

Capturing Fortress Europe: International Collaboration and the Joint Strike Fighter

Ethan B. Kapstein

On 26 October 2001, US Secretary of the Air Force James Roche announced the largest weapons acquisition contract in Pentagon history: the award for building the multi-service Joint Strike Fighter (JSF). The winner of the contest, following a five-year competition or 'Concept Development Phase', was Lockheed Martin Corporation, and its potential value has been estimated at over \$200 billion, depending upon the number of planes actually built over the programme's lifetime. In addition to Lockheed Martin, the JSF programme also included a complex set of foreign partnership arrangements, which enabled friends and allies to influence the design of the aircraft, to bid for sub-contracts and, ultimately, to buy the finished product. The JSF thus became the Pentagon's first cutting-edge acquisition programme to be co-developed and co-produced by the United States in cooperation with foreign governments and industries.¹

In adopting this collaborative approach, the Pentagon rejected calls, going back to the JSF's earliest days on the drawing board, that foreign participation in the programme be strictly limited. To be sure, in 1994 a Defense Science Board (DSB) task force had argued that the plane should be built with the 'foreign market in mind', meaning that an export-oriented version might be developed in order to lengthen production runs, thereby reducing the average cost of each unit.² With respect to foreign participation in the actual design and production of the aircraft, however, the DSB warned '*co-development should be minimised*' (emphasis added), in order to avoid all the complications that international collaboration would inevitably bring, including thorny technology

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transfer issues, greater management complexity and the overruns in time and money that resolving these and other problems would create.³

Why has the Pentagon – despite the DSB’s advice – followed the route of international collaboration in developing and building the Joint Strike Fighter? And what are the economic and security implications associated with that decision, which could involve transferring some of America’s most advanced defence technology? Briefly, international collaboration provided a strategy for ensuring that the JSF would win foreign market share in Western Europe and elsewhere – markets deemed critical to the financial health of the American defence industrial base at a time of sharply falling domestic procurement budgets during the 1990s. The Pentagon and its contractors may have preferred to export the JSF ‘off-the-shelf’ as the Defense Science Board had urged, but by the mid-1990s, that prospect looked increasingly dim. The Europeans were building three jet fighters themselves – the multinational *Eurofighter* (a collaboration between Britain, Germany, Italy and Spain), the French *Rafale* and the Swedish *Gripen*. The European defence-industrial base was also in the midst of a major restructuring effort, which was leading to the formation of a small number of big transnational firms, while the European Union was slowly beginning to articulate a more coordinated approach to defence acquisition.⁴ All these developments raised fears in Washington of a ‘Fortress Europe’ that would lock out American weaponry.⁵

The Pentagon and its defence contractors therefore had to devise an industrial strategy for capturing the European market at this critical time.⁶ That strategy was to offer foreign partners something of a Trojan horse, as JSF would enter European (among other) arsenals through co-development and co-production of the plane with local governments and firms, enticing them with the economic and technological benefits that international collaboration with the United States would bring.⁷ Indeed, one of the elements of genius in the JSF’s programme design was to create strong domestic industrial support for the project in target markets, since local industries and workers would have so much to gain from participation. JSF’s promise of creating jobs and transferring technology, in turn, made the plane attractive to politicians who had to vote the funds for its procurement. It is in the true political economy sense of the term ‘capture’ – meaning the ability of strong economic lobbies to capture government decision-making – that JSF entered foreign markets.

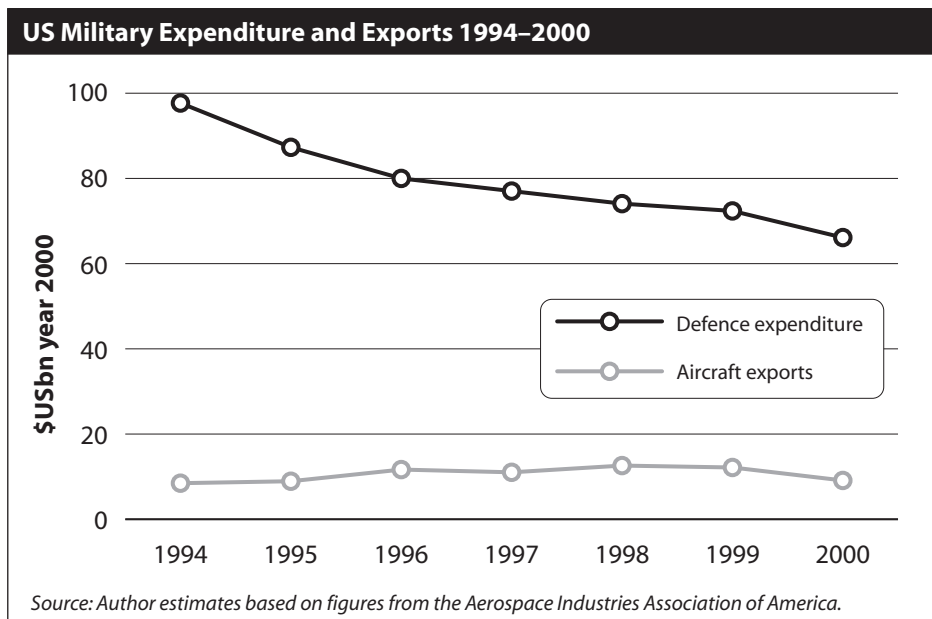
Planning the Joint Strike Fighter

During the early 1990s, the Pentagon faced a major acquisition headache when it came to military aircraft. The Air Force’s A-10s and F-16s, the

Navy's F/A-18C/Ds and the Marine Corps's AV-8Bs and F/A-18A/C/Ds were all facing the end of their operational lives and replacements would soon be required. Anticipating these developments, the Air Force and Navy had already launched four new tactical aircraft programmes – the F-22, F/A-18E/F, the AFX stealth fighter (a joint Air Force–Navy project) and the Multi-Role Fighter (MRF) – while the Navy had tasked the Defense Advanced Research Projects Agency (DARPA) to examine designs for a new Short Takeoff and Vertical Landing (STOVL) platform that could replace the Marine Corps' AV-8Bs.⁸

But the timing for launching a series of major new weapons programmes could not have been worse. The end of the Cold War had brought about sharp reductions in the defence budget, and this meant it would be impossible for each of the services to develop and purchase the new aircraft they sought. Coming to office in 1993, the Clinton administration had quickly launched a 'Bottom-Up Review' of US military strategy and its associated budgetary requirements, and the president sought total savings of \$112bn from the Pentagon during fiscal years 1994–98.⁹

The administration determined that 'future budgets could not sustain new aircraft development programmes for both the US Air Force and the Navy, much less for the Marine Corps'.¹⁰ Between 1994 and 2000, the defence procurement budget alone fell by over \$30bn or some 37%, and total defence aerospace purchases fell by a similar percentage.



These cuts resulted in the termination of the AFX and MRF programmes, and sharp reductions in F-22 and F/A-18E/F procurement levels. More dramatically, reductions in defence spending led to a radical shrinking in the number of American prime defence contractors. During the 1990s, the number of aerospace firms competing for prime contracts from the Pentagon shrank from six to three: Lockheed Martin, Boeing and Northrop Grumman.

Given this budgetary environment, the Pentagon in 1994 began to study the possibility of building a single ‘joint’ advanced strike aircraft, which would provide the Air Force and Navy with their main fighter platform for the first part of the twenty-first century. That plane would likely become the last manned fighter aircraft that the United States would ever build, given the costs of these systems and the physical limitations of human beings.¹¹ It would be a complex programme, in that it would have to meet the myriad fighter requirements of the two

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services, one of which relied on aircraft carriers to provide runways (the Marine Corps entered the programme later, in late 1994). This unique platform, originally labelled Joint Advanced Strike Technology (JAST), eventually became known in 1995 as the Joint Strike Fighter (JSF).¹²

The Pentagon’s decision to build a single fighter for the Air Force and Navy was not without its detractors. In 1996, Principal Deputy Under Secretary of Defense Noel Longuemare recalled his initial doubts about the proposal: ‘We’ve tried this before ... The TFX programme [of the 1960s] attempted to build a universal airplane that did everybody’s job and wound up doing everybody’s job poorly’. Even the Air Force general put in charge of the JAST programme office, George Muellner, declared his scepticism.¹³ In an interview with James Fallows of *The Atlantic Monthly*, he recalled telling Pentagon leaders: ‘I have to be honest – I really don’t want to lead this program. I have some real misgivings about its likelihood of success’. He noted that the programme was ‘resented by all the military services’, particularly at a time when many of their own procurement projects were being cut by the Secretary of Defense.¹⁴

As with every weapons acquisition programme, JAST/JSF would be shaped by multiple political, military, financial, industrial and technological factors and objectives. Politically, the new plane had to win friends in Congress to keep the procurement programme on track over the many years and billions of dollars the plane would take to develop and build. Militarily, the programme had to meet multi-service

requirements for a stealthy aircraft that could deliver precision weapons into high threat areas. Financially, it had to be produced under severe cost constraints, given the pressures on the procurement budget. Industrially, it had to provide enough work to maintain core competencies in the American defence-aerospace sector. And technologically, it was expected to incorporate cutting-edge propulsion, avionics and weapons systems into a composite structure airframe.¹⁵

On top of these programmatic influences, JAST was expected to incorporate another element into its design. As already noted, a 1994 DSB report urged that the new aircraft should be developed 'with the foreign market in mind'.¹⁶ To the DSB, this meant building a version of the plane that could be easily exported to foreign customers, along the lines of the fabulously successful F-16, whose foreign customers included Belgium, The Netherlands and Denmark. That export-orientation was primarily driven by economic considerations, since foreign sales would permit longer production runs, resulting in a lower cost per aircraft as learning curve effects and economies of scale were realised.¹⁷

While the DSB actively encouraged exports, it did *not* want to see the JAST aircraft co-developed and co-produced with foreign partners. Collaborative armaments programmes that involved one or more foreign nations inevitably resulted in a suboptimal division of labour, a more complicated set of programme requirements and a more complex management structure. There were also difficult technology transfer issues that would have to be resolved. For all these reasons, a DSB task force concluded that 'foreign participation in co-development of next-generation strike fighters ... would complicate the program to the point of reducing the probability of success'.¹⁸

The DSB view on international collaboration was in line with initial Pentagon thinking about the plane back in the JAST programme office. Even at this early development stage, it appeared likely that any future strike weapon system would contain a host of highly sensitive technologies, including low observables (stealthiness) and an advanced core engine system. As a result, the technology transfer issues alone would probably mean that deeper foreign collaboration on the project was doomed. Accordingly, JAST managers did not pursue foreign partnerships at first.¹⁹

But a major turning point for the JAST programme occurred in late 1994, when it was ordered by Congress to incorporate a STOVL capability that could be used by the Marine Corps and British Royal Navy as a replacement for their aging *Harriers*.²⁰ This congressional decision was apparently made after heavy lobbying from the Marine Corps, which feared that it would lack a new fighter once the AV-8B was

retired from service.²¹ The Royal Navy shared a similar set of concerns with the British government, which had already committed to buying the *Eurofighter* and was unlikely to fund a *Harrier* replacement. If the Marine Corps and Royal Navy were to get a new aircraft, therefore, it would have to be a version of the JAST, soon to be renamed JSF.²²

Given this shared interest in a future STOVL aircraft, on 20 December 1995, the US and UK governments signed a memorandum of understanding (MOU) that made Britain a full collaborative partner in all aspects of the Joint Strike Fighter.²³ [Under the MOU, the British agreed to contribute \$200 million towards the cost of the 1997–2001 Concept Development Phase (CDP) of the project – the phase that consisted of a design competition among the rival firms, with the ultimate prize being the contract for building the plane. Since the British government’s commitment was on the order of 10% of the total CDP cost of \$2bn, it naturally expected that British firms would reap their fair share of the development contracts awarded, and indeed BAE SYSTEMS (formerly British Aerospace) would be among the major subcontractors of the American prime contractors (initially McDonnell Douglas, Boeing and Lockheed Martin) that were competing to build the aircraft.

For Britain, JSF represented something of a windfall: a relatively inexpensive way of purchasing a new STOVL capability, while keeping domestic defence industries busy for many years to come – assuming the plane was built. As discussed below, this expectation has been partly fulfilled, although problems over British (and other foreign) work-share and technology transfer continue to plague the project. The central question, however, is whether international collaboration, first between the US and UK, and later with a number of other foreign partners, was even necessary to the successful building of the JSF, with or without a STOVL variant.

For Britain, JSF was a windfall

Between 1997–2001, two teams led by Boeing and Lockheed Martin vigorously pursued the CDP (McDonnell Douglas had already been eliminated from the competition). Each company was required to build one conventional takeoff and landing (CTOL) variant of JSF for the Navy and Air Force, and a STOVL variant for the Marine Corps and Royal Navy (the Royal Navy’s aircraft carriers have short flight decks which require vertical takeoff and landing capability). Lockheed Martin’s JSF architecture represented an incremental or evolutionary improvement over existing platforms (with the exception of its complex STOVL technology), and it adopted a relatively conventional combat aircraft design. Boeing, in contrast, proposed a somewhat more radical, delta-wing jet fighter, and its plane looked rather odd and ungainly to many

observers. It was following intensive study of these two programmes by the US Department of Defense and the British Defence Procurement Agency that US Secretary of the Air Force Roche – alongside British procurement chief William Bach – made his October announcement: Lockheed Martin had won the competition and would take the lead in building the JSF.

With the 2001 decision to build JSF, the airplane has moved into the Engineering and Manufacturing Design (EMD) phase of the programme. During the EMD the kinks in JSF's architecture and production are supposed to be ironed out, while Lockheed Martin and its subcontractors enter into supplier agreements. The cost of this EMD is estimated at \$20bn; again, the British government has committed approximately 10% of that amount. As a consequence, British firms expect to receive at least 10% of the work-share, including substantial technology transfer.²⁴ Whether Lockheed Martin and the United States government fulfill the hopes of friends and allies for work and for technology remains one of the crucial questions surrounding the entire JSF programme.

Why collaborate?

The JSF is the first cutting-edge weapons platform procured by the Pentagon that relies on significant foreign participation in every aspect of the programme, including financing, design and project management.²⁵ During the CDP, the Pentagon invited foreign governments to seek participation at one of four levels: Full Collaborative Partner; Associate Partner; Informed Partner; and Foreign Military Sales (FMS) Major Participant. Only the United Kingdom qualified as a full collaborative partner, with deep involvement in every aspect of the programme. The Associate Partners included Denmark, the Netherlands and Norway, all of which had participated in F-16 licensed co-production, an airplane that was approaching the end of its useful life. Naturally, having established an aerospace infrastructure to build F-16s, these governments and their defence contractors wanted to keep the lines busy in years ahead, and their firms hope to win contracts for the JSF as well. Thus far, however, they have been disappointed by their amount of work-share, leading the Norwegian parliament in April 2004 to threaten to abandon the programme.²⁶ Canada and Italy joined as Informed Partners, meaning that they had minimal voice in setting requirements, but would still expect to receive work-share in return for buying the plane. Accordingly, several Canadian defence firms have won sub-contracts on JSF, and Italy, bargaining hard, even won the option to consider assembling its variant of the JSF in a domestic factory.²⁷ Still, Italy's Finmeccanica has 'expressed concern' about the amount of technology and work it is receiving.²⁸

Finally, the three initial FMS partners for JSF include Turkey, Singapore and Israel; the three also had F-16s in their arsenals and were looking for JSF contract work.²⁹

Why did the United States adopt this complex, multi-tiered structure of foreign participation during the JSF's Concept Development Phase? A RAND Corporation Report expressed the common view that

Foreign government and industry participation have been included for the following reasons: to enhance equipment interoperability with allies, to promote foreign acquisition of the aircraft, to share the financial burden of development and production, and to gain access to unique technologies and capabilities from key allies.³⁰

All these factors undoubtedly were influential in shaping the programme, but the question remains of which ones were paramount in making the JSF a collaborative venture – rather than, say, simply an off-the-shelf export item – in light of the high costs that are also associated with foreign participation in the design and building of a cutting-edge weapons system.

The interoperability argument is probably the longest-standing argument for armaments collaboration among allies. Indeed, ever since its inception in 1949, the North Atlantic Treaty Organisation has sought to transform its national collection of weapons into a unified force.³¹ That effort has largely proved elusive, as the allies continue to pursue their own idiosyncratic approaches to defence procurement.

In thinking about the issue of interoperability, it is useful to recall that it can mean one of four quite different things: complementarity (country X provides the navy for an operation, country Y the air force); commonality (X and Y operate identical platforms); interchangeability (X can substitute its F-16s for Y's *Rafales*); and compatibility (X's air-based radars can communicate with Y's ground-based radars). A country could rationally promote interoperability that does not involve platform or hardware commonality. For various reasons, countries may prefer to build their own nationally designed weapons systems, even though they may attach some value to making them interoperable with those of allies. In short, interoperability arguments that are based on the necessity of platform commonality are overblown, particularly when the allies retain different communications, intelligence and weapons systems.

Second, there is the technological argument for international collaboration: that it provides a mechanism for giving the United States access to foreign defence technology that government and industry otherwise lack. This view has become widespread in recent years, and is often associated with the so-called 'globalisation' of the defence-industrial base.³² But this argument raises two separate questions: first, is

the United States really becoming increasingly dependent on the international economy for access to advanced defence technology? Second, if so, does growing technological dependence necessitate industrial collaboration?

With respect to the first question, the US is undoubtedly sourcing more weapons components from abroad, especially so-called 'dual-use' items such as semi-conductors and other parts that constitute defence systems. Still, the amount is small; for the F/A-18 E/F fighter, for example, foreign contractors constituted less than 1% of the plane's total subcontractor cost.³³ At present at least, the US imports very little by way of advanced defence technologies, much less entire platforms. As the Defense Science Board noted in its review of JAST/JSF technology, 'Given the position of the US in technology, we are more likely to export technology than to import needed technology. Even in most of the international ventures considered successful, US companies had little need for the foreign partners' technologies'.³⁴

The European Union itself is currently bemoaning the state of the continent's defence-technology base. The EU writes in a recent report that 'Europe's innovative performance remains too weak ... EU should seek to improve its position in enabling technologies ... where it often lags behind its main competitors'.³⁵ While it is undoubtedly true that EU defence contractors build some excellent platforms, statements like this one help us to see why European and other foreign partners might take a strong interest in American defence technology, while reciprocal interest is relatively slight.³⁶

But even if the United States did require some foreign technology to make the JSF a success, was it really necessary to develop the plane collaboratively in order to acquire it? With the AV-8B, for example, the United States licensed the STOVL technology from British Aerospace; McDonnell Douglas then substantially modified the technology to meet Marine Corps requirements. The AV-8B, with its STOVL capability, is probably the single most important case of the Pentagon relying on foreign technology in any major procurement programme, yet it did not co-develop or co-produce the plane with the United Kingdom as a result; it simply bought a licence for the technology it wanted. Why didn't it do so with JSF as well, if indeed the British or others had advanced technology to contribute?

This leaves the two economic arguments for international collaboration, one of which emphasises risk-sharing among a group of

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partners, the other of which emphasises foreign acquisition of the platform. It is the latter which provided the winning argument with respect to JSF.

The idea of risk-sharing is simply that an investor may be willing to share some of the potential gains associated with a project alongside others who are willing to assume part of its costs and any potential losses. For a defence firm, an investment in a project like JSF could be a 'make or break' proposition. If, for example, the United States government decided to terminate the JSF before production started, it could potentially bankrupt its manufacturer, given the fixed investments that it had to make in plant, equipment and so forth. Indeed, McDonnell Douglas invested so heavily in its bid for the JSF contract during the earliest selection stage (before the competition was narrowed to Boeing and Lockheed Martin), that the firm lost its independence and accepted a subsequent merger with Boeing. At a time when US defence procurement budgets were being slashed by Congress and any number of programmes were at risk, broad financial participation in the programme would provide a powerful risk management device, a way to reduce Pentagon and contractor losses if the project failed.

But this does not mean that *foreign* participation in the project was necessary. After all, the Pentagon could have decided to allow Lockheed Martin and Boeing – as opposed to Lockheed Martin and BAE SYSTEMS – to share the JSF contract, rather than running the competition as a 'winner take all' exercise. Indeed, it appears that Boeing expected that it would receive some of the contract even after losing the CDP, for this very risk-sharing reason.

To be sure, foreign risk-sharing implies financial contributions from other governments, limiting the Pentagon's direct investment in the project. That participation could be especially valuable at a time of sharply reduced domestic procurement budgets. But, as we will see below, those contributions have to be weighed against the costs – potentially quite heavy – associated with them.

However, foreign collaboration can be seen as a risk-sharing device not only economically, but even more to the point, politically. After all, a risk that every Pentagon acquisition manager and defence-industrial executive faces is that Congress will axe their programme. This makes it prudent for firms to invest in political strategies like lobbying to keep projects alive. It is in this context that foreign participation could prove useful. Simply stated, the political costs associated with cutting an international programme could prove higher than those associated with terminating a solely domestic platform, given the foreign policy externalities – the problems created with friends and allies – which

would be associated with that decision. If the United States ended a collaborative venture like JSF, friends and allies would question its credibility as a defence partner, and would be more likely to develop national or other international approaches to weapons procurement. Such costs of programme termination would also have to be calculated by the Pentagon and Congress as the weapon's future was being debated.

But even if we assume that foreign participation makes it harder to cut a programme, the price of that collaboration must not be overlooked. By co-developing and co-producing a weapons programme, foreign partners might gain significant leverage over the Pentagon and its American defence contractors, by exploiting the classic 'hold up' problem of industrial organisation. If a foreign partner is making, say, the tail of the JSF, it can 'hold up' the prime contractor for more money, technology, work-share and so forth, refusing to deliver its part of the plane until its demands are met, thereby slowing or halting the production process. Using foreign collaboration as a risk-sharing device is, therefore, a two-edged sword at best.

We finally turn to the issue of foreign acquisition of a platform, and herein lies the nub of the problem. Historically, the United States has shown itself more than willing to export its weapons to friends and allies around the world. These items are usually outdated, or they are variants of systems in the American arsenal, like the F-16. Export sales are often financed through the Pentagon's Foreign Military Sales (FMS) assistance programme, which provides loans for such purchases.

While export sales are usually justified in terms of national security and foreign policy objectives, their economic appeal should not be overlooked. For the Pentagon and its defence contractors, exports provide a useful way of reducing the average cost per unit of a platform. If a firm can build 3,000 jet fighters instead of half that number, there are likely to be important learning-curve and economies-of-scale effects that will lead to lower costs. The lower costs, in turn, are attractive to the Pentagon, which can make more efficient use of scarce procurement dollars, and to firms that are likely to find high profits in selling an additional unit of a platform. Exports, then, are probably the preferred way of selling weapons to foreign partners.

But countries often do not wish to import their weapons off the shelf because they prefer to maintain some autonomous defence-industrial capability. Indeed, as the European members of NATO revived their defence industries following the end of the Second World War, reliance on American imports became less compelling. Between 1953 and 1964, for example, US defence exports to NATO-Europe fell from \$15bn to \$3.3bn.³⁷ To win sales in an increasingly competitive market, the Pentagon

and its contractors therefore offered licensed co-production (but not co-development) of weaponry, which gave the Europeans who so chose access to American production technology, while allowing them to maintain or upgrade their own domestic defence industrial base, along with the jobs that local production created. This strategy of licensed co-production probably reached its zenith with the 1975 agreement between General Dynamics and four European Participating Governments (Belgium, Denmark, the Netherlands and Norway) to build the F-16 lightweight fighter aircraft.³⁸

By the time the JSF was on the drawing board in the 1990s, however, the economic environment for American defence firms was proving more difficult. Budget cuts around the world were reducing demand for military hardware, creating a buyer's market. At the same time, European governments were committed to producing three new fighter aircraft, including the Swedish *Gripen*, the French *Rafale* and the multinational *Eurofighter*. Many of Europe's leading defence firms, which had long been state-owned enterprises, were now being privatised by governments, and their senior management was applying commercial logic to weapons development and acquisition. Recognising that national markets were too small to enable their firms to survive, they carried out a spate of mergers and acquisitions that resulted in the creation of large, transnational defence enterprises, such as Britain's BAE SYSTEMS and the Franco-German firm EADS, that nearly rivalled the size of their competitors in the United States.

The European Union was also slowly putting into place a more coherent approach to defence acquisition, with the creation in 1998 of an Organisation for Joint Armaments Cooperation, known as OCCAR.³⁹ As defence analyst Gordon Adams remarked of these developments, 'there is a pronounced "fortress Europe" trend emerging in Europe, which is ... the most important international market for US defence products and technology'.⁴⁰ In its internal study of international armaments collaboration, the Defense Science Board noted the 'dangers of regional consolidations in the defence industry, namely "Fortress US" and "Fortress Europe"'.⁴¹ It was this fear of a Fortress Europe that would keep American defence firms and their weapons out of the market that provided the strongest impetus for international collaboration on the Joint Strike Fighter programme.

The critical importance of foreign acquisition and defence exports to the financial health of the American aerospace industry during the 1990s cannot be minimised. As Table 1 indicates, defence exports rose from 22% of total defence-aerospace sales in 1994 to 37% in 2000, slipping from a peak of 44% in 1998. According to two close students of American

defence exports, 'In 1995 the Clinton administration explicitly recognised the economic health of the US arms industry as a criterion to be considered in evaluating arms sales'.⁴²

The Clinton administration responded aggressively to the industry's need for political and economic support in its quest for foreign markets. First, the administration used the Office of the President and the network of State Department embassies to help sell defence hardware. Second, reviews of export licences were expected to consider the consequences for the defence-industrial base if approvals were not forthcoming. Third, and of great significance, the Department of Defense agreed to waive Research and Development (R&D) recoupment charges – that is, demanding that foreign buyers pay their 'fair share' of a project's R&D costs – for foreign military sales, providing export weapons with a direct subsidy from US taxpayers.⁴³ Finally, the FMS programme was provided important additional financial support for extending low-interest loans – a programme that made possible, for example, Poland's 2003 decision to purchase the F-16 from the United States over other competitors including the Swedish *Gripen* and French *Mirage*. According to Peter Evans, between 1992 and 2001, the United States sold \$143bn worth of arms, financing \$39bn through FMS while selling another \$82bn for cash through that programme (the rest of the sales were made commercially without US government involvement).⁴⁴

The greatest potential for capturing European markets, however, was found in the JSF programme – potentially the largest weapons acquisition programme in history. If the question facing the American defence industry was how to avoid being shut out of a Fortress Europe, off-the-shelf exports did not provide a compelling long-term answer, especially in light of the veritable glut of fighter aircraft that the continent was now facing. The challenge, then, was to devise a political and economic strategy for locking in at least some European governments so that their dependence on American weaponry would continue for many years to come. The solution was found in co-development and co-production of the most advanced aircraft that the United States had ever built. As it was structured, the JSF project would provide foreign partners with a windfall opportunity to acquire American defence technology, while promoting aerospace-related jobs at home.

To understand the appeal of JSF and international collaboration to potential buyers, we need to consider a state's procurement choices. In building a stock of weapons, nations can choose either to allocate scarce resources towards domestic defence procurement, or they can import arms from friends and allies – or some combination of the two. All things being equal, domestic arming might be assumed to produce, as

James Morrow has written, 'a more reliable improvement in security', but at great cost, while the strategy of relying on allies through weapons imports produces 'additional security quickly but with less reliability'.⁴⁵ States would thus seem to face a stark trade-off between defence autarky, which is expensive, and dependence on imports, which is risky. Interestingly, Morrow does not take up the third possibility, namely international armaments collaboration, in which two or more partners co-develop or co-produce a weapons system.

National solutions to the problem of acquiring costly, high-technology defence goods depend upon the availability of two key resources: technological and financial assets.⁴⁶ Building on Morrow's realist logic, one might argue that states would always prefer to be autonomous in

We can think of the JSF as a Trojan Horse

weapons research, development and production, but they are impeded from doing so by their inability to mobilise the necessary assets. Relying on imports, in contrast, is the least-preferred strategy, since it makes the state dependent on foreign sources for vital military supplies; supplies that might be easily cut off during a conflict. In this respect, it is notable that even

some of the smaller NATO allies like Denmark and the Netherlands have sought to maintain a defence-industrial capability through national means and licensed co-production from abroad. Co-development and co-production are therefore what economists would call second-best solutions, in that they enable the state to continue building weapons domestically while obtaining precious military technology, if only in collaboration with foreign partners.

Co-development and co-production of sophisticated weapons systems can also bring important economic and technological benefits to recipient nations, and in so doing create an industrial lobby within foreign nations for such programmes, which then pressure their governments to provide procurement funds. It is in this sense that we can think of the JSF as a Trojan horse, entering foreign markets with the promise of job creation and technology transfer.

During the Concept Development Phase of JSF, for example, Lockheed Martin and Boeing each relied on at least seven British defence subcontractors in addition to BAE SYSTEMS; indeed, there was considerable overlap among the subcontractors so that they would win no matter which American prime contractor was chosen to head the production phase (that is, British firms were subcontracted by both Lockheed Martin and Boeing teams). By putting foreign contractors on the design and development team, it would be more likely that their national governments would buy the JSF, if only for its job-creating properties.

Lockheed Martin stressed that

In the United Kingdom alone ... the JSF team will create approximately 3,400 jobs during System Design and Development; and during the 30 years production and support phase 8,400 direct, and many thousands indirect, long term, highly skilled, highly paid jobs will be created.⁴⁷

The British defence procurement minister, William Bach, remarked that Britain's participation in the JSF programme was 'a major benefit both to Britain's Armed Forces *and* British Industry' [emphasis added].⁴⁸

The United States also successfully wooed Italian participation in JSF through the lure of industrial contracts. During the negotiations, Lockheed capitulated on the role Italian engineers would play in the programme, and on a commitment to assemble the plane in Italy. In return for these commitments, the Italian government agreed to invest \$1bn in the JSF programme.⁴⁹ As already noted, companies in Australia, Canada and Denmark, among others, have also won or been promised JSF contracts.

As the RAND Corporation explained these industrial pressures during the Concept Development Phase:

Both of the competing prime contractors recognise the importance of including significant industrial participation on their teams representing the countries that are participants in the Concept Development Phase and that are likely to play a major role in ... production. Both prime contractors recognize that they would be politically at a competitive disadvantage in the downselect if their teams did not include equitable industrial representation from the key foreign government participants in the programme – particularly the United Kingdom, since the UK formally has been granted a position of influence over the final downselect.⁵⁰

Indeed, the pressure on Lockheed Martin and Boeing to win the JSF contest was so great – it is perhaps the last competitively awarded contract for manned combat aircraft in American history⁵¹ – that it resulted in a perverse outcome: the promise of more subcontract work to foreign firms than was proportional to the amount of the foreign government's contribution. In other words, in a traditional collaborative programme, if Britain pledged 10% towards a weapon's development costs, its firms would be expected to receive 10% of the business as their 'fair share'. Given the intensive nature of the JSF competition, however, and the strong desire to sell the aircraft overseas, foreign firms may end up receiving more than the government's participatory contribution. Estimates suggest, for example, that BAE alone could obtain nearly one-quarter of the value of JSF's initial production contract.⁵²

Extra bother

Despite the appeal of co-production and co-development from an economic and security standpoint, however, in practice such programmes have proved difficult to execute. Thus far, JSF appears to be no different from many other collaborative projects in the struggles it is facing. This approach to weapons procurement complicates project management for several reasons.

First, international collaboration requires that states and firms commit to building a common platform according to an agreed upon division of labour. They must then follow through on that commitment by producing their part of the collective project on time and within a specified budget. But it may take 10 years or longer to go from basic research and development to prototype construction, and any number of variables could change during this time-period that would influence the programme's likelihood of successful completion. Firms may go bankrupt or simply fail to meet the technological challenges they face. A 2000 General Accounting Office report on the development phase of the JSF project, for example, cast doubt upon the ability of the contractors to meet their technological targets on time and on budget, and urged the programme be delayed and its technological demands revisited.⁵³ Some analysts, for example, have urged that the now-overweight and over-budget JSF simply drop its STOVL design.

Second, defence procurement budgets can fluctuate owing to changes in a country's economic and security environment, and the state's commitment to acquire a platform may be cancelled or reduced as a result. Europe's multinational *Eurofighter*, for example, has been plagued by frequent changes in orders – and thus of programme costs – chiefly due to the German government's indecision over the number of the planes it wants to buy.⁵⁴ In the United States, the annual defence appropriation process means that weapons procurement decisions and budgets can always be revisited. Again, the JSF programme has already been plagued by threats of budget cutbacks from Congress, and even the military services are reconsidering their own commitment to the project. This risk of cutting JSF, in turn, spills over to foreign partners, who are now rethinking their own investment in the project and whether it will even move forward to completion.⁵⁵

Third, as previously noted, co-development requires the resolution of difficult technology transfer issues.⁵⁶ While the United States Department of State has taken a series of policy actions designed to facilitate technology transfer to friends and allies (an initiative known as the Defense Trade Security Initiative), especially with the JSF programme in mind, Under Secretary of State Lincoln Bloomfield has recognised that it

has only met with 'mixed results', particularly in light of tightening technology controls in the wake of the 11 September terrorist attacks.⁵⁷ Even the closest of allies, the US and UK, are facing ongoing difficulties with technology transfer issues on JSF.⁵⁸

Fourth, international collaboration necessarily involves 'incomplete contracts' that are constantly being re-negotiated. As already noted, when country X is making the tail of the aircraft it can hold up its partners for more money and more work, or else threaten the project's viability. This leads to new rounds of negotiation between governments, primes and sub-contractors. As previously mentioned, several countries have expressed dissatisfaction with their slice of the JSF pie and have threatened cancellation of their orders. If domestic political pressures in Congress, say, demand that American-based companies get more work at the expense of foreign firms, that could doom JSF, at least as an international programme.

In short, international collaboration in the JSF programme was primarily driven by an American concern with capturing foreign market share at a time when domestic defence procurement budgets in the United States were falling rapidly. Given the changing structure of the arms business, particularly in Western Europe, American firms became worried that they would no longer be able to export their weapons off the shelf or have the kits assembled abroad as they had done so successfully with the F-16. Now, buyers were demanding advanced technology as the price of their purchase. The industrial structure of the JSF programme is a reflection of those market realities. Whether the programme will succeed remains an open question.

But, assuming JSF goes ahead and is built, it needs to be asked if defence planners *should* respond to the financial needs of the industry by promoting international collaboration of advanced weaponry. This strategy rests on a fundamental bargain: that nations who wish to partner with the United States will control leakage of the defence technology they receive. The theory is that collaboration actually supports and promotes counter-proliferation policies. But the theory is unproven.

Collaboration and proliferation

Since the end of the Cold War, defence collaboration and exports have grown in importance to American aerospace firms. Because the Pentagon worries about the financial health of its suppliers, it has generally supported this industrial strategy. The security consequences of this policy largely depend on how foreign governments and firms assess the costs and benefits associated with technology leakage.

Consider the problem facing a foreign partner in a weapons collaboration project like the Joint Strike Fighter. During the process of co-development and co-production, that partner obtains technological knowledge that is costly for 'outsiders' (that is, those outside the project) to obtain. Governments and firms thus come to possess a valuable good. The foreign partner, therefore, has some incentive to incorporate that technology into defence equipment that it can export to the outsiders, reaping all the benefits of that sale. Governments have to determine whether approving such exports over American objections, and the threat of possible sanctions, is profitable. One can readily see that a government which is focused on the short term, say the next election, may decide to bolster defence jobs today at the risk of American sanctions tomorrow – sanctions, incidentally, that are also costly for the US government to impose, especially on close friends and allies.

For the United States, using collaboration as an extension of its counter-proliferation regime is also a risky strategy, beyond the obvious problems associated with the spread of its technology to friends and allies, and the added security risks that such diffusion must bring. Fundamentally, an international collaborative project like JSF may be conceptualised as a defence cartel arrangement. From a security perspective, the cartel's insiders benefit from controlling cutting-edge technology, which gives them a military advantage over the outsiders. From a purely military standpoint, therefore, collaboration might be a useful way of bolstering alliance capabilities.

But how do outsiders respond to this state of affairs? One might hope that they would be defeated by the prospect of competing against the American-led cartel, and give up their own efforts to develop costly defence technologies, in the way that the Soviet Union was 'defeated' by President Ronald Reagan's Star Wars programme. Alternatively, however, for some countries the incentive to invest even more in advanced weaponry could increase. One could imagine, for example, outsiders like China, Russia, India, or even certain European states like France, seeking to maintain advanced military capability in the face of the American-led cartel, perhaps by sharing capabilities with others who are like-minded. In that case, the cartel arrangement has actually provoked outsiders to do more, undermining its potential security benefits.⁵⁹

Theory aside, international collaboration on the Joint Strike Fighter increases the likelihood of dissemination of some of America's most advanced defence technology around the world. As already noted, elements within the US have been uncomfortable with that aspect of the JSF programme since its inception, and in a recent report the General Accounting Office warned that the JSF programme would 'push the

boundaries of US disclosure policy'.⁶⁰ These technology transfer issues and the risks they entail merit public debate.

In considering a fresh policy approach to international defence collaboration that takes seriously the downside risks associated with the proliferation of advanced technology, some basic principles are needed.

The first principle should be that subsidies to support arms sales and technology transfer must be eliminated. Subsidies force American taxpayers to foot the bill for defence technologies sold abroad, and provide a windfall to foreign governments and industries, along with an incentive to purchase. If America's friends and allies wish to buy its technology, most of them are wealthy enough to do so without needing a subsidy. Indeed, providing greater economic transparency on international arms collaboration projects (and export sales) more generally is a policy that all democratically elected governments should adopt.

*The US must
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Second, the United States must make clear the costs associated with violation of its export control laws and regulations. For example, what sanctions would be imposed on Britain or Italy if a British or Italian engineer – purposely or inadvertently – divulged critical JSF technology? At present, there is a remarkable lack of transparency regarding enforcement of the export control regime.

Third, the United States must reconsider its approach to international arms collaboration, recognising that some of the time-worn arguments for it, like interoperability, are weak or specious. Exports and licensed co-production of weapons systems to friends and allies bring the same or even greater economic and security benefits without the associated costs. Again, the government should explain why it sells weapons the way it does.

In sum, the Joint Strike Fighter exemplifies the way in which economic forces have weighed on military planners and the defence industry since the end of the Cold War. These economic forces have led to new approaches to weapons procurement, including a much heavier reliance by defence contractors on foreign sales of military hardware. As a result, officials and executives on both sides of the Atlantic have shown renewed interest in international armaments collaboration. The costs and benefits of these collaborative arrangements deserve greater policy analysis and public scrutiny than they have received to date.

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Notes

- ¹ A possible exception is provided by the British Aerospace Harrier aircraft, with its unique Vertical Take-Off and Landing (VTOL) technology. In this case the United States licensed the technology from BAE, but the plane was produced and substantially redesigned for the US Marine Corps by McDonnell Douglas, and is currently in service as the AV-8B. It is one of the aircraft that the JSF would replace. The US–Japan FSX fighter project, in contrast, involved Japanese purchase of F-16 technology for an aircraft that would only serve the Japan Defense Forces.
- ² Defense Science Board, *Task Force on Joint Advanced Strike Technology Program* (Washington DC: Department of Defense, September 1994), p. ES-7.
- ³ *Ibid.*, p. 50.
- ⁴ A good overview of these developments is provided in Jean-Paul Hebert, *La Consolidation de l'Europe de l'Armement Face Au Defi Transatlantique* (Paris: Ecole des Hautes Etudes en Sciences Sociales, 2001).
- ⁵ See Dov S. Zakheim, *Towards a Fortress Europe?* (Washington DC: Center for Strategic and International Studies, November 2000); note that Zakheim had served as Deputy Under Secretary of Defense in the Reagan Administration from 1985 to 1987, and remained a consultant to the Pentagon after leaving for the private sector. See also *The Economist*, 'Getting it Together?', 20 July 2002.
- ⁶ For a statement of that strategy, see Defense Science Board, *International Armaments Cooperation in an Era of Coalition Security* (Washington DC: Department of Defense, August 1996).
- ⁷ See General Accounting Office, *Joint Strike Fighter Acquisition: Cooperative Program Needs Greater Oversight to Ensure Goals are Met* (Washington DC: Government Accounting Office, July 2003).
- ⁸ See Christopher Bolkcom, *Tactical Aircraft Modernization: Issues for Congress* (Washington DC: Congressional Research Service, 14 February 2002); on the STOVL programme, see DARPA, *JSF: A DARPA Perspective*, downloaded at <http://www.darpa.mil/body/legacy/docs/JSF-DARPAperspective.doc>.
- ⁹ For a thorough analysis of the Bottom-Up Review from a budgetary standpoint see Eric V. Larson, David T. Orletsky and Kristin Leuschner, *Defense Planning in a Decade of Change: Lessons from the Base Force, Bottom-Up Review, and Quadrennial Defense Review* (Santa Monica, CA: RAND Corporation, 2001).
- ¹⁰ John Tirpak, 'Strike Fighter', *Air Force* vol. 79, no. 10, October 1996, downloaded at www.afa.org/magazine/oct1996/1096stri.asp.
- ¹¹ Mark Lorell, *The US Combat Aircraft Industry, 1990-2000: Structure, Competition, Innovation* (Santa Monica, CA: RAND Corporation, 2003).
- ¹² Thorough introductions to the JSF programme are found in Christopher Bolkcom, *Joint Strike Fighter: Background, Status and Issues* (Washington DC: Congressional Research Service, 15 February 2002); and John Birkler, et.al., *Assessing*

- Competitive Strategies for the Joint Strike Fighter: Opportunities and Options* (Santa Monica, CA: RAND Corporation, 2001).
- ¹³ Cited in John Tirpak, 'Strike Fighter'.
- ¹⁴ James Fallows, 'Uncle Sam Buys an Airplane', *The Atlantic Monthly*, June 2002, <http://www.theatlantic.com/issues/2002/06/fallows.htm>.
- ¹⁵ See Defense Science Board, *Task Force on Joint Advanced Strike Technology Program*.
- ¹⁶ *Ibid.*, p. ES-7.
- ¹⁷ Interviews with Department of Defense officials, June 2003.
- ¹⁸ Defense Science Board, *Task Force on Joint Advanced Strike Technology Program*, p. 50.
- ¹⁹ Interviews with Department of Defense officials, June 2003.
- ²⁰ The US and UK had a long history of collaboration on STOVL technology, which officially ended in 1991, only to restart in 1994.
- ²¹ Telephone interview with Department of Defense official, 9 March 2004.
- ²² On British involvement, see UK Ministry of Defence, Defence Procurement Agency, *Joint Combat Aircraft*, downloaded at <http://www.mod.uk/dpa/projects/jca.htm>.
- ²³ Christopher Bolckom, *Joint Strike Fighter: Background, Status and Issues* (Washington DC: Congressional Research Service, 15 February 2002), p. 12.
- ²⁴ Even though subcontractors are supposed to bid competitively for each part of the project, governments and firms based in foreign partner nations naturally expect to receive their 'fair share' of the JSF programme, according to how much the government has contributed to the CDP and EMD phases.
- ²⁵ European governments, in contrast, have had significant experience with collaborative armaments programmes; how much the Pentagon has learned from that experience in shaping the JSF project remains unclear. I thank Alex Nicoll for highlighting this point.
- ²⁶ Renae Merle, 'Norway Threatens to Revoke Support for Strike Fighter', *Washington Post*, 16 April 2004, p. E3.
- ²⁷ See Anne Marie Squeo and Daniel Michaels, 'US Changes the Rules in High Stakes Venture of Selling Military Jets', *Wall Street Journal* 22 July 2002, p. 1.
- ²⁸ Renae Merle, 'Norway Threatens to Revoke Support for Strike Fighter'.
- ²⁹ For a useful introduction to the JSF's international dimension see John Birkler, et.al., *Assessing Competitive Strategies for the Joint Strike Fighter: Opportunities and Options*. See also Christopher Bolckom, *Joint Strike Fighter: Background, Status and Issues*.
- ³⁰ John Birkler, et.al., *Assessing Competitive Strategies for the Joint Strike Fighter: Opportunities and Options*, p. 16.
- ³¹ See Ethan B. Kapstein, 'International Collaboration in Armaments Production: A Second-Best Solution', *Political Science Quarterly*, winter 1991/92, p. 661.
- ³² See Ethan B. Kapstein, *The Political Economy of National Security: A Global Perspective* (New York: McGraw-Hill, 1992).
- ³³ RAND Corporation, *Going Global: US Government Policy and the Defense Aerospace Industry* (Santa Monica, CA: RAND Corporation, 2002), p. 67.
- ³⁴ Defense Science Board, *Task Force on Joint Advanced Strike Technology Program*, p. 48.
- ³⁵ European Commission, *European Defense – Industrial and Market Issues*, report published 11 March 2003, p. 8.
- ³⁶ One reviewer of this article has argued that European partners are providing some significant technology for JSF, and indeed, as

- already noted, the initial STOVL design for the AV-8A and AV-8B was British. I thank Alex Nicoll for highlighting this point.
- ³⁷ See Paul Ferrari, et.al., *US Arms Exports* (Cambridge, MA: Ballinger, 1988), p. 95.
- ³⁸ On the F-16, see Ethan B. Kapstein, 'International Collaboration in Armaments Production: A Second-Best Solution', p. 665.
- ³⁹ See Bukhard Schmitt, ed., *European Armaments Cooperation: Core Documents* (Paris: Institute for Security Studies, Chaillot Papers no. 59, April 2003).
- ⁴⁰ Gordon Adams, 'Fortress America in A Changing Transatlantic Defense Market,' in Burkhard Schmitt, ed., *Between Cooperation and Competition: The Transatlantic Defense Market* (Paris: Institute for Security Studies, Chaillot Papers no. 44, January 2001), p. 3.
- ⁴¹ Defense Science Board, *International Armaments Collaboration*, p. 7.
- ⁴² William Keller and Janne E. Nolan, 'Mortgaging Security for Economic Gain: US Arms Policy In An Insecure World,' *International Studies Perspectives*, vol. 2, 2001, p. 183.
- ⁴³ *Ibid.*
- ⁴⁴ Peter C. Evans, 'Competing for Foreign Military Contracts: The Financial Connection', unpublished manuscript, MIT Department of Political Science, downloaded from web.mit.edu/ssp/spring03/evans.htm.
- ⁴⁵ James Morrow, 'Arms versus Allies: Tradeoffs in the Search for Security,' *International Organization*, vol. 47, 1993, pp. 207-233.
- ⁴⁶ See Ethan B. Kapstein, 'International Collaboration in Armaments Production: A Second-Best Solution', p. 661.
- ⁴⁷ Lockheed Martin Press Release, 'Lockheed Martin Team Wins Joint Strike Fighter Competition,' 26 October 2001.
- ⁴⁸ *Ibid.*
- ⁴⁹ See Anne Marie Squeo and Daniel Michaels, 'US Changes the Rules in High Stakes Venture of Selling Military Jets', p. 1.
- ⁵⁰ John Birkler, et.al., *Assessing Competitive Strategies for the Joint Strike Fighter: Opportunities and Options*, p. 87.
- ⁵¹ Mark Lorell, *The US Combat Aircraft Industry, 1990-2000: Structure, Competition, Innovation*.
- ⁵² Lockheed Martin Press Release, 'Lockheed Martin Team Wins Joint Strike Fighter Competition', 26 October 2001.
- ⁵³ General Accounting Office, *Joint Strike Fighter Acquisition: Development Schedule Should Be Changed to Reduce Risks* (Washington DC: General Accounting Office, 16 March 2000).
- ⁵⁴ See CIA, 'Germany: National Security Situation', http://www.cia.gov/nic/PDF_GIF_research/defensemkts/germany.pdf; and Joseph Fitchett, 'From Bottom to Top of Political Agenda, Eurofighter May Finally Fly', *International Herald Tribune*, 17 June 1997, p. 13.
- ⁵⁵ Christopher Bolkcom, *Joint Strike Fighter: Background, Status and Issues* (Washington DC: Congressional Research Service, 15 February 2002).
- ⁵⁶ General Accounting Office, *Joint Strike Fighter Acquisition: Cooperative Program Needs Greater Oversight to Ensure Goals are Met* (Washington DC: General Accounting Office, July 2003), p. 1.
- ⁵⁷ Lincoln Bloomfield, 'Export Control', Remarks to the Aerospace Industries Association of America (AIAA) Conference, Washington DC, 20 February 2002, downloaded at <http://www.state.gov/t/pm/rls/rm/2002/8514.htm>.
- ⁵⁸ Douglas Barrie, 'Disjointed Strike Fighter', *International Defense*, vol.

158, no. 20, p. 28.

- ⁵⁹ For a formal model of these arguments, see Paul Levine and Ron Smith, 'Arms Export Controls and Proliferation', *Journal of Conflict Resolution*, vol 44, no. 6 December 2000, pp. 885–895.
- ⁶⁰ General Accounting Office, *Joint Strike Fighter Acquisition: Cooperative Program Needs Greater Oversight to Ensure Goals are Met*, p. 1.