

**Facilitating Japan's Participation in Multinational Defense R&D:
A Japanese Approach to Strategic Management of Technology Transfer and
Intellectual Property Rights Issues**

By
Masahiro Matsumura, Ph.D.
Visiting Research Fellow, NDU-INSS
and
Professor of International Politics
St. Andrew's University in Osaka
masahiro@andrew.ac.jp

1. Introduction: Defining a Research Objective

In 2014, Japan made a high-profile policy reversal toward the export policy of major most technologically and militarily advanced nations, that permits the export of defense equipment, articles and services, involving technology transfer.¹ Since then, however, Japan has made little substantial progress to date, except several bi-national research and development (R&D) projects for individual element technologies as well as some limited legal-administrative instruments thereof.² For several decades, Japanese defense firms have produced arms mostly for domestic use, with some under manufacturing agreements of U.S. defense contractors. Unsurprisingly, Japanese arms do not sell well overseas, due to their low international price competitiveness consequent upon the nature of domestic defense markets that are generally closed, highly monopsonistic, and comparatively small-sized; and due to the total lack of battlefield operational experience and combat-proven performance that results from the postwar pacifist constitution.

¹ The Three Principles on Arms Export of 1967 and the additional policy guidelines of 1976 by the Miki administration together constituted a de facto arms export ban until it was replaced by the Three Principles on Transfer of Defense Equipment and Technology of 2014. See, *Defense of Japan* (Defense White Paper), Japan's Ministry of Defense, 2014, pp. 329-331 and pp. 455-456, Reference 62,

http://www.mod.go.jp/e/publ/w_paper/pdf/2014/DOJ2014_reference_web_1031.pdf,
http://www.mod.go.jp/e/publ/w_paper/pdf/2014/DOJ2014_4-1-3_web_1031.pdf#search=%27three+principles+of+arms+export%27.

² These bi-national projects are rather Japan's response to many foreign nations, such as some major West European countries and India, that have realized the value of Japanese advanced technologies, especially dual-use technologies with significant military applications. See, *Defense of Japan*, 2015, pp. 266-269,
http://www.mod.go.jp/e/publ/w_paper/pdf/2015/DOJ2015_3-2-4_web.pdf, accessed on February 1, 2017.

The veiled rationale of the reversal, therefore, lies in facilitating multi-national R&D for a major weapon system, without which major Japanese defense firms will suffer further technological atrophy. Also, the reversal aims at sharing financial burdens and technological risks with project partners as well as at outcompeting emergent arms-export rivals, such as South Korea. The rationale makes sense when Japan under perennial fiscal austerity faces rapidly growing regional security uncertainties and threats, both present and potential. Thus the current state of affairs does not satisfy a high priority on multi-national R&D as set by that three major policy documents: the first full-fledged Japan's National Security Strategy of 2013,³ the Strategy of Defense Production and Technological Bases of 2014,⁴ the Three Principles on Transfer of Defense Equipment and Technology of 2014. This circumstance constitutes a typical policy failure.

This study aims to identify underlying impediments to Japan's participation in multi-national defense R&D and then specific measures to remove or at least alleviate them toward the successful formation and implementation thereof.

2. Setting an Analytical Approach and the Range and Scope of Expected Policy Proposals

The study will begin with a comparative analysis of U.S.-U.K and U.S.-Japan legal instruments for defense R&D, such as exchanges of notes and memoranda of understanding (MOUs) as well as treaties and agreements. The focus on the legal aspect is essential, as highlighted by the joint statement of the Defense Production Committee of the Japan Business Federation (KEIDANREN) and the Aerospace and Defense Committee of the American Chamber of Commerce in Japan,⁵ issued in July 2012. More analytically, these

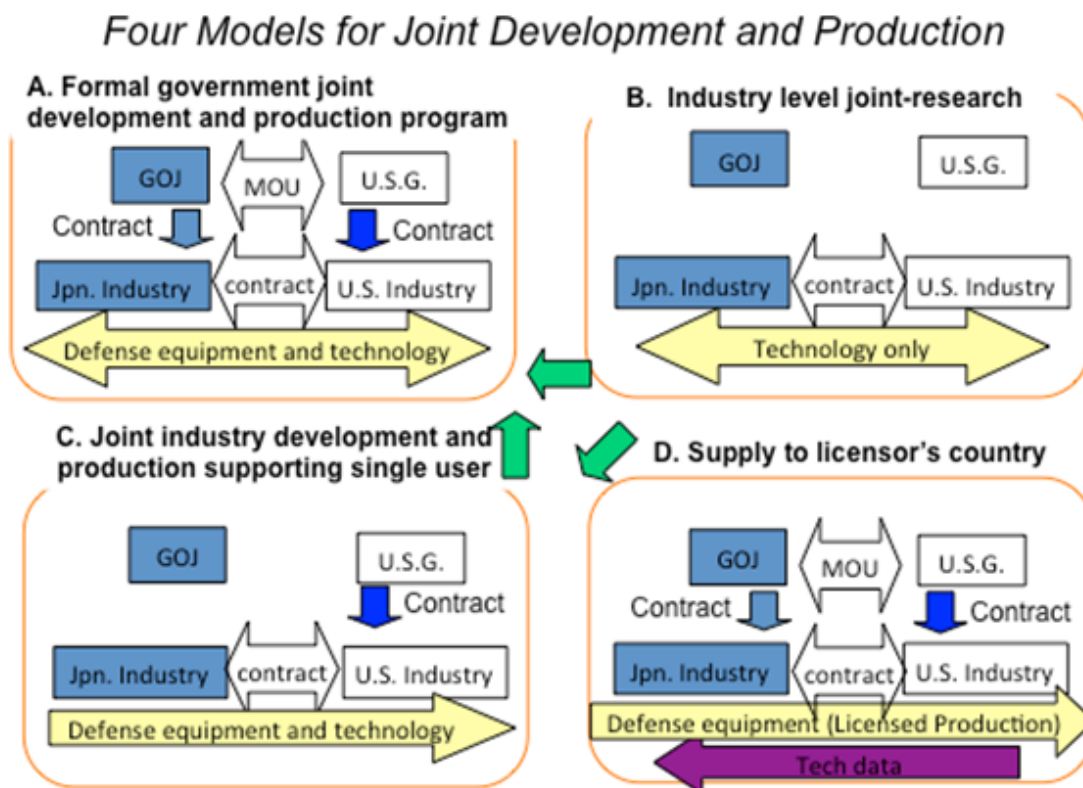
³ http://www.mod.go.jp/j/approach/agenda/guideline/pdf/security_strategy_e.pdf, accessed on December 15, 2016.

⁴ <http://www.mod.go.jp/atla/soubiseisaku/soubiseisakuseisan/2606honbuneigo.pdf>, accessed on December 15, 2016.

⁵ With a diagram, the statement points out four legal models on bilateral joint development and production in which an inter-state MOU and an inter-firm contract play a crucial role: ① formal government joint development and production program, ② industry-level joint research, ③ joint industry development and production supporting single user, and ④ supply to licensor's country. "Joint Statement on Defense Industry Cooperation between Japan and the United States", July 17, 2012, <http://www.keidanren.or.jp/en/policy/2012/059.html>, accessed on December 19, 2016.

legal instruments reflect or manifest the distribution of political, fiscal, industrial, and technological power between the project participants, both states and firms, constituting both cause and effect of the evolving pattern of project formation and implementation. The selection of the U.S.-U.K. case as the reference point makes sense, given that the U.K. possesses the longest and richest experience in cooperative defense R&D with the U.S. under the so-called special relationship sharing even nuclear weapon and submarine technologies. This relationship is enabled by sharing English as their common language and similar common law tradition involving respect and observance of intellectual property rights as well as sharing strategic, political, legal and other important interests.⁶

Most probably, U.S. dominance in the field has necessitated Japan to emulate the U.K. approach in instituting similar legal instruments. The analysis at a bi-national level serves as indispensable basis for that at a multi-national level, given the evolutionary development of these legal instruments in which paragraphs of preceding ones are incorporated as they are or by reference.⁷ In this light, it is also important to examine if there are significant similarities between early U.S.-U.K. MOUs and a set of bi-/multi-national MOUs for the U.S.-led Joint Strike Fighter (JSF) project that includes the



⁶ Legal interests include those under respective Official Secrets Acts, Defense Secrets Acts, Espionage Acts and the U.S.-U.K. General Security of Information Agreement (GSOIA) of 1961.

⁷ This is most conspicuous in MOU development. See, Neal Pollack, "International Cooperative Research and Development Programs", *Acquisition Review Quarterly*, summer 1999, p. 231.

U.K. as a key party shouldering the second largest financial contribution.⁸

Such a comparative analysis will certainly enable identifying general principles, major norms, and specific rules regarding legal relationships in intellectual property rights (IPR), which are immediate concerns for firms considering if to participate in such a project. More importantly, it will also reveal the essential features of power relationship among project participants, involving the congruence and conflict of their different interests at a given time, as manifested in the non-IPR clauses concerning distribution of financial and technology contribution. Cooperation in R&D has natural limits in scope, range, and time,⁹ especially when a challenger strives to deprive the top dog of its monopoly or oligopoly of core technological competence.¹⁰ Of course, some middle-power countries pursue complementary niches and market relationships that avoid direct competition with larger “top dog” prime defense contractors.

Then it is crucial to compare and contrast the two major multi-national R&D projects, with a focus on technology transfer and IPR issues: the U.S.-led JSF and the Eurofighter projects. The former follows a prime-contractor-led approach, while the latter a joint-venture approach. The selection of the two cases makes sense because they respectively represent two major approaches to multi-national R&D for a major weapon system that incurs enormous costs and requires a variety of state-of-the-art military technologies. By contributing an overwhelming portion of the total funds,¹¹ the U.S. has led the JSF project with the other partners, including the U.K, Australia, Canada, Denmark, Italy, the Netherlands, Norway, and Turkey. It is managed by the Pentagon JSF Program Office and implemented by the Lockheed-Martin as the prime contractor that works with foreign as well as domestic defense firms as sub-contractors. On the other hand, the Eurofighter project has

⁸ The U.K. is one of the original nine partner countries: Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey, and the United States. In addition, the three foreign military sales (FMS) customers are Israel, Japan, and the Republic Korea.

⁹ As for a comprehensive typology of forms of international collaboration, see, Tina Barnes, Stephen Raynor, and John Bacchus, “A New typology of forms of international collaboration”, *Journal of Strategy and Management*, Vol. 5, No. 1, 2012. As for a classic example of overcoming “tragedy of the anticommons” in R&D, see, Dustin R. Szakalski, “Progress in the Aircraft Industry and the Role of Patent Pool and Cross-Licensing Agreement”, *UCLA Journal of Law & Technology*, Vol 5, No. 1, Spring 2011. As for the general nature of the governance of international R&D partnerships, with a focus on joint venture vs. contractual partnership, see, John Hagedoorn, Danielle Cloudt, and Hans van Kranenburg, “Intellectual property rights and the governance of international R&D partnership”, *Journal of International Business Studies*, Vol. 36, No. 2, March 2005.

¹⁰ Gary Hamel, Yves L. Doz, and C.K. Prahalad, “Collaborate with Your Competitors—and Win”, *Harvard Business Review*, January-February 1989, pp. 133-139.

¹¹ Ronald O'Rourke, “F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress”, Congressional Research Service, September 16, 2009, pp. 9-10, <https://pdfs.semanticscholar.org/78c6/d3a360669584a054992d49cc9f0ebad1b9e0.pdf#search=%27sdd+f35+financial+contribution%27>, accessed on December 19, 2016.

been formed by the U.K., Germany, Italy, and Spain, without any prominent funder.¹² It is managed by the NATO Eurofighter and Tornado Management Agency (NETMA) and implemented by the joint venture, aka Eurofighter Jagdflugzeug GmbH, created by their defense firms. The selection of the two projects is also tenable because, as elaborated later, the formation of the Eurofighter project resulted from a strong sense of European frustration with the JSF project, centered on the level and speed of U.S. military technology transfer.¹³ Practically, it is very important to analyze the major features of a digital information/data management system through which to control access to massive classified, patented, proprietary and other technology information. The access can be hampered by the complex and complicated interplay of three legal regimes: IPR, export control and information security.

In sum, this study will first identify major defects and shortcomings of Japan's international legal instruments as related to bi- and multinational defense R&D, focusing on IPR management. Then, the study will examine how military technology transfer is facilitated or hampered by non-IPR legal/administrative factors that reflect overall power relations among project participants, with a focus on the substantial interplay of IPR and non-IPR clauses. Last, this work will formulate policy proposals for Japan and the U.S. to facilitate Japan's participation in the R&D, in view of their congruent and conflictual interests.

3. The Evolution and Dormancy of Legal Frameworks for Cooperative R&D: the U.S.-U.K. vs. the U.S.-Japan Cases

1) The Basic Structure

As shown by Table 1, the two cases have a very similar basic structure. More specifically, with the U.S. leadership, the U.S.-Japan case has apparently emulated the U.S.-U.K. one in regard to the following four instruments.

In 1953, the U.S. concluded with the U.K. *the Agreement to Facilitate the Exchange of Patents and Technical Information for Defense Purposes*, setting a general legal framework for technology transfer that is based on formal reciprocity. In 1956, only three

¹² As for ownership of the Eurofighter Consortium, <https://www.eurofighter.com/about-us>, accessed on December 19, 2016.

¹³ For example. David Moore, Stuart Young, Kevin Burgess, and Peter Antill, "The Impact of U.S. Export Control and Technology Transfer Regime on the Joint Strike Fighter (JSF) Project — A UK Perspective", excerpt from the Proceedings of the Eighth Annual Acquisition Research Symposium, Naval Postgraduate School, April 30, 2011, <http://calhoun.nps.edu/bitstream/handle/10945/33611/NPS-AM-11-C8P03R01-025.pdf?sequence=1&isAllowed=y>, accessed on December 29, 2016.

years later, the U.S. also entered an identically-named agreement with Japan, a significant portion of which overlaps with the preceding agreement of 1953.

In 1960, the U.S. concluded the *NATO Agreement for the Mutual Safeguarding of Secrecy of Inventions Relating to Defence And For Which Applications For Patents Have Been Made*. It enables the protection of U.S. secret patents when transferred to NATO allies, especially the U.K. On the other hand, in 1988, the U.S. agreed similar legal instruments with Japan, signifying that technology transfer was unidirectional from the U.S. to Japan for more than 30 years since the conclusion of the agreement of 1956. During this period, Japanese domestic laws and individual equipment-specific bilateral contracts extended sufficient protection over the secrecy of U.S. inventions as embedded in defense equipment that Japan imported from the U.S. and as related to technology transfer for Japan's manufacturing coproduction under U.S. license.

In 1961, the U.S. concluded with the U.K. the *General Security of Information Agreement* (GSOIA) *with the Industrial Security Annex thereto*. Although classified to date, the content of the GSOIA can be easily conjectured, for example, from the well-developed U.S.-Japan *General Security of Military Information Agreement* (GSOMIA) of 2007. Its text is available in the public domain, most probably, due to the total lack of communications intelligence and other clauses concerning non-military information that has to be classified.

¹⁴Also, the content of the Annex is further elaborated in the U.S.-U.K. Defense Trade Cooperation of 2007, which is available in the public domain. It is highly consistent with the *National Industrial Security Program Operating Manual* (NISPOM), a U.S. domestic legal/administrative instrument. Japan does not have a National Industrial Security Program and an adequate full-time professional security cadre that enable active information-security implementation and practice. Consequently, Japan has neither concluded a similar annex nor published an equivalent of the NISPOM. Apparently, for more than four decades, the bilateral exchange of classified technology information remained very limited without GSOMIA's general standard framework and procedures, yet managed only in a case-by-case approach. Also, the lack of an Annex still hampers full, swift, and smooth realization of such exchange at the level of industrial sectors.¹⁵

¹⁴ GSOIA deals with the whole classified information of government, while GSOMIA is limited to that of defense and national security organizations.

¹⁵ Depending on the extent of defense industrial cooperation, the U.S. Department of Defense negotiates an industrial security supplement or complement to a GSOMIA. These "Industrial Security Agreements" (ISA) are sought with those governments with which the Department has entered co-development, co-production and/or reciprocal procurement arrangements involving industry. It establishes requirements that apply to contracts, subcontracts, pre-contract negotiations, or other government-approved arrangements with industry involving classified information. The ISA also includes provisions for the clearance of manufacturing facilities and its personnel, provides guidelines for the handling and transmission of classified information and materials, and establishes procedures for officials visits, during which classified information will be exchanged. Moreover, the ISA provides

In 1970, the U.S. entered the *NATO Agreement on Communication of Technical Information for Defense Equipment*, facilitating bi- and multi-national defense R&D with NATO allies, especially with the U.K. In contrast, the U.S. concluded *the Exchange of Notes on Military Technology Transfer* with Japan only in 1983, with a major focus on such transfer from Japan to the U.S. Until then, no substantial transfer and cooperative R&D took place between the two.

In 1985, the U.S. concluded the *Memorandum relating Principles Governing Cooperation in R&D, Production, Procurement and Logistic Support of Defense Equipment*. As of today, there is no equivalent legal instrument between the U.S. and Japan.

Apparently, the basic U.S.-Japan legal framework is only an imperfect emulation of the U.S.-U.K. one, with a significant time lag in instituting necessary major legal instruments. The latter is wider, deeper, and more robust in content than the former. Nonetheless, the former is equipped with four of the five major legal instruments prerequisite to cooperative R&D with the U.S. This means that the U.S. and Japan have agreed on basic principles and norms for R&D without concurring on rules and procedures openly and explicitly, but have followed a case-by-case approach to individual projects.

2) The Evolution and Dormancy of Institutional Development

As shown by Table 1, the U.S. concluded a series of legal instruments with the U.K. that are built on the 1985 Memorandum, so as to facilitate and accelerate the formation and implementation of R&D projects. These instruments include the *1985 Master Information Exchange Agreement for Defense Purposes*, *1994 MOU on Technology R&D projects*, *2000 MOU concerning Cooperative Participation in R&D Projects*, and *2008 MOU concerning the Exchange of Engineers and Scientists*. More importantly, diplomatic and policy commitment to those R&D has been reinforced by the *1993 Agreement on Defense Cooperation* and the *U.S.-U.K. Defense Trade Cooperation Treaty of 2007*.¹⁶

On the other hand, the U.S.-Japan legal framework has been dormant in contrast to the remarkable evolutionary development that the U.S.-U.K. framework has undergone, as demonstrated by the totally lack of the aforementioned legal instruments. This means that the U.S.-Japan framework lacks both explicit policy commitment to and legal instrumentality for cooperative R&D. Even without them, the U.S. and Japan have muddled through a

points of contact for security issues that may arise and those for visits.

It is important to note that ISA does not provide a template for industrial participation, co-development, and/or co-production. Rather, as with a GSOMIA, exemplary defense security implementation and active security practice are crucial aspects of a trusted defense industrial partnership that is based on the efficacy of security in industry. As with a GSOMIA, the U.S. requires a similar phased approach toward the assessment of a partner nation's governmental security oversight over its defense industry and over its willingness and capability to protect classified information.

¹⁶ The treaty has evolved out of the *2000 U.S.-U.K. Declaration of Principles for Defense Equipment and Industrial Cooperation*.

case-by-case approach to cooperative R&D. This is shown by successful formation and implementation of 19 individual R&D projects to date since the conclusion of the *1983 Exchange of Notes*, for minor yet significant element technologies and subsystems for different defense equipment. The two countries concluded an MOU for each project, but all of the MOUs except one are classified.¹⁷ Yet, it is apparent that they do not have to be classified but could be put in the public domain as in the U.S.-U.K cases. Should there be anything to be classified, specific parts of those MOUs could be redacted, or, alternatively, unclassified versions of them could be put in the public domain. It is almost sure that, given its bureaucratic culture of timidity or aversion of politicization in legislative process under the pacifist constitution, the Japanese government has demanded the U.S. counterpart to classify those MOUs when they include a fraction to be classified. Or, doing so has already become an operational security practice between the two countries.

Given the 19 bi-national projects, the U.S. and Japan most likely have already agreed implicitly a substantial part of the content of the aforementioned U.S.-U.K legal instruments, especially rules and procedures for formation and implementation of cooperative R&D. This is clear by looking at the sole-unclassified *2004 MOU concerning Ballistic Missile Defense* whose full text is put in the public domain. This MOU deals with how to treat U.S. information on missile defense that was to be given to Japan, where the U.S. executive branch had to be accountable for the Congress. The MOU's organization coincides with the established one in U.S.-U.K. legal instruments,¹⁸ and its content is also a partial yet faithful reflection of them.

The U.S.-Japan legal framework to date, unlike the U.S.-U.K one, suffers serious lack of MOUs that openly set rules and specific procedures of cooperative R&D to be brought into force through effective and active implementation and oversight thereof. Unfortunately, this lack works as strong disincentive against Japanese firms' participation in R&D, at the time when the U.S. tries hard to bring out their active industrial involvement.¹⁹

The problem stands most conspicuous for IPR issues, especially patents and trade secrets, that greatly influence individual firms' competitiveness, profitability, and, ultimately, market survivability. Standard IPR clauses have already evolved over time through a series of U.S.-led bi- and multi-national MOUs. The U.S. leadership therein means that U.S. legal

¹⁷ The exception is the *2004 MOU on Ballistic Missile Defense* through which to give U.S. information unilaterally to Japan.

¹⁸ It includes ①purpose and scope, ②management, ③financial provisions, ④disclosure and use of information, ⑤controlled unclassified information, ⑥visit to establishment, ⑦security, ⑧third party transfer, ⑨military technologies, ⑩claims and liability, ⑪customs duties, taxes, and similar charges, ⑫settlement of disputes, and ⑬general provisions.

¹⁹ For instance, Section 4 of the *2004 U.S.-U.K. MOU relating Principles Governing Cooperation in in Research and Development, Production, Procurement and Logistic Support of Defense Capability* requires the industries of each country to take their own initiatives for full industrial involvement.

approach to IPR has greatly impacted on the evolution of MOUs' development, involving significantly borrowings and overlaps between these MOUs and the U.S. IPR laws and regulations.

Early exemplar clauses, for instance, are available in the U.S.-U.K. *MOU on Technology R&D Projects* of 2000. It has since seen full development in a set of JSF-related bi- and multi-national MOUs, each of which is specific to a particular stage of project implementation as listed in Table 2: (1) Engineering and Manufacturing Development (EMD), (2) System Development and Demonstration (SDD), (3) Production, Sustainment & Follow-on Development (PSFD), and (4) Initial Operational Test and Evaluation (ITO&E). The MOUs set general rules and procedures on how to disclose and use project information including government project foreground information, government project background information, contractor project foreground information, contractor project background information, proprietary project information (or, controlled unclassified information), and patents, as well as on how to handle infringement claims and share the cost of resolving the claims. Also, the MOUs cover third party sales and transfers of project equipment and information.

In other words, these rules and procedures are based on equity and reciprocity, specifically enumerating who owns intellectual property (IP) developed during contract performance and the rights the government customers enjoy in a particular IP; they include substantial details regarding limitations on the cooperating governments' ability to transfer the technology to third parties or otherwise commercialize a contractor's technology; and they also cover the patents and other pre-existing proprietary technology a contractor may bring to the project. The established rules and procedures of the aforementioned MOUs require observance of respective national disclosure policies, no payment for using government and contractor project information, and consultation and written consent prior to third party sales and transfers,²⁰ and equal secured access to a patent of any project invention through non-exclusive, irrevocable, loyalty-free licenses in the event that a contractor hold the patent title.²¹

²⁰ Under these MOUs, a government cannot divulge trade secrets it obtains from contractors. Trade secrets would ordinarily be background technology whose development a contractor funded itself, rather than under a government contract. Contract deliverables incorporating trade secrets, therefore, could be viewed as having been developed using mixed funding, i.e., both the contractor and the government contributed funding to develop the particular end product. In general, the government will obtain somewhat fewer "government purpose rights" to items developed with mixed funding rather than items developed solely with government funds. The MOUs require that contractors obtain the government's approval to include trade secrets in any deliverable end product. This allows the government to control whether it will accept end items in which the government will have less IPR, in exchange for being able to use the contractor's trade secret in the end item.

²¹ Under these MOUs, a contractor is entitled to seek patents for inventions it creates during performance of a project contract. A government is entitled to rights to practice the patented invention. Contractors must report their inventions to the governments and inform the governments of their intent to seek a patent on their invention. If a contractor seeks to use a

All of these mean that inter-state MOUs are the legal umbrella for the settlement of infringement claims and compensation under which to handle them between and among the project's participating states. The lack of MOUs, therefore, forces a remedy-seeking firm to confront the state concerned or the offending firm directly, most probably, through administrative and juridical proceedings according to the law and regulations of the lead state of a given project. Thus, the MOUs play a critical role to determine the level of defense-firms' willingness to participating in cooperative R&D.

Certainly, while the MOU rules and procedures are prerequisite to cooperative R&D, they demand in-depth legal expertise to evade some crucial pitfalls,²² such as how to define purposes for use of project information²³, how to exempt application of a participating state's Freedom of Information Act to disclosing proprietary information,²⁴ and how to extend protection over subcontractors' IPR.²⁵

patent it already owns in performing a new contract, it can negotiate royalties for the patent's use with the governments. Under the MOUs, the governments are entitled to use patented inventions without the patent owner's permission, but the governments are liable for patent infringement damages.

²² To understand general nature of the pitfalls, see, for example, a U.S. government guide book on the Federal Acquisition Regulations (FAR) and the Defense Federal Acquisition Regulations Supplement (DFARS): "Intellectual Property: Navigating Through Commercial Waters", Office of Under Secretary of Defense for Acquisition, Technology and Logistics, October 15, 2001. Also, the Defense Information System Agency explains regulations on data rights in <http://www.disa.mil/about/legal-and-regulatory/datarights-ip/datarights>, accessed on January 17, 2017. These address IPR issues between a contractor and the US Government customer, including apportion rights between a contractor and the government for technical data and software developed in the course of contract performance, while explaining a number of examples of different IPR issues DOD faces and DOD's approach to them.

²³ Three standard licenses are (1) an unlimited right license, (2) a government license, and (3) a limited license. When an unlimited license is given to a government and/or a firm, the holder of proprietary information, especially trade secrets, can no longer claim its protection. Limited rights permit the government to learn about and use the proprietary, trade secret technology and components delivered for the purpose specified in the contract, but severely restrict further distribution or use of these technologies in any other way. Contractors can sue the government for breach of contract should the government use the trade secret beyond what the contract specifically permits. Again, it is the contractor's responsibility to mark and identify to the government its trade secret material. Subcontractors can also take advantage of standard MOU stipulations, and can also negotiate additional protections for their trade secrets with the prime contractor. To understand the general nature of the problem, see, Taylor M. Norton, "Protecting Subcontractor' Intellectual Property in Government Contracts: Trade Secrets and Proprietary Data", *The Federal Lawyer*, October 2010. It is also possible to limit license specific to the use of technical information to a government agency, a project or even a particular stage of a project as in the JSF project.

²⁴ To understand the general nature of this problem, see, for example, Exemption 4, *U.S. Department of Justice Guide to the Freedom of Information Act*, 2013, and, James R. Wells, Scott L. Vernick, and David H. Colvin, "Protecting Company's Trade Secret and Confidential Information in Government Contracting", *ACC Docket*, October 2009.

²⁵ Non-disclosure agreements (NDAs) may be an important element of protecting a contractor's trade secrets from misappropriation by other contractors working on a multinational project. Norton, *op.cit.*

3) Japan's Agenda for Legal Framework Building and her Probematique Beyond it

The above analysis has revealed some major shortcomings and defects of the U.S.-Japan legal framework for cooperative R&D. The framework has not undergone necessary evolutionary development through instituting a series of specific detailed MOUs that the U.S.-U.K one did. Assuming the nature of a repeated game of international cooperative R&D, the U.S. as well as a major U.S. ally has strong self-interest to observe MOUs that are based on equity and reciprocity. Such an assumption is well taken as long as U.S. leadership is expected in overall military power in general and military industrial-technological power in particular. Thus, to facilitate bi- and multi-national R&D, the U.S. and Japan have to conclude similar legal instruments without delay.

Certainly, stipulating full IPR clauses in MOUs is very important for Japanese firms to reduce their sense of uncertainty and give them incentives to participate in U.S.-led bi- and multi-national R&D.²⁶ But, the fair legal framework does not necessarily enhance Japan's access to a particular piece of technology of another partner, particularly the U.S., even if the access is a primary objective of participation in a project.

4. A Comparative Analysis of the JSK and the Eurofighter Projects: Major Impediments to Technology Information Sharing and Their Implications to Full Development of IPR Clauses

1) The Probematique

The multi-national R&D project of a large weapon system relies on extensive technology contributions from the participating states and firms. This means an overall level of technology sharing may result from the complex and complicated interplay of the three legal regimes: IPR, export control, and information security.²⁷

A participating-state's export control regime may block, hamper or delay a specific technology transfer even if all the IPR issues are all well settled. That is, overall transfer may be imbalanced in quantity and/or quality, particularly, in favor of a lead state that bears a greater proportion of financial contribution and/or a crucial part of technology contribution. It has a privileged position to force other project participants through general-framework and

²⁶ Doing this requires building MOU expertise within the Ministries of Defense (MOD) from scratch and putting these MOUs in the public domain. For a significant period of time, MOD will have to rely on IPR experts seconded from other ministries and agencies. This is a challenge for MOD due to the legal cap on the size of public service, particularly that of MOD, that involves a net loss of the allotted posts of officials at worst or a successful barter of other ministries' posts at best.

²⁷ As for export control, information security, and the related laws, regulations, and policy documents, see, Chapter 7 "Technology Transfer, Export Controls, and International Programs Security," *The Green Book*, edition 10, July 2016, <http://www.dscs.dsca.mil/pages/resources/default.aspx?section=publications&type=greenbook>, accessed on December 23, 2016.

project-specific MOUs to accept the project structure, implementation management, detail rules and procedures, and information management system. True, a disadvantaged state could abstain from participating in a project or exit from it when the state sees no good opportunity for as much technology transfer as it desires. But, the state would be conceivably unwilling to do so because it may be lured with limited incidental access to state-of-the-art technologies of the lead state and its firms as well as economic benefits, commercial profits, and/or political-strategic interests that it anticipates from participation in the project.

Thus, a lead state could take advantage of the privileged position, if not prey on the disadvantaged, invoking its policy discretion in export control over critical technologies. Such action per se does not contradict with full observance of the legal obligations under a fair IPR regime. Perhaps, respective bureaucracy in IPR, export control, or information security is autonomous and, most probably, myopic in accordance with the laws and regulations concerned. Neither does it share any policy objective nor coordinate their different jurisdictions of administrative operation meaningfully. But top policy makers could arbitrarily invoke their discretion for sledgehammering intervention.

This problem can be avoided, at least logically, when several much-of-an-muchness states form a joint venture entity, pooling their financial and technology contributions to a project. In this case, there is neither a lead state nor a prime contractor that is subjected to the jurisdiction and administrative oversight thereof. Instead, the entity follows a regulatory approach based on rules and procedures agreed upon by the participating states and/or firms, involving no arbitrary or discretionary intervention against technology sharing. Of course, this approach makes no sense if the project participants are unable to provide sufficient financial and technology contributions that can match those of a lead-state-managed and prime-contractor-implemented project.

2) General Background of U.K. Frustration with the JSF Project

The U.S. export control regime is fraught with poor coordination consequent upon its highly decentralized and fragmented institutional mechanism, involving unnecessary delays and inefficiencies in license application process. The regime neither has a single primary export control licensing agency nor a unified control list nor a single enforcement coordination agency nor a single integrated information technology system.²⁸

²⁸ Ian F. Fergusson and Paul K. Kerr, "The U.S. Export Control System and the President's Reform Initiatives", *CRS Report for Congress* (R41916), January 13, 2014, p. 10. U.K. experience, as elaborated later, supports their assessment. However, an insider in the executive branch would say that there is a very efficient process in which the State Department refers licenses to the Defense Department for review and in which the Commerce Department does to the Defense Department for dual-use technology. This position may stand, at least from such a viewpoint, given over many of sixty five thousands licenses a year that return to State and Commerce within five to ten days. See, Fact Sheet 6, http://2016.export.gov/ecr/eg_main_023180.asp, accessed on February 1, 2017.

This has inevitably led to suboptimal performance of a supply chain. Given the U.S.-led legal frameworks for international cooperative R&D, especially U.S.-U.K. general-framework and JSF project-specific MOUs, U.K. firms do not generally deal directly with the U.S. government on export control requests according to *International Traffic in Arms Regulations* (ITAR). Instead, they need to pass them through a U.S. firm, more specifically in the JSF project, the Lockheed Martin as prime contractor. This means that, when ITAR-controlled technology is involved, a U.K. company cannot work with another firm without first getting U.S. approval. On the other hand, the U.S. does not face similar export-control impediments to exploiting and using non-U.S. companies' intellectual property that has been funded privately or by other governments.

No wonder, the U.K. perceives that U.S. firms use ITAR to protect their IPR. Due to the above ITAR impediments, U.K. firms are increasingly concerned that some R&D activities have been moved to the U.S., and see the need to ensure no technological improvement to be made there. Behind this concern, there is the awareness that ITAR may apply to such improvement, most possibly impeding their future ability of using their own original IPR. Consequently, some U.K. firms do not want to participate in a U.S.-led project and rather to form an ITAR-free project with non-U.S. partners.²⁹ This strong sense of frustration is a major driver behind formation of the Eurofighter project.³⁰

In response to strong U.K. protests, the U.S. amended ITAR so as to issue a "Global Project Authorization (GPA)" license for a comprehensive transfer of relatively low unclassified JSF-related technologies as related to defense articles, technical data or defense services. GPS licensing is made possible by concluding an inter-governmental MOU for cooperative R&D, and today applies to NATO members, Australia, Japan, and Sweden.³¹

For arms export, Department of State export authorization structure is based on the *Arms Export Control Act* (AECT), and the Directorate Defense Trade Controls (DDTC) and the Regional Security and Arms Transfer (RSAT) implement the *International Traffic in Arms Regulation* (ITAR) and *U.S. Munitions List*. For all commodities and unclassified technical data except arms and other designated items, Department of Commerce export administration structure is based on the *Export Administration Act* (EAA), and the Bureau of Industry and Security implements the *Export Administration Regulations*, *Commerce Control List*, and *Country List*. In addition, various Department of Defense offices, agencies and organization provide policy and technical oversight, strategic assessment and validation, threat assessment, and technical support, among others.

²⁹ David Moore, et.al, "The Impact of U.S. Export Control and Technology Transfer Regime on the Joint Strike Fighter (JSF) Project — A UK Perspective", excerpt from the Proceedings on the Eighth Annual Acquisition Research Symposium, Wednesday Sessions, Volume 1, April 3, 2011, p. 81, <http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA543870>, accessed on January 25, 2017.

³⁰ *Oushu no Boei-sangyo-seisaku ni kansuru Chousa-Mishon Hokoku* (The Fact-finding Mission Report on European's Defense Industrial Policy), KEIDANREN Boei-Seisan-Iinkai (The Japanese Business Federation, Defense Production Committee), July 20, 2010, p. 2, <https://www.keidanren.or.jp/policy/2010/067houkoku.pdf>, accessed on January 25, 2017.

³¹ 22 Code of Federal Regulations 126.14 - Special comprehensive export authorizations for

These moves made some improvement of unnecessary delays and inefficiencies of the export control regime.

Yet, these moves in export control have nothing to do with the information security regime that quite often blocks technology transfer. This is because the GPA does not apply to classified military technologies to which the U.K. and other participating states in the JSF project desire to have at least limited access. These technologies includes those related not only to avionics but also to low observability of aircraft (or a complicated mixture of airframe shape and structure), special structural and coating materials, special embedded sensor, and special devices incorporated into the inlets and exhaust of the engine.³² In fact, David Moore, et.al, sees that, in the JSF project, “the U.K. firm was never allowed near anything associated with the software”, and thus could not understand how the systems work “without a full picture what systems are doing at the time failures occur.”³³

3) The Focal Point: Information Management System and Software Source Code

The cooperative R&D project of a large weapon system involves exchanging extensive and complex digital engineering data, such as design, manufacturing and product support data.³⁴ Practically, the necessity of efficient, speedy and accurate exchange of data can only be satisfied by a computer-networked Integrated Weapon System Data Base in general and a prime contractor’s Integrated Technical Information Service in particular.³⁵ It may use the Continuous Acquisition and Life-cycle Support (CALS), a prominent U.S. program in the field, or one very similar to CALS.

Such a system is a shared digital environment involving electronic networks, software platforms and electronic data management systems used by project participants to manage and share technical information and data that contain not only classified/controlled government information but also proprietary information including trade secrets. In order to

NATO, Australia, Japan, and Sweden, <https://www.law.cornell.edu/cfr/text/22/126.14>. Robert A. Borich Jr., “Globalization of the U.S. Defense Industrial Base: Developing Sources Abroad Through Exporting Advanced Military Technology”, *Public Contract Law Journal*, Vol. 31, No. 4, summer 2002.

³² Cynthia R. Cook, et.al, *Assessing and Supporting the Joint Strike Fighter in U.K.: Issues and Costs*, RAND, 2003. pp. 111-115. Manufacturing information includes manufacturing process details and software source code information based on classified algorithms and design rationale. Build-to-Print information includes less sensitive supporting documentation of manufacturing information. Assembly information is associated with hardware and necessary for assembly and testing of defense equipment.

Needless to say, U.S. technology transfer for Final Assembly and Check-Out (FACO) is far limited than for assembly information, not including manufacturing and build-to-print information.

³³ Moore, *op.cit*, p. 85.

³⁴ More specifically, the data include engineering drawings, product definition data, logistic support analysis data, technical manuals, training manuals, technical plans, and operational feedback on weapon systems, among others.

³⁵ Graham Spinardi, et.al, “Technical data interchange in the Eurofighter project”, *Science & Public Policy*, Vol. 22, No. 1, 1995, pp. 30-32.

prevent misappropriation, unauthorized use or leakage of them, access to the system has to be strictly restricted on a need-to-know basis and also to be compartmentalized to a specific portion of the system for the use of sub-contractors that are assigned to work for particular parts of the project. This means that any data communication between subcontractors has to be approved by the prime contractor. This connotes that, unless a project is managed by a joint venture entity whose partners agree sharing technical information rather equally, a prime contractor serves as the sole information integrator who only knows overall process and development of the project; subcontractors are kept in the dark. This operationally cumbersome data segmentation approach not only slows down collaboration across subcontractors but also may possibly result in data fracture by upgrading data in one folder without changing the same data in other files.³⁶ Most importantly, the approach by default involves the critical power-relational problem concerning who controls such an information management system and how. This applies well to the JSF project.

Certainly, there is an alternative approach to avoid such a problem. It may “administer the system by tagging each data element with information including its origin, security, commercial confidentiality markings, and access restrictions, and then linking the access rights of individuals to the markings. This requires a parallel identity and access management, in which all individuals must have proof of identity to log on the system”. This data-level management system would “allocate access rights automatically, thus eliminating the need for a manual management of access privileges”. This is quite possible with the existing technologies and procedures if there exists policy commitment to managerial innovation.³⁷

Unfortunately, a lead state, such as the U.S. in the JSF project, will not follow the alternative approach so as to preserve and enhance its long-term technological leadership. This is because the focus of a large weapon system R&D, such as that of an air superiority fighter, has increasingly shifted from platform to system development, necessitating system integration capability to be core competence. Software source codes are their nerve system or the “black box” that defines the capabilities, limitations and adaptability of the weapon system to adapt itself to future operational requirements. The shift is most manifest in the case of the fifth-generation JSF. This means that both data segregation in information management system and substantial monopoly over source codes and combat data constitute a lead-state’s effective policy instrument and the source of power respectively that would not easily be compromised.

In this light, it is critically important to note the operational sovereignty issue raised

³⁶ Puay Tang and Jordi Molas-Ggallart, “Intellectual Property and Inter-organizational Collaborative Networks: Navigating the Maze”, SEWPS: SPRU Electronic Working Paper Series No. 130, The Freeman Centre, University of Sussex, February 2005, pp. 25-26 and pp. 29-30.

³⁷ *Ibid*, pp. 30-31.

by the U.K. regarding the JSF project. The country participated in the project because it planned to acquire and deploy the aircraft. Thus, it expected to have as sufficient access to source codes as to make necessary modifications and additions according to its own unique operational needs, such as equipping its own radars/sensors, missiles, and/or pods. Furthermore, it naturally desires to speedily do so at its discretion without disclosing its own technology information. Yet, the U.S. restrictive approach is virtually incompatible with such an expectation. As a result, the U.K. now perhaps has to disclose all the technology information and data as related to the necessary modifications, probably necessitating it to leave the reprogramming of source codes to the U.S.³⁸

This high-handed U.S. approach has prevailed so far and will remain so for a foreseeable future. Given its capability of overwhelming financial and technology contribution in general and near monopoly of core competence in most advanced weapon system R&D in particular, the U.S. as a lead state does not have to be at tug-of-war with other participating states in setting terms of transfer of source codes and data for the purpose of keeping their participation in the project; U.S. necessity of compromise will remain minimal. On the other hand, the 4.5th-generation Eurofighter project has been only halfway successful in that it could pool necessary financial and technology contribution from the participating states and firms. Yet, the project is well known to have suffered higher R&D and production costs than planned due to uncompetitive and inequitable distribution of relative gains and losses among the states and firms that aim to enable their arduous collective action.³⁹ This approach will become increasingly inviable in the case of cooperative R&D of a state-of-art weapon system that focuses more on system integration, such as fifth- and future-generation fighters.

5. Policy Proposals

Hitherto, this study has identified underlying impediments to Japan's participation in multi-national cooperative R&D of an advanced weapon system, with an intent to explore specific measures for removing or at least alleviating them toward the successful formation and implementation of such R&D.

As the first step to be taken, Japan and the U.S. have to fully develop their legal framework for cooperative defense R&D without delay by concluding a series of MOUs. In doing so, they need to emulate a series of U.S.-U.K. MOUs as shown in Table 1 and Table 2.⁴⁰

³⁸ This is a conjecture based on the Japanese experience in the FSX (a derivative version of F-16) co-development project in which the U.S. rejected to disclose the source code and combat data as much as the Japanese government desired.

³⁹ Marc R. De Vore, "The Arms Collaboration Dilemma: Between Principal-Agent Dynamics and Collective Action Problems", *Security Studies*, Vol. 20, 2011.

⁴⁰ As a useful reference, see, *Guidance for the Drafting of MOUs and Programme MOUs – Basic Considerations and Checklist*, Acquisition Practices Publication, NATO Group on Acquisition Practice, January 1989.

The current U.S.-Japan framework is fraught with serious defects and shortcomings, particularly those in IPR, that work as Japanese-firms' strong disincentives against their participation in cooperative R&D.

Then Japan's Ministry of Defense (MOD), either within or without the Acquisition, Technology, and Logistics Agency (ATLA),⁴¹ needs to establish a permanent unit of IPR experts. Given no current effective human resources therein, the ministry cannot but recruit those necessary experts on a government-wide secondment basis to be supplemented and complemented by those from the private sectors. MOD-proper officials shall work with the experts to do spadework concerning detail legal issues for further extra-governmental consultation and legal services, so that they can make full use of American and other foreign lawyers specializing in government contracting and IPR issues.

Most importantly, the Japanese government must put the contents of R&D-related MOUs in the public domain, thereby removing or at least significantly reducing the sense of uncertainty on IPR among Japanese firms. This effectively means that the government has to repeal the longtime policy that classifies almost all the project-specific MOUs. To note, the government has so far concluded no meaningful general framework MOU for cooperative R&D and only muddled case-by-case through a series of minor individual bi-national projects for element technology and subsystems. Most probably, the government classified all the MOUs even when it had no impelling need to do so. This is apparent given that the extensive U.S.-U.K MOUs have been put in the public domain. Should it be necessary to classify a fraction of an MOU, it could be redacted, or an unclassified version of it would have to be prepared.

Secondly, Japan has to lower its expectation toward swift attainment of favorable terms of technology sharing with the U.S, particularly access to software source code as core competence. Rather, there will be a two or three decades-long protracted ordeal to reach the far less-than-expected level of technology sharing than that of the U.S.-U.K level. Nonetheless, the first step forward must be taken now, not later, because full development of the legal framework is a necessary condition for the facilitating formation and implementation of international cooperative R&D. This study has found that the overall framework of a R&D project in general and the substantial terms of technology sharing in particular are determined by distribution of financial and technology contribution among project participants. Japan can neither make large financial contribution nor possesses advanced system integration capability comparable to those of the U.S. (This implies that, should Japan be a lead state providing a majority of financial contribution and/or essential core competence technologies, the country could dictate substantial terms of technology sharing.)

⁴¹ For ATLA's various functions, see, http://www.mod.go.jp/atla/en/soubichou_gaiyou.html, accessed on February 1, 2017.

Thus, Japan has to choose a non-U.S., perhaps, European partner for a large weapon system R&D, while forced to be self-reliant in developing its system integration capability without combat data, an unfortunate constrain under Japan's pacifist constitution. More specifically, for example, Japan can only aspire to develop core competence reaching to the level of the 4.5th -generation fighter such as the Eurofighter, not more than the 5th or future-generation one. It should be recalled that the U.K once extended "no black box" offer for possible Japan's acquisition of Eurofighters, involving as many source codes as necessary to enable Japan's operational sovereignty of the aircraft.⁴² Yet, such lower but substantial core competence will surely serve as an effective bargaining chip. That is, the U.S. may possibly agree to grant limited access to core competence technologies to Japan only when it sees Japan has become able or has a good chance to go its own technological development path, which thrusts at the U.S an innegligible risk to confront a future technological challenger; or, when the U.S. needs substantial Japan's financial contribution. Apparently, the key for a "top dog" to preserve and enhance technological leadership lies in fine-tuning how and how much it shares what sensitive core competence technologies with an "under-dog".

It is well known that Japanese civil high-tech sectors possess numerous state-of-the-art material, electronic, and non-military system integration technologies at element and subsystem levels. In order to enhance its bargaining power vis-à-vis the U.S. and other countries, the Japan's MOD in coordination with the Ministry of Economy, Trade and Industry (METI) has to develop its own or joint full list of key state-of-the art dual-use technologies for contribution to international defense R&D. This is because Japan's discretion to invoke export control license-granting to these important technologies could be used to strengthen Japan's bargaining position on the formation and implementation thereof, thereby deterring or countervailing U.S. arbitrary exercise of policy discretion in export control and foreign disclosure.

Lastly not at least, all the bi- and multi-national arrangements for technology sharing practically center on data segmentation of and access rights to a project's information management system. Needless to say, Japan needs to learn from U.S. and other partners' state-of-the-art technologies. In a U.S.-led project, however, the country will surely take maximal advantage of the interplay of IPR, export control, and information security regimes to preserve and enhance its technological core competence, involving more segmentation and less access. On the other hand, the U.S. and other partners also need to bring out Japanese technological capability and potential for a common project. Here is a never-ending tug-of-war inherent in international cooperative defense R&D. At the bottom line, it is a plus-sum game, but collaboration therein is in fact another form of competition.

⁴² Jun Hongo, "BAE pitching Typhoon as F-22 eludes," *The Japan Times*, June 12, 2009.

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**Table 1: The Evolutions and Dormancy of Legal Frameworks for Defense R&D:
U.S.-U.K. vs. U.S.-Japan Cases**

Year	U.S.-U.K.	Year	U.S.-Japan
1953	Agreement to Facilitate the Exchange of Patents and Technical Information For Defense Purposes	1956	Agreement to Facilitate the Exchange of Patents and Technical Information For Defense Purposes
1960	NATO Agreement for the Mutual Safeguarding of Secrecy of Inventions relating to Defence and for which Applications for Patents have been made	1988	Agreement implementing the 1956 agreement, with MoU, procedures, related notes, and letters
1961	GSOIA as amended including Industrial Security Annex	2007	GSOMIA but no Industrial Security Annex
1970	NATO Agreement on Communication of Technical Information for Defense Purposes	1983	Exchange of Notes on Military Technology Transfer (from Japan to the U.S.)
1985	Memorandum relating to Principles Governing Cooperation in R&D, Production, Procurement and Logistic Support of Defense Equipment		
1988	Master Information Exchange Agreement for Defense Purposes		
1993	Agreement on Defense Cooperation		
1994	MoU on Technology R&D Projects		
2000	MoU on Cooperative Participation in R&D Projects		
2004	Reciprocal Defense Procurement MoU		
2007	Defense Trade Cooperation Treaty		
2008	MoU concerning the Exchange of Engineers and Scientists		

- GSO(M)IA: General Security of (Military) Information Agreement
- MoU: Memorandum of Understanding
- After the 1983 U.S.-Japan MoU, there have been 19 cooperative research projects for element technologies and one cooperative development project for ballistic missile defense.
- The U.S.-U.K. Defense Trade Cooperation Treaty of 2007 formalized the Industrial Security Annex of 1961.
- In 2016, the U.S. and Japan entered the *Reciprocal Defense Procurement MOU* (in force for five years) that confirmed application of the established principles and norms to defense procurement as related to R&D.

Table 2: The Bilateral and Multilateral MoUs for the Joint Strike Fighter Project

Year	Parties	Memorandum of Understanding (MoU)
2001	US, UK	MoU concerning the Cooperative Framework for Engineering and Manufacturing Development (EMD) of the Joint Strike Fighter (JSF)
2001	USA, Australia, Canada, Denmark, Italy, Netherlands, Norway, Turkey, UK	MoU concerning the Cooperative Framework for System Development and Demonstration (SDD) of the JSF
2007	USA, Australia, Canada, Denmark, Italy, Netherlands, Norway, Turkey, UK	JSF Production, Sustainment & Follow-on Development (PSFD) MoU
2007	US, UK	JSF Cooperative Initial Operational Test and Evaluation (ITO&E) MoU
2014	USA, Australia, Netherlands, UK	JSF ITO&E MoU