

Introduction

The practice of European aerospace collaboration is now over sixty years old and Britain's involvement with its neighbours, if dated from the Anglo-French Concorde Treaty of November 1962, almost exactly that. On a personal note, my first tentative essay on the subject dates from 1969; as an undergraduate student of Defence Analysis, I considered the 'pros and cons' of European military aerospace collaboration. It would be fun, if somewhat trite, to write that nothing much has changed in the interim. While there is an element of *deja vu* in this Element, much has changed from the 1960s. My naïf essay appeared at a time when the some of the first collaborative programmes had either collapsed or were in trouble (I should also admit that my first published article on the Airbus from 1976 was less than hopeful about its future). From the perspective of the second quarter of the twenty-first century Europe now has several world-class trans-European defence/aerospace companies – at least three of which are better described as global in scale and scope, and two of these are British owned and headquartered. The United States still dominates much of the world defence industry and export markets, but in some areas of advanced military technology Europe has at least stayed in touch with the Americans – something that would not have been confidently predicted fifty years ago.

From a more parochial British viewpoint, by the early 1960s, the UK aerospace industry was, as I have written elsewhere, *Struggling to Survive*.¹ A belated rationalisation of the leading companies had produced two still under-resourced airframe groups, British Aircraft Corporation (BAC) and HSA, one helicopter firm, Westland, and two engine suppliers, Rolls-Royce and Bristol Siddeley Engines (BSE), the former more successful and capable than the latter, indeed perhaps the only truly world-class company in the national industry. The creation of two competing aircraft and engine companies was explicitly aimed at maintaining some degree of domestic competition, but which in practice only led to an implicit 'Buggins Turn' in allocating government-funded work. In 1966, Rolls unilaterally ended this charade by taking over BSE. The 1950s had seen the delivery of many British military programmes, few of which in the later years of the decade had made much headway in world markets; some had been absolute turkeys. The French, especially Dassault's family of fighters, had begun to pull ahead and the Swedes had begun to deliver some very effective products. Other Europeans, primarily Germany and Italy, were beginning to rebuild their aerospace industries. The Americans, however, were the main source of supply to the NATO alliance and other 'allied' nations.

¹ Forthcoming.

Worse was to come – in 1964–5, the newly elected Labour government axed a series of military aircraft projects, including the white hope BAC TSR.2. To rub salt in the wound, the government then ordered American aircraft to fill the bomber and transport gap left by these cuts. To balance some of the lost work, Labour continued with the expensive ‘Anglicised’ American F-4 K Phantom and somewhat reluctantly funded Hawker’s VSTOL P.1127, later known as the Harrier. However, the aerospace industry, although much maligned by Labour politicians, was still seen as a key employer and a high-value technology-intensive sector. This implied the need for continued support either in the form of R&D funding launch aid for civil projects or military contracts. The struggle to sustain the industry on the back of a small domestic market against a background of rapidly escalating development costs was the main reason the TSR.2 was axed and why the Labour government picked up the thread of cooperation with the French.² Matters were not helped by the tendency on the part of the RAF and MoD to ignore the export potential in formulating requirements, a British failing that continued for decades after the war. The United Kingdom also cancelled projects, such as the supersonic Hunter, that might have won a share of the world market. The French, on the other hand, would tend to prioritise a wider marketability – a factor that helped to explain sales of Dassault aircraft.³

The 1962 Concorde treaty hopefully signalled a better way: share the development costs and launch projects between two comparable states and launch production on the basis of a wider ‘domestic’ market. With the publication of the Plowden Report in 1965 into the UK aircraft industry, the Labour government went further, stating categorically that the United Kingdom should never again independently build large and complex aircraft, civil or military. So, building on the Concorde principle (no matter that Labour also wanted to cancel this project as well as the others in the 1964–5 cull), by 1966, the United Kingdom was committed to a series of bilateral military joint projects with France.

This Element begins at this point, describing what would turn out to be decades of turbulent politics and perhaps some dubious defence economics. It finishes with a much stronger British military aerospace industry, but with unfinished European business. Where possible (which effectively means up to the mid-1990s) I have used UK government archives located at Kew as well as some unpublished sources located at the National Aerospace Library (NAL) in

² The economic rationale for the TSR-2 cancellation might have been more justifiable had the decision not also included an order for the American F-111, which was itself cancelled in 1967.

³ I am grateful to Mr Paul Stoddard for this observation, and for several other comments on an earlier draft of this Element.

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Farnborough.⁴ This is still only a partial survey of original sources and events are largely from a British perspective (although I am grateful from comments by my colleagues in the French Air and Space Academy). However, using archival sources even to this point introduces a vital contemporary historical voice to the political-economic analysis of what remains a continuing issue in Anglo-European defence industrial relations.

Although the approach is primarily historical, focusing on the political context of the primary military aircraft collaborative programmes, economic factors are never too far from the surface. These include the effects of scope/scale economies, cost escalation and supply chain issues that shaped the motivation for and operation of the programmes considered in the narrative. The former is of particular significance, as the United Kingdom and other leading European aerospace powers sought to create and to maintain an *affordable* national or shared capability that could aspire to world-class standards, which in practice meant US standards. Similarly, although the subject matter is defined by the *aircraft systems* developed in Europe between 1960 and 2024, the importance of key suppliers, particularly in the engine and avionics sectors, was frequently a decisive element in the interplay of national industrial interests.

Finally, while military aerospace is central to this analysis, some mention is made of civil aerospace and the emergence of a competitive family of airliners developed and built by the Airbus consortium, in which the industries of Britain, France and Germany, the ‘*big three*’ players in the European aerospace industry, integrated their national industries successfully to challenge the United States. This history was not without links to military developments, particularly in the Anglo-French rivalries in the engine sector played out in both the story of Airbus and at least two of the major military programmes discussed in Section 1. The failure to establish a ‘military Airbus’ is perhaps one of the great ‘what ifs?’ of the history of European aerospace collaboration.⁵

There is certainly scope for a more diligent (and younger) analyst to continue this work, expanding perhaps on the wider defence industrial context beyond

⁴ Of particular value were the diaries of Freddie Page, who was closely involved in several key post-1945 military aerospace programmes, including collaborative projects up to the late 1970s. His diaries are kept at the NAL, but I also prepared a paper based on his memories for the Royal Aeronautical Society; Keith Hayward, *Freddie Page; Aerospace Engineer and Businessman; The life and times of Sir Frederick Page, CBE, MA, FEng, Hon. FRAeS, RAeS Paper*, 2013.

⁵ The political history of the Airbus is a complex and fascinating study in its own right, particularly the role of successive British governments in nearly derailing the rise of Airbus on at least three occasions. For an archive-based study of two of these near disasters for European aerospace, see Keith Hayward, ‘Airbus Industrie, Britain’s Return’, *The Aviation Historian*, Issue No. 38, January 2022, pp. 10–18 and ‘Britain’s Aerospace Brexit’, *The Aviation Historian*, Issue 28, July 2019, pp. 10–19

the narrow confines of military aerospace. But focusing on the single sector that pioneered and still dominates the universe of collaborative defence projects remains a valid approach, and the historical approach validated by the fact that much of the present reflects an unbroken stream of cause and effect.

As the United Kingdom moves into the unexplored bourn that is Brexit, the lessons of the past half decade or more should be obvious. Losing contact with the European market and perhaps drifting away from our industrial neighbours across the Channel could pose a serious challenge to the long-term health of the UK defence aerospace industry. The growing integration of European R&D and its closure to UK-based actors is a sign of things to come. Links with the United States, although more than a little tempting, will continue to threaten dependency and exclusion from what a friend and colleague in the industry has called the ‘noble aspects’ of development – systems integration and the acquiring the core technology of systems design and development.⁶ Forging alternative alliances across the world may come to fill some of this prospective gap, but they have yet to be proven and tested by political or economic crises. As the reader will discover, these tests can be to the destruction of collaborative hopes and aspirations. The period covers what might be described in retrospect as the era of ‘project-based’ European collaboration involving British aerospace companies that started in the early 1960s as a bilateral phenomenon, expanding into a more multilateral basis and concluding to date, in the early 2020s, as a more globalised process. This Element may thus act as a primer for the twists and turns of launching and managing over time a complex collaborative defence–industrial relationship. At the very least the story is rarely without interest.

European states have been collaborating on successive generations of military aircraft since the late 1950s, but with increasing intensity from the mid-1960s. The economic rationale for this activity has been well covered by several authors. In practice, collaboration has also been a complex political exercise involving a mixture of national military, but perhaps often more decisively, vital industrial and technological interests. Although European military aerospace collaboration has included most of the major European aerospace companies, the core actors have been the United Kingdom, France and Germany. The interplay of this triad has shaped most of the key aircraft projects: the Transall (1960), the Jaguar and AFG, (1966), Alpha Jet (1974) MRCA/Tornado, (1968), EFA/Rafale (1985), A400 M (1990) and into the current negotiations concerning advanced drones and a further generation of combat aircraft. There has also been a parallel evolution of European rotary aircraft collaboration and

⁶ Air Marshall, Sir Brian Burridge, also formerly of Finmeccanica and CEO Royal Aeronautical Society.

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joint work on guided weapons. Collaboration has not been exclusively European; the United Kingdom in particular has worked with the United States on the AV-8B Harrier (1976), the T-45 Goshawk (1981) and along with several other European states, the F-35 Lightning II (2001). But the United Kingdom has clearly been at the heart of European military aerospace cooperation since the early 1960s. (See Table 1 for the main UK collaborative programmes.)

Collaboration has been driven by a mixture of hard economics and political interest. The former was characterised by the rapidly rising costs of developing advanced military aircraft and airliners and the difficulty of sustaining production on the back of a small domestic market. This increased the unit costs of production to an unaffordable level, undermining both domestic affordability and attractiveness in export markets. Although collaboration increased administrative overheads, particularly when associated with inefficient but politically essential work-sharing practices, in splitting launch costs and increasing the base market the hope was to retain, at the ‘cost’ of some degree of lost autonomy, the greater part of a vital national technological and industrial capability. Politically, the United Kingdom sought to sustain close links with allies, especially in the context of seeking and then re-enforcing membership of the European Economic Union (EU), formally the European Economic Community (EEC).

This did not preclude cooperation with others, primarily the United States for specific projects. In some respects, the United Kingdom has thus managed to build effective alliances with both the United States and Europe. This has several related reasons. There are historical links stretching back to the Second World War, when the United Kingdom transferred critical military technologies to the United States, including early work on atomic weapons, radar and the jet engine. The combination of the Rolls-Royce Merlin engine and the North American P-45 airframe on a British initiative turned a mediocre aircraft into one of the war’s most successful combat aircraft. After the war the nuclear links were restored and became fundamental to UK security policies. Periodically, the United Kingdom has produced unique designs that filled gaps in the US inventory – the Canberra bomber in the 1950s, the Harrier AV8B, which was much improved by, thanks to, American funding, and the Hawk trainer adopted by the US Navy as the Goshawk. Coming the other way, the United Kingdom has been prepared to buy or licence to build American aircraft such as the Apache attack helicopter.

As we will consider in Section 2, latterly the Anglo-American linkage has evolved into a more complex relationship based on investment inside their respective domestic defence markets. The United Kingdom in particular has

Table 1 UK aircraft collaborative programmes – 1962–2023

Date	Name	Function	Countries
1962	Concorde	Civil airliner	UK, Fr
1965	Jaguar	Fighter	UK, Fr
1965	AFVG	Fighter	UK, Fr
1967	Airbus A300	Civil airliner	UK, Fr, Ge
1968	MRCA/Tornado	Fighter	UK, Fr, Ge, It
1975	AV-8B Harrier 11	VSTOL fighter	UK, US
1978	Airbus A310	Civil airliner	UK, Fr, Ge, Sp, I
1978	P110	Agile fighter	UK led Arab coa
1985	Eurofighter/Typhoon	Agile fighter	UK, Ge, It, Sp
1994	A400 M	Military transport	UK, Fr, Ge, It, S
2001	F-35 Lightning II (A, B & C)	Fighter bomber	US, UK, It, and o
2022	Tempest	New-generation fighter	UK, It, Jap + Sw
2022	FCAS	New-generation fighter	Fr, Ge

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placed fewer barriers to its defence market and industry than any other of the major NATO defence industrial powers. The United Kingdom has also been able to negotiate a less rigorous application of US technology transfer controls. The F-35 may in this light be seen as the peak of an Anglo-American collaborative stream. The United Kingdom is the only ‘Tier One’ partner, with privileged access to US-developed technology reciprocating (for the F-35B) with unique VSTOL engine capability as well as BAe Systems’ (BAES) experience of ‘lean manufacturing’ applications in aerospace production. Finally, although the United Kingdom has from time to time shared with its European neighbours some fear of long-term dependence on the United States, the threat has seemed less intense seen from London than Paris.⁷

This Element’s primary theme is the interplay of these economic, strategic and essentially political considerations. Although international collaboration could be suboptimal in terms of strict economic outcomes, the political returns and more pertinently in terms of sustaining the UK military aerospace industry, the exercise must on balance be described as a successful policy outcome.

Military aerospace has not been alone in exhibiting increases in intergenerational costs that have placed a growing burden on national defence equipment budgets. However, aerospace was the first to exhibit these effects and over the decades with increasing degrees of severity. This is largely due to the intrinsic complexity of advanced military aerospace across the board of aerodynamics, structures, propulsion and above all electronics. Land systems, although showing some degree of additional technological complexity and hence cost from one generation to the next, have been largely sustainable on the back of domestic orders. Naval systems – ships – have had the same relatively slower cost/complexity growth rate. Equally, much of the cost of larger vessels is bound up with the construction and integration of a very small number of ships. Combined with the often particularly high political salience of shipbuilding locations, the incentive and desirability to collaborate has been low.⁸ In the case of submarines, especially nuclear, the value of strategic autonomy has also driven national construction. There are now more examples of cross-border naval and land systems collaboration, but aerospace remains the primary focus for international development.

⁷ These fears have been more intense in the civil sector, but even here Rolls-Royce frequently saw the American market as paramount, and in 1978, the British government favoured links with Boeing or McDonnell Douglas over rejoining Airbus.

⁸ Regional employment issues were also factors in the aerospace industry, such as the priority afforded to allocating work to Shorts of Northern Ireland, but such concerns weighed especially heavily in the shipbuilding sector.

But collaboration with whom? Working with the Europeans was not inevitable. However, in the 1950s and even into the last quarter of the twentieth century there were few realistic options. There were only a limited number of countries with either the defence budgets or the industrial capabilities with whom to collaborate effectively. Japan into the 1970s would fall into this category, but its own strong preferences were to work with American companies. In the 1950s, the United Kingdom had some links with the United States through trans-Atlantic licence-built production (the Canberra bomber for the USAF and Westland helicopters for the British Navy and other customers), and of course increasingly close nuclear weapons cooperation. However, in terms of establishing an egalitarian relationship that would support UK aerospace companies, the United States would be a problematic potential partner. This was in fact driven home when the United Kingdom contemplated the launch of a supersonic airliner: diverging technical and industrial interests forced the United Kingdom to look across the Channel for a partner. Working entirely with the Americans threatened to undermine domestic competence, and it was feared to ultimately drive up the costs of weapons procurement should the United Kingdom become dependent on the United States. The United Kingdom would later establish a deeper defence aerospace industrial relationship with the United States, which in later years contributed to the divisions and fractures in the European military aerospace sector, especially in advanced combat aircraft systems. While the United Kingdom has not been alone in looking to the United States for partners and off-the-shelf equipment in competition with European products, the depth and scale of the Anglo-American linkage represents a distinct alternative to a wholly European defence industrial policy.

What became the Concorde was also the first example of the link between industrial cooperation and wider European interests, linked to Britain's first unsuccessful attempt to join the EEC. The first steps in UK military aerospace cooperation would also be with France, but as Germany and Italy were rapidly re-emerging as aerospace manufacturing centres, they would quickly provide alternative partners for the United Kingdom. However, what would soon emerge as a problematic relationship with France helped to shape the strategic direction of the UK and European military aerospace industries. There is here a story of what did not happen: the formation of a permanent industrial structure comparable to the European Airbus, integrating the major European military aerospace companies, the better to challenge the United States in world markets and to develop projects more efficiently and economically. This is primarily the failure of France and the United Kingdom to agree on long-term industrial cooperation, largely due to the irreconcilable interests of their respective engine and aircraft companies. The role of Germany from the early 1960s and frequently into the 1980s was primarily a 'balancing', but not always easy

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collaborative partner in the Anglo-French dyad. Italy has also played a junior role in shaping these events, as does Sweden.

As already noted, a second theme, evident in the early 1970s, is the prospect of closer defence industrial ties with the United States, which would become a major theme of the 1990s, with two strands: project-based cooperation on the US F-35, which has de facto emerged as an alternative to all-European cooperation; and the globalisation of mainly, but not exclusively, Anglo-American companies, such as Rolls-Royce, BAe, Raytheon and General Electric from the mid-1990s.

Finally, there is the strand of increasing industrial integration in some aspects of European military aerospace, primarily in rotary craft with the emergence of two transnational companies Airbus Defence and Space and Leonardo, and in the guided weapons sector, a dominant Anglo-French-German entity in MBDA.

This Element is presented in three sections.

- (1) A history of European cooperation in the development of high-value combat aircraft, beginning in the 1960s with the Anglo-French military aircraft package and the MRCA/Tornado programme. This era saw the emergence of a fundamental split in the European military aerospace sector – a schism reinforced by the failure of the five-nation European Fighter Aircraft (EFA) projects and the launch of competing French Rafale and the four-nation Eurofighter/Typhoon in the 1980s.
- (2) The emergence of transnational European aerospace/defence companies. This section focuses on the creation of BAES and the growth of an Anglo-American axis in core military aerospace programmes, counterbalanced by largely European helicopter and missile multinational companies from the mid-1990s to the present.
- (3) The Element ends with an examination of the current status of the European military aerospace sector; the continuing reverberations of Anglo-French differences over next-generation fighter programmes and the emergence of two competing projects. The conclusions are, from a European perspective, rather negative, or at least pessimistic about the future for a more integrated and thus potentially more efficient and effective UK military aerospace industrial base. From a purely British perspective, the future might be more promising.

1 Military Aerospace Collaboration 1960–1990

Launching Collaboration

In the early 1960s, the leading European aerospace nations – Britain, France, Germany and Italy – were at different stages in their post-war development. The UK industry was arguably the largest and most capable of the three, but

by the early 1960s it was failing commercially, if not technically. France, on the other hand, was beginning to make significant inroads into world markets, especially in the military sector. Germany was at the early stages of a state-led recovery from the 1945–55 prohibitions on aerospace activity, but already with ambitions to do more than licence-build foreign designs. Italy was a little ahead of Germany in terms of indigenous capabilities, but with less motivation to acquire a world-class aerospace industry. Sweden was an outlier, with a highly capable military aerospace industry, selectively using imported technology to build an impressive range of fighter aircraft. But its neutrality-driven policies blocked formal collaboration with its European neighbours.

The United Kingdom

Despite a considerable investment in civil and military aircraft since 1945, by 1964, the UK aerospace industry was at a crossroads. Except for the Vickers Viscount, British civil programmes had failed miserably in world markets. On the military side, only the Hawker Hunter of the second generation of jet fighters was an unequivocal success. The three ‘V’ Bombers were at the heart of Britain’s strategic nuclear force, technically successful but already obsolete, and, of course, unavailable as exports. An attempt to develop an indigenous ballistic missile, the Blue Streak, despite American help, had been expensively cancelled in 1960 as a military programme, although by 1962 it had become the first stage of a European satellite launcher. British carrier-based aircraft were outpaced by American products and obsolete by world standards (the NA39 Blackburn Buccaneer was something of an exception to this rule). The government-encouraged rationalisation of industry, initiated in 1959, had produced two competing aircraft and engine groups and one helicopter company. British Aircraft Corporation and HSA, although stronger than the fragmented industry of the 1950s, were still small by comparison with their American competitors. Ostensibly designed to compete for government work, both tended to receive contracts in turn. Rolls-Royce dominated its smaller competitor, BSE, and was by far the one UK aerospace company recognisably world class. This disparity, and consequent weight in government thinking towards the industry, would become even more evident with its take over of BSE in 1966, and the breakdown of merger talks between the BAC and Hawker Siddeley Aviation (HAS). Westland, the single helicopter company, had, contrary to government policy, built a solid basis on the back of licence-built US designs, but was now looking to develop its own designs.