. If Italy followed suit the ensuing organization "would not be truly European in scope [...]." What is more there might be other defectors. Both Germany and Denmark had accepted in principle, but on condition that the new organization had "as broad a European base as possible, i.e. the participation as soon as possible [...] of all the states represented at the Strasbourg Conference." If they and other

⁷⁵ See Amaldi's contribution on 21/9 cited in note 72 and his letter to Adams cited in the previous note. Amaldi's emphases have been suppressed.

⁷⁶ For this paragraph see De Maria (1993), section 5.

⁷⁷ This entire paragraph is based on a note by the secretaries of the Cabinet Ministerial Committee on *Blue Streak*, document B.S. (61)2, 21/9/61, file CAB134/1428, PRO, London.

smaller countries dropped out, for reasons of cost and/or to protect their neutrality, Britain would find herself saddled with a project which had "most of the economic disadvantages of a multilateral enterprise conducting an expensive and complicated business" with none of the hoped for political benefits. In short, it was politically imperative in British eyes that Italy join in the launcher development project as soon as possible.

During the latter half of September "considerable pressure" was put on the Italians.⁷⁸ The British and French ambassadors in Rome made a joint approach to the government, German experts entered into direct contact with their Italian homologues, and steps were taken to arouse the interest of Italian industry. A personal message from Macmillan to Italian Prime Minister Fanfani was delivered on 3 October. At the same time the cabinet ministerial committee responsible for *Blue Streak* considered alternative courses of action if Italy did not participate. All had serious disadvantages, particularly from a political point of view.

Cancellation, though the cheapest alternative, was out of the question, at least in Thorneycroft's eyes. "I regard Blue Streak as probably the most important technical project in my ministry," he said, re-iterating the now standard arguments for continuation. *Blue Streak*, he insisted, was to be continued to avoid US dependency, particularly in telecommunications, to benefit industry, to enable Britain to be well placed to take advantage of possible military applications of space, and to avoid parliamentary criticism for not having cancelled earlier.⁷⁹ But if the UK proceeded without the Italians, what was the best basis on which to do so?⁸⁰ Britain could again consider going it alone, which would be more efficient and probably cheaper — but this would cast serious doubts over her claims to be interested in European collaboration and might have "an unfortunate effect on our negotiations with the European Economic Community." She might seek a purely bilateral Anglo/French arrangement — but this might "reinforce pressure for the supply to France of purely military information [...]," and create difficulties in Washington. Or she might work for a tripartite Anglo/Franco/German consortium — but this might encourage the "smaller European countries to believe that we

⁷⁸ For this paragraph see the minutes of the meeting of the Cabinet Ministerial Committee on *Blue Streak* held on 2/10/61, document B.S. (61) 5th meeting, in file CAB134/1428, PRO, London.

⁷⁹ See the memorandum by the Minister of Aviation, document B.S. 61 (3) of 28/9/61 on file CAB134/1428.

⁸⁰ For what follows see document B.S. (61) 2 cited in note 77 and the minutes of the meeting held on 2/10/61 cited in note 78.

were now prepared to accept in other fields as well the idea of a tripartite directorate in Europe, to which they are strongly opposed." In addition if Germany built the third stage of the rocket on her own "Soviet propaganda against West German militarism, and allied encouragement of it, would be provided with a useful theme." In sum the most preferable alternative in Britain's eyes was to push for as wide a European participation as possible, encouraging the French and the Germans to share any ultimate shortfall in contributions, including that of the Italians (about 10%), on at least a pro rata base with the UK.

In an effort to bring matters to a head, the British and French governments called a meeting of all the European states represented at Strasbourg, plus Australia, for 30 October in London. Its aim was to discuss the draft of a convention establishing a European launcher development organization. The week before Britain was still far from sure that a suitable basis for collaboration could be found. The Italians seemed to be insisting that *Blue Streak* be abandoned as a condition for their participation, though it was possible, said Thorneycroft, that their ministers "had agreed that it was for political reasons desirable for them to join ELDO, but felt constrained to take account of the fact that their technical advisers had reported unfavourably." The French, for their part, had refused to accept to share pro rata with the British (and the Germans) the shortfall in the ELDO budget if Italy should not participate, and had suggested cancelling the meeting if their Latin neighbour withdrew.⁸¹ And there were continuing difficulties with the Australians, who persisted in their view that their contributions in kind to the development of *Blue Streak* should also entitle them to continuing rights, without further payment, in the subsequent period of satellite research and the commercial exploitation of telecommunication satellites. This line was sure to antagonise other potential European members of the consortium.

To deal with this situation there was little Thorneycroft could do, given his determination to press on, but to seek authority to offer even more generous financial incentives to the delegates to the London conference. To save the meeting from possible failure caused by a breach with Australia it was decided to offer to set aside £1million over five years from Canberra's contribution to the Joint Project to be used as an Australian financial contribution to possible post-*Blue Streak* ELDO programmes.⁸² To make up the Italian shortfall should they not participate, Thorneycroft requested permission to

⁸¹ See the minutes of the Cabinet Ministerial Committee on *Blue Streak* meeting on 23/10/61 document B.S. (61) 6th meeting, file CAB134/1428, PRO, London.

⁸² For the Australian position see document B.S. (61) 2 cited in note 77. For the UK proposal as to how to assuage the Australians, see the minutes of the Cabinet Ministerial Committee on *Blue Streak* held on 27/10/61, document B.S. (61) 7th meeting, file CAB134/1428, PRO, London.

pay up to 60% for a UK/France/German project, reducing to 50% as other countries were brought in.⁸³ The Minister of Aviation was then prepared to spend up to £42million on a "European" project — compared to the original £50 million estimate for a *Blue Streak*—*Black Knight* combination.

These moves were of course indicative of the increasing vulnerability of the UK and of the Minister of Aviation in particular. Britain had now been "hawking" this project around the continent for almost 18 months, and had spent some £6million on keeping the *Blue Streak* teams at work. The political repercussions of withdrawal, both at home and in terms of the Macmillan government's European aspirations, would be extremely serious. In addition Thorneycroft was under pressure from the European space industry. In September 1961 it established a supranational body called EUROSPACE, which included among its members all the leading European companies in aircraft and missile manufacture. Its aim, according to its constitution, was "to promote the development of aerospace activities in Western Europe," which included helping the embryonic European space organizations to carry out their programmes. More specifically, sectors of this industry, both in Britain and in France, were keen advocates of the *Blue Streak*-based European launcher. As F. Vinsonneau of the French company SEREB put it, "What we did say, and repeat with conviction, was that the only solution in the [space] field was a united Europe [...] experiences and methods gained by the United Kingdom formed a large part of our common fund of knowledge and it would be our duty to support them and prevent their dispersal."⁸⁴ There were undoubtedly strong technical and managerial arguments against going ahead with ELDO in the form being considered in 1961. But they seemed to be more than outweighed, at least in the eyes of the product champions, by the assumed industrial and above all political benefits of pressing ahead.

6 *The Lancaster House conference*

The UK duly convened a meeting of potential member states to draft a final version of the ELDO convention at Lancaster House in London. It lasted from 30 October to 3 November 1961. Thorneycroft was in the chair, and representatives were sent by Belgium, Denmark, France, The Federal Republic of Germany, Italy, the Netherlands, and the UK. Australia also attended officially this time. Norway, Sweden and Switzerland, who were represented at Strasbourg, only sent observers.

⁸³ For this proposal see document B.S. (61) 3 cited in note 79.

⁸⁴ For more detail on the lobbying activities of the European space industry see De Maria and Krige (1992). The quotation can be found in *Aviation Week*, 3/7/61, p. 31.

After the opening plenary session, in which the Italians explained the doubts they had about the project, the conference broke down into an administrative and financial working party and a technical working party. These presented their results to plenary sessions where the main difficulties that had arisen were discussed. In general, according to an internal British document, "the representatives of other countries supported the formation of a European Launcher Development Organisation and were sympathetic towards the difficulties which the U.K. Government in particular was experiencing in its efforts to found the Organisation." At the end of the meeting an agreement was reached on the form of a suitable convention.⁸⁵

Four main problems arose at the meeting. Firstly, of course, there was the question of Italy. According to one source, by the time the meeting took place, Italian engineers had come around to the view that, for all its limitations, ELDO had certain advantages for them. In particular the building of a test satellite for the launcher dovetailed neatly with their plans for the national space programme. Also they hoped, with the support of Germany, to push ELDO in the direction of studying advanced launcher technologies, particularly cryogenic propulsion. In the event they were unable to enter into formal commitments at Lancaster House. Apparently Prime Minister Fanfani, at the last minute, instructed the delegates to remain temporarily aloof since negotiations with the USA over the *San Marco* platform had reached a particularly important stage, and he wanted to do nothing which might hinder their successful conclusion.⁸⁶ Under these circumstances, the conference could do no more than strongly encourage Italian participation. To tempt them it was agreed that £2 million be set aside in the initial programme for a two-year study of future possibilities and the need for vehicles and ranges, preferably led by a suitably qualified Italian. The French delegation also suggested that Italy should take the lead in any advanced propulsion research which ELDO might undertake, a project that was close to Broglio's heart.

The second problem concerned the free exchange of information. Failure to agree on these rights would have imperilled the whole project, because the availability of information for use by other countries was fundamental to the British proposals. The German delegation had particular difficulties here because design and patent rights under German

⁸⁵ For this paragraph and the quotation see the Report on the Lancaster House Conference prepared for the Cabinet Ministerial Committee on *Blue Streak*, document B.S. (61) 6, 13/11/61, in file CAB134/1428, PRO, London.

⁸⁶ For this paragraph see the interview of C. Buongiorno with L. Sebesta, Rome, 23/6/92, ESA archives, Florence. For additional information see also Sebesta's interview with L. Broglio, Rome, 22/6/92.

law belonged to the inventor. It was thus difficult for the government to get free access to this information for other member states participating in ELDO. In the prevailing spirit of compromise a suitable way around the difficulty was devised.

Then there was the ongoing problem of Australia. The French, in particular, strongly objected to making commitments in the convention to future programmes, and Britain tended to sympathise with their position. The question was not resolved at the conference. Instead Britain accepted that Australia should circulate a note to other ELDO member countries repeating its offer to make the facilities available for the first programme also available as contributions in kind to any subsequent programmes, in return for which Australia would continue to have full membership rights in the organization. Britain agreed to inform its ELDO partners that it was willing to go along with this arrangement. At the same time, in view of the attitudes expressed by other parties at the Lancaster House conference, she made it clear to Canberra that she would not put pressure on any country who was not prepared to accede to Australia's request.

The final important aspect discussed at the meeting was the financial one. Spain said that if it joined it could not afford to pay more than £1million to the organization. The small countries, particularly the Netherlands and Denmark, wanted the absolute value of their contributions limited to their share of the £70million estimate for the initial programme, i.e. they wanted this to be treated as a ceiling on expenditure. Britain and France would have none of it. They insisted that, while this was the best available estimate of the cost of ELDO, they could not guarantee that it would not be exceeded in a development project of the type being considered. The compromise found was to insert a clause in the financial protocol which stated that, if the £70 million limit should be exceeded, the member states would discuss among themselves as to how to deal with the excess.

The other financial problem dealt with at Lancaster House was how to share the shortfall should the Italians not join. France and Germany made it clear that they were most unlikely to help, despite considerable pressure put on them by the UK delegation. Instead, they suggested that, if Britain paid the Italian contribution of 9.78% they might be willing to share any outstanding shortfall due to the defection of smaller member states. This was coupled with the demand by the big countries that the annual budget of the organization be voted by a qualified two-thirds majority, the qualification being that it be accepted by those contributing 85% of the budget. This destroyed any hope that

states like Belgium or the Netherlands might have had of restricting expenditure using formal voting mechanisms.⁸⁷

In the light of these developments Thorneycroft's immediate problem was to persuade his colleagues that Britain should be prepared to pay Italy's contribution to a future ELDO. The matter was discussed by the Cabinet committee on 24 November 1961. It was hostilely received by the Chief Secretary to the Treasury and by the Minister for Science. Both insisted that further expenditure on ELDO would be at the cost of other more worthwhile scientific projects. There were certainly going to be sharply increasing demands for science and technology over the next five years from both the Research Councils, whose forward estimates increased by 10% per annum, and the universities. Why spend more money on a launcher with no guaranteed important civilian use? American launchers could be used to put scientific satellites into orbit. In telecommunications the Americans were far ahead, and had let it be known that there would be room for only one international system. Britain's contribution to ELDO would involve developing an already obsolete first stage, and her large stake in the organization might well preclude her from having ESRO's satellite engineering laboratory, where the greatest technological advantages were to be obtained, on her soil. In sum, according Lord Hailsham, the science minister, if Britain took on the entire Italian share of the budget, it should be clear that this was being done "for reasons other than scientific", and the scientific effort in other fields should not be reduced to pay for it.⁸⁸

The immediate purpose of the Cabinet meeting was to advise Macmillan on the line that he might take with de Gaulle in discussions which were due to begin that afternoon. There was general agreement that he should ask the French President to join him in urging the Italian government to make a favourable response. If that happened Britain would be prepared to share the remaining shortfall equally with France and Germany. If Italy should stay out the question of whether or not Britain should itself make up the difference would have to be reconsidered, though Macmillan was told of the divided opinions at the meeting. The Prime Minister duly took up the issue the next day. de Gaulle said that France would be willing to bear more of the total cost of ELDO, but only to cover the deficit caused by non-participation of the smaller countries, not Italy.⁸⁹

⁸⁷ All of the material in the preceding paragraphs dealing with the Lancaster House meeting is from the document cited in the previous note. See also ELDO (1965), pp. 8-10.

⁸⁸ This paragraph is based on the minutes of the Cabinet Ministerial Committee on *Blue Streak* held on 24/11/61, document B.S.(61)8th meeting, and Hailsham's paper prepared for it, document B.S.(61)7, 16/11/61, both in file CAB134/1428, PRO, London.

⁸⁹ See Aide memoire from Macmillan dated 26/11/61 in file PREM11/3515, PRO, London.

Our documents do not permit us to follow the subsequent evolution of the negotiations over Italian membership in any detail. When the ELDO convention was signed on 30 April 1962, though, Italy was among one of the seven participating states, the others being Britain, France and Germany, Belgium and the Netherlands, and Australia. In the agreed division of labour the Italians were given responsibility for the first series of satellite test vehicles, while Belgium would provide down range guidance stations and the Netherlands the long range telemetry links, including the requisite ground equipment. In 1963 negotiations were opened between Britain, France and Germany on how to share the shortfall of contributions to the budget, amounting to a little under 12%. It was agreed that this would be done pro rata according to the scale of contributions to the initial programme. In practice this meant that the UK absorbed almost half of the deficit, its final share rising to 38.79%. France, Germany and Italy were to pay respectively 23.93%, 18.92% and 9.78%. Belgium, at 2.85% and the Netherlands, at 2.64%, made up the balance. Australia's contribution was the provision, free of charge, of the range and rocket firing facilities at Woomera. The convention establishing ELDO came into force on 29 February 1964.⁹⁰

7 *Concluding remarks*

The most striking feature about the birth of ELDO, and one that has been noted many times before, was the scepticism, and even opposition, to the project by many experts in the main participating countries. In the case of scientists this was mainly based on fears that the enormously costly rocket would be financed at the expense of their research programmes. Engineers stressed the obsolescence of the technology in the first stage, and the complex managerial problems that would be created by building bits and pieces of the system in different countries. These expert opinions were overruled in France, in Germany, and in Italy, along with the counter-suggestion that if Europe wanted to enter space rapidly it would be advised first to try to negotiate to build a heavy American launcher under licence.

ELDO then was a child of political, not technical parentage.⁹¹ In particular, it was a child of the Macmillan government, which saw the rocket as at once enabling it to

⁹⁰ For this paragraph see ELDO (1965), pp. 11-15. For the position of the Italian ministers see the statement by Thorneycroft made at the Cabinet meeting on 24/11/61, cf note 88.

⁹¹ The phrase is a deliberate allusion to the remark made by ESA's then Director General in 1984, Erik Quistgaard, that ELDO was "a child of non-technical parentage, of blindness to technical reality" — see ESA (1984). De Maria and Krige (1992) survey a number of arguments in similar vein in the introduction and conclusion to their paper.

achieve a measure of independence from the United States and to draw closer to its continental partners, and indeed to the newly-fledged European Economic Community. There were other arguments of course for continuing with the project — to save costs, to boost industry, to preserve inhouse skills — but it was these political concerns that dominated the thinking of Macmillan and Thorneycroft from the time the *Blue Streak* missile was cancelled.

It has been pointed out that Macmillan's decision to apply for Common Market membership in July 1961 was hopelessly ill-timed, that he placed far too encouraging an interpretation on the signals coming from the Elysée, and that if he had been more attentive the fiasco of de Gaulle's veto in January 1963 might have been avoided.⁹² While there is doubtless much truth in this, one can forgive Macmillan for feeling that de Gaulle was seriously interested in closer ties with Britain, at least in advanced technology. It was de Gaulle who, by all accounts, and against the opinion of all his experts, instructed his delegates at the last minute to take a cooperative line at the crucial Strasbourg meeting in January 1961. It was de Gaulle who accepted, in November 1961, that France share the shortfall of the contributions to the ELDO budget due to the non-participation of smaller countries. And it was while Britain's application to the EEC was pending that France and Britain agreed (in November 1962) to enter together another major, and financially disastrous project, the development of a supersonic airliner significantly labelled *Concorde*. In sum the negotiations over the setting up of ELDO took place in a context of a growing wish by Britain to become part of the European club, of an associated willingness on her part to make major compromises to achieve that objective, and of at least some positive signals from across the Channel that her membership would be welcomed. The difference, of course, was that whereas de Gaulle decoupled technological collaboration from the British application for membership of the EEC, Macmillan did just the opposite.

The possibilities inherent in this very specific political conjuncture, such as they were, were only exploited because of the determination of the British Prime Minister and of his Minister of Aviation. Thorneycroft never wavered in his conviction that it was essential for Britain to continue the development of *Blue Streak* as a civilian launcher. Macmillan never hesitated to contact now de Gaulle, now Adenauer, now Fanfani, and to ask them to intercede before their governments in favour of the British proposals. These personal ties were of crucial importance in bringing otherwise reluctant partners into line.

⁹² Ward (1992).

The British domestic political situation also played a key role in keeping *Blue Streak* alive. The moment it was decided to try to convert the missile into a civilian space launcher the Macmillan government exposed itself to charges that it was wasting money. As time passed, and hundreds of thousands of pounds a month were spent in anticipation of finding partners, so did these accusations become more difficult to rebut. What the Conservatives needed above all was a quick decision from other European governments. However the political symbolism was so great, the military interest so limited, and the technical aspects of the project so unsound, that this was just not possible. As the weeks and months dragged by so Britain's need to make ever more costly concessions to bring other partners on board increased. Each step forward, each partner acquired, was at once a sign of progress and a further impediment to the government extricating itself from the project. It gradually lost control over a process which steadily gathered its own momentum, and it paid a heavy price for it. By 1963 the UK not only found itself committed to paying almost 40% of the budget of the new organization — far more than the 25% it had thought to pay when it initiated the scheme two years before. It also found itself brutally excluded from the Common Market by an uncompromising de Gaulle. Britain had failed to meet either its financial or its political objectives, and it was saddled with developing a technically obsolete rocket. It is hardly surprising that it very quickly began to reconsider its continuing membership of the very club that it had brought into being.

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