

Tentative translation

Revised 2nd Edition

# Security Trade Control Guidelines

for researchers in universities and other  
institutions of higher education



Japan Society for Intellectual Production



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## **INTRODUCTION**

These guidelines have been created for all university personnel who may have to deal with security trade controls in the course of their work, including researchers and administrators involved in international exchange programs. Their purpose is to help everyone to understand how security trade controls apply to research-related exports.

While the majority of university personnel may not be familiar with the Foreign Exchange and Foreign Trade Act (hereinafter, “Foreign Exchange Act” [these guidelines cover the provisions regarding controls on foreign trade]), controls enforced under this Act do in fact cover a wide range of university activities. For this reason, before participating in programs or activities that involve foreign people or transactions, faculty members need to check whether any aspect of the planned activity may be controlled under this Act. Also, further to a partial revision of the Act in April 2009, each exporter is now legally required to identify the party responsible for determining whether an export license is required. Everyone working for universities must therefore familiarize themselves with the provisions of the Foreign Exchange Act, **even as they apply to commonplace activities like international exchange programs**, paying particular attention to the provisions related to **security trade controls**.

However, the reality is that many major universities that run active international exchange programs have yet to establish institution-based systems to deal with security trade controls. In addition, many of their personnel are not fully aware that, in order to be run successfully and safely, international programs are required to comply with security trade control regulations. This situation is compounded by the fact that, as the population decreases and there are fewer young Japanese to fill university places, more universities are expanding their international exchange programs in a bid to maintain student numbers.

In order to help Japanese universities promote their international exchange programs, including industry-academia collaborations involving foreign companies, the Japan Society for Intellectual Production has developed these guidelines, along with our “Guidelines for Establishing and Implementing a Voluntary Control System for Security Trade”. These guidelines are intended to be of reference to faculty members and others who actually deal with security trade controls in the course of their research work or in connection with international exchange programs, and the other set of guidelines is primarily intended to help organizations establish their own internal systems for dealing with security trade controls. With the aim of supporting universities in fulfilling their social responsibilities as members of the community, and in order to **allow faculty members and staff the freedom to focus on performing their day-to-day work**, in these pages we will **explain in a simple manner how security trade control regulations may apply to international academic exchange programs, and shall clearly outline steps that researchers and other staff need to follow as they proceed in their research activities**.

It should be noted that certain academic activities are exempt from security trade controls under the Foreign Exchange Act, and as such will not be covered in these guidelines, including basic scientific research that is not focused on technical application (i.e., research that employs a theoretical or experimental methodology, and whose primary purpose is not to design or produce specific products but to explore principles of natural science), and general “educational” activities using materials like textbooks.

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[Layout of these guidelines]

These guidelines have been broken down into the following chapters:

1. Academic research activities and security trade controls;
2. Examples of implicated research fields, including those linked to WMDs;
3. Cases where the end-user and end-use of goods or technology are subject to advance screening;
4. Steps exporters should take when they think an item may be subject to export control legislation; and
5. Basic statistical data.

In Chapter One, we explain that when it comes to international academic exchange programs, there is no research field that is totally exempt from security trade controls, and offer some precautions for researchers who are involved in these programs. We then describe some realistic, fictional scenarios that will help researchers and university personnel understand how export controls are applied, and that will highlight some of the less obvious areas where there is a risk of security trade control violations in the context of international academic exchange. **If you don't understand how security trade controls apply to academic research activities, we recommend you to read Chapter One first.**

In Chapter Two, we start by explaining the framework of security trade controls (in particular, "list controls"). We then provide examples of subjects within each of the major research fields that are most likely to be implicated in the "export" of items, or international transfer of technology, that could potentially be used in the development, production, and use of WMDs or conventional weapons (in these guidelines, the term "export" is not limited to the conventional sense of buying and selling, but also indicates bringing or sending items out of Japan). If you already understand the importance of security trade controls in universities and **would like to know more specific information regarding the status of your research subject under the Foreign Exchange Act , please start reading from Chapter Two.**

In Chapter Three, we explain that, even if the item to be exported or the technology to be transferred is not explicitly listed on the control lists explained in Chapter Two, there are certain cases (subject to "catch-all controls") where the exporter will still be required to apply to the Ministry of Economy, Trade and Industry (METI) for an export license. **If you are already involved in international research-related exchange activities, and have understood how list controls are applied, but have questions or concerns regarding license requirements in particular cases, please start reading from Chapter Three.**

In Chapter Four, we explain specific steps to be taken when an export or international transfer of technology is found to be subject to legal controls. **If you have found out that your research requires you to export an item or provide a technology to another country, but you do not know what to do next, you will find the answer in Chapter Four.**

In Chapter Five, we share some basic statistical data related to security trade controls as they apply to academic research activities.

## 1. Academic Research Activities and Security Trade Controls

### (1) Researchers' questions about security trade controls:

[Question 1] Why do we have to deal with security trade controls in our university?

As we mentioned in the Introduction, legal controls under the Foreign Exchange Act cover a wide range of transactions, including the transfer of funds and the export of materials and equipment (referred to in the Act, and hereinafter, as the export of "goods"). International academic exchange often involves **exports of goods** (dealt with in Article 48 of the Act) **and provisions of technology** (referred to in the Act as "provision of services", and dealt with in Article 25) that are subject to security trade controls. **There are a wide range of university-based activities that could fall subject to the provisions of this Act**, including the export of research equipment, chemical substances or microorganisms; sponsored research or collaborative research involving foreign governments or companies; the provision of technical guidance to foreign companies; and the acceptance of foreign researchers and international students. Universities are therefore required to implement appropriate measures for dealing with security trade controls.

The purpose of the Foreign Exchange Act is "to enable the proper development of foreign transactions and the maintenance of peace and security in Japan and in the international community, and thereby to ensure equilibrium in the international balance of trade and currency stability as well as to contribute to the sound development of the Japanese economy" (Foreign Exchange Act, Article 1). That is, **the Foreign Exchange Act** was not enacted to simply control economic transactions between Japan and other countries, but rather to support "**the maintenance of peace and security in Japan and in the international community**".

Many readers might find it hard to believe that international academic exchange programs could pose any kind of threat to security in Japan and the international community. However, let's not forget that academic research conducted at universities involves highly sophisticated technical knowledge in research fields such as nuclear, aerospace and microorganisms engineering. It also entails the use of physical and chemical equipment, as well as the accumulation of the world's most advanced scientific technologies, chemical substances and microorganisms. All of these resources have the potential to be used in the development of nuclear, chemical or biological weapons or missiles, or as their means of delivery (hereinafter, "Weapons of Mass Destruction" or "WMDs"; the specific ways in which these resources can be diverted to WMD programs are explained in detail below). We need to remember that leading researchers in these fields are certainly well positioned to share and distribute their knowledge and resources.

Many readers might still object that their own research field has got nothing to do with WMDs, and that only a few particular academic fields are subject to security trade controls. This is an understandable objection. However, the opposite is in fact true: nowadays, any scientific research field, including agriculture, medicine, dentistry and pharmacy, could potentially be linked to weapons programs. Given the recent trend toward a more interdisciplinary style of academic research, **when viewed in their wider context, all scientific research fields can be implicated**. Researchers in certain "special research fields" that are relatively closely related to WMDs tend to understand how their work could be used to contribute to weapons programs. They are therefore usually fully aware of the importance of security trade controls, and

experienced in dealing with these controls in their day-to-day work. As a result, they are rarely involved in serious violations. What is **of most concern is the risk that researchers who are unfamiliar with the regulations could unwittingly send sensitive research-related goods out of Japan that could end up contributing to WMD programs.** For instance, a researcher in electronic engineering who lacks expertise in chemistry could unknowingly be involved in the export of certain commercially-available, controlled chemical substances that he or she is using.

Also, universities that accept large numbers of researchers from abroad (hereinafter, “foreign researchers”) and international students may neglect to find out enough information about each individual, such as the name of their home university and their personal background. But METI has identified certain end-users and end-uses that are subject to strict security trade control regulations (see Chapter 3, “(3) End-users suspected to be involved in WMD programs [Institutions on the Foreign End User List]”). The list names specific categories, institutions and countries that are of particular concern. As they take in large numbers of international researchers and students, a university may unknowingly accept someone connected with one of these controlled categories, institutions or countries. If that person thereby gains access to a dual-use technology, it could pose a threat to Japan’s national security and also undermine the trust that the international community places in our country.

However, **simply rejecting all researchers and international students from specific countries would be considered a form of discrimination based on nationality, something that the international community has been working hard to overcome, and would thus be unacceptable from a human rights point of view. The Foreign Exchange Act was not formulated to promote such a discriminatory attitude.**

As should now be clear, a wide range of university-based international exchange activities are likely to fall subject to security controls under the Foreign Exchange Act, and it is for this reason that universities are required to implement appropriate measures for dealing with security trade controls. In particular, in order to maintain and develop a free research environment that allows faculty members to focus on their day-to-day work, universities that are actively involved in international exchange programs must work to **increase awareness of security controls among their staff and researchers. By increasing awareness, we can eliminate common misconceptions researchers have about trade controls, including the idea that their own research poses no threat and so does not fall subject, and we can also help everyone recognize the importance of establishing effective voluntary systems for dealing with trade controls.**

[Question 2] What kind of research and activities are subject to security trade export controls?

As explained in the answer to Question 1, almost all research fields in the sciences, including research in science, engineering, agriculture, dentistry, medicine and pharmacy, are likely to fall subject to regulations. The primary purpose of security trade export controls (in these guidelines, the term “export controls” also covers international transfers of technology) is to control transnational movement of WMDs and conventional weapons (i.e., weapons other than WMDs, such as guns, tanks and fighter jets). Therefore, the Act’s “goods” category mainly targets these weapons, their constituent parts, and civil goods that could be used in their development (for example, production machinery), and the “technology” category mainly targets technologies that

could be used in the design, production or use of these “goods”. The export legislation lists the specific goods and technology for which an export license is required: when the item to be exported matches the technical specifications prescribed under the legislation, the exporter must apply for a license (“list controls”; for details, see Chapter 2).

However, even where the goods or technology in question are not found to match the technical specifications stated on the control lists, depending on the country of the end-user, exporters may still be required to confirm the scope of the end-user’s business activities as well as the export’s proposed end use, in order to prevent the export from being used in weapons programs. If, on the basis of these checks, it is determined that the goods or technology to be exported may be diverted for WMD purposes, the exporter must apply for an export license (“catch-all controls”; for details, see Chapter 2 and Chapter 3).

To sum up, in order to comply with export controls, exporters must first check whether the item or technology they wish to export is named on the control lists. If it is, their universities must take appropriate steps to control the export. If it is not, the exporter must go on to check the end-user’s country. If that country is subject to controls, the exporter must investigate the proposed end-user and end-use, and, depending on the result of that investigation, the university must take appropriate steps to control the export to prevent it from being diverted to weapons programs.

The following are examples of research fields in science and engineering that are particularly likely to fall subject to export controls:

- (i) Nuclear power
- (ii) Aerospace
- (iii) Chemistry
- (iv) Biology
- (v) Precision engineering (including control engineering, electronic engineering and mechanical engineering)
- (vi) Information engineering (including communications engineering, software engineering)

In Chapter 2, we will provide detailed explanation about these fields, for (i) to (iv), in the context of WMDs, and for (v) and (vi), in the context of conventional weapons.

[Question 3] How are security trade export controls useful in promoting research?

Some researchers in the fields of science and engineering may understand why universities need to enforce export controls, but may still resent them as yet another restriction on their research activities. But, in reality, quite the opposite is true: as we shall now explain, export controls are in fact fundamental to facilitating international collaborative research, and allow everyone to get their work done more efficiently and with less hassle.

Take, for example, a researcher who needs to exchange research materials with her research collaborators abroad. If her university does not have an adequate system in place to deal with export controls, she could unknowingly end up sending controlled goods overseas. The illegal transaction may only be picked up at a later stage, by which point her research will already have progressed to an important stage. This could put an abrupt end to the collaborative project. If researchers send goods overseas without paying enough attention to export controls, it is also

possible that the goods could get held up in customs and end up being delivered late, and **additional freight costs may have to be paid**. If, on the other hand, universities take enough care to administer export controls in the proper way, they can avoid problems related to the export of research-related goods, as well as problems associated with accepting researchers or international students from countries that are implicated in the development of WMDs.

Despite these benefits, some researchers may still feel that having to deal personally with complex export control procedures will get in the way of their work involving international exchange programs. It is true that export controls do give researchers a few extra tasks to deal with. If, however, their university has implemented its own effective system for administering **export controls** (as described in the “Guidelines for Establishing and Practicing Voluntary Control System for Security Trade”), **researchers who are involved in the hands-on work will only need to take a minimum of care to comply with their institution’s rules, and won’t find themselves overwhelmed by extra procedures**. In the case of institutions that have yet to finish establishing their own system to manage export controls, if researchers working on international collaborative projects pay close attention to what’s written in these guidelines and take just a few simple steps, they will be able to proceed with their projects unimpeded. **These guidelines provide a simple summary of what you, as researchers, need to know, leaving you free to focus on running your international projects. This advice is designed to help you minimize the formalities you have to go through in order to ensure the ongoing and secure running of international exchange activities.**

When a collaboration with a foreign company or university reaches the stage where it is ready to be applied practically, researchers at universities that have implemented effective procedures for export control will be at an advantage when it comes to publicizing and developing their results commercially. Export controls are enforced under international agreements, which means that other countries share similar export control procedures to Japan. In other words, companies and universities abroad also have to comply with their own country’s export control rules. If a Japanese university has a comprehensive system in place to ensure absolute compliance with export controls under our own Foreign Exchange Act, foreign collaborators are more likely to see that university as being a reliable partner, making them more comfortable to enter into collaborative research or business contracts. This will also save the university a lot of effort when it comes to contract negotiations.

## (2) Hypothetical case studies and practical advice for researchers

To help you to understand how important security trade controls are to university research activities, we will now present a few simple fictional scenarios that illustrate problems associated with international exchange activities, and provide some practical advice as to how they can be solved. At the end of this booklet, you can also find a section entitled, “Hypothetical Problems Involving Export Controls at Universities”, where expanded versions of the case studies given here have been compiled as an accessible reference resource to help faculty members in their day-to-day work.

### [Scenario 1]

A researcher failed to check in advance whether an item he wanted to export was subject to controls, and as a result his experiment was delayed and extra costs had to be paid.



### **(Summary)**

Professor A of National University Y was conducting collaborative research with Professor L of University S, Country X, and they were working on developing a new kind of floor inspection technology. One day, they decided that Professor A would send University S a particular piece of inspection equipment that he had developed, so that a floor inspection experiment could be done in Country X. University Y didn't have a department in charge of export controls, or any staff who were familiar with the regulations, so Professor A consulted with a freight forwarding company, and on the basis of their advice decided to apply for a tax exemption (an "ATA Carnet"<sup>1</sup>) and go ahead and export the equipment. However, when the freight forwarder made its customs declaration, customs officials were concerned that a particular part of the inspection equipment might require an export license under the Foreign Exchange Act. After Professor A was informed of this by the freight forwarder, he checked METI's website and realized that the part in question did indeed require an export license. This meant that he had to fly the rest of the equipment out ahead, and delay the delivery of the controlled part. He immediately applied for a license, and as soon as one was issued he exported the part, but the field experiment had been delayed and he had to pay extra money to cover the second delivery.

#### Note 1) ATA Carnet:

This is a customs document issued under the ATA Convention (Customs Convention on the ATA Carnet for the Temporary Admission of Goods). The ATA Carnet simplifies the process of making temporary, duty-free imports when bringing goods such as professional equipment (a typical example is equipment for TV news coverage), commercial samples, and goods for exhibitions into a foreign country. The ATA Carnet is convenient as it is accepted by customs in several countries, even if each country normally has different import procedures. When you first obtain a carnet you are required to apply for qualification, which you should obtain through your university. For details, contact an international freight forwarding company or the Japan Commercial Arbitration Association (visit their website here: [www.jcaa.or.jp/index.html](http://www.jcaa.or.jp/index.html))

### **(Practical Advice)**

An export license must be obtained *before* attempting to send goods overseas (before making a customs declaration). For this reason, it is essential to check well in advance whether or not your export requires an export license.

### **[Scenario 2]**

A researcher who wished to provide a certain technology to an international student realized that he was required to apply for an export license under the Foreign Exchange Act, and avoided breaking the law.

### **(Summary)**

Although he rarely makes media appearances, Professor U of Research Center S, National University T, is one of the internationally acclaimed researchers who have been producing remarkable results in the development of solid rocket engines. Professor J is a professor at the Department of Mechanical Engineering in the Faculty of Engineering of the same University. He is engaged in research into a system for injecting fuel into the interior of piston engine cylinders, and was Professor U's senior in graduate school. One day, Professor J asked Professor U if Student M, an international student from Country I who had been accepted into the University's doctoral program about three months beforehand, and who was studying in Professor J's lab,

could participate in the journal-reading sessions and study groups carried out in Professor U's laboratory. Professor J explained that, as part of his research into thermo-fluid analysis in the combustion process, Student M was also interested in jet engines and rocket engines, which, like piston engines, are types of internal-combustion engine. At first, Professor U said that he would welcome Student M. However, the following day, when Professor U was reading Student M's resume that he had received from Professor J, he found out that Student M was a researcher at University Z, Country I. He asked Professor J for details, and found out that Student M was, while studying as a graduate student at University T, still employed as a researcher at University Z's Aerospace Engineering Department, and was still receiving salary from that institution. University Z, Country I, is listed on METI's Foreign End User List as a research institution suspected of being implicated in the development of missiles (see Chapter 3, Section 3, "End-users suspected to be involved in WMD programs [Institutions listed on the Foreign End User List]").<sup>2</sup> A license was therefore required from METI before providing someone affiliated with that institution with knowledge on the latest rocket technology that could be used in the development of WMDs. If they provided this technology without a license, they would probably be breaking the law. Considering the nature of Professor U's research, and Student M's affiliation, Professor U judged that METI would not grant a license in this case, and decided to refuse Professor J's request.

Note 2) Foreign End User List:

This is a list provided by METI that identifies foreign institutions and fields of research that are suspected of being involved in WMD programs. Unless it is obvious that the export will not contribute to WMD programs, a license needs to be obtained from METI when carrying out research or university-based activities where goods or technology need to be provided to parties listed on the Foreign End User List, and careful consideration is therefore required.

**(Practical Advice)**

A license under the Foreign Exchange Act must be obtained *before* providing technical information that could potentially be used in WMD programs to the foreign institutions or individuals (including international students and researchers) that have been identified on the Foreign End User List. Prospective exporters should therefore proceed with caution and verify whether or not the provision of information in question may be subject to controls.

**[Scenario 3]**

It did not occur to a researcher that an item she had made for her research project would be subject to controls, but it was. As a result, the item could not be exported and the researcher had to find an alternative way of conducting her experiment.

**(Summary)**

Professor U at the Faculty of Engineering, Private University T, is working on research into ways of removing anti-personnel landmines in post-conflict areas. Professor U had proposed the use of sound waves to detect anti-personnel landmines made of plastic, and was planning to test her idea in a field test in Country C, a country in Southeast Asia that has been struggling to find ways of clearing anti-personnel landmines. Professor U developed an acoustic landmine detector that consisted of several different devices, to which she applied a strong oscillating source (sound source) that she had made herself, which incorporated an ultra-magnetostrictor capable of easily generating wideband, large-amplitude mechanical vibrations. The other instruments were all large and heavy, so Professor U decided to send them to Country C using a

reliable international carrier. However, since the oscillating source was a fragile handmade device that needed to be handled with care, and given its small size, Professor U planned to carry it with her in her carry-on baggage. It never occurred to her that her handmade research prototype would fall subject to export controls. However, right before she was going to depart for Country C, she was informed by the carrier that the ultra-magnetostrictor was controlled as “metallic magnetic materials” under the Export Trade Control Ordinance (hereinafter, “Export Order”), Appendix 1, Section 5, vi, and that it matched the specifications in the METI Goods Ordinance, Article 4, Item (viii)(b).<sup>3</sup> As she had no time to obtain an export license before her departure, and as it was very difficult to re-schedule her visit to Country C, Professor U had no choice but to go ahead with the tests using an alternative oscillating source.

3) METI Goods Ordinance:

This refers to the “Ordinance of the Ministry Specifying Goods and Technology Pursuant to Provisions of Appendix 1 of the Export Control Order and the Appendix of the Foreign Exchange Order”.

**(Practical Advice)**

The necessity of an export license under the Foreign Exchange Act does not depend on how big the item is, or on who made it. Exporters are required to apply for an export license when the item’s materials, structure, etc., match the technical specifications stipulated by law (Appendix 1 of the Export Trade Control Ordinance and the METI Goods Ordinance).

**[Hypothetical Case 4]**

An illegal export was almost committed because researchers were under the false impression that an export license was not necessary for items that were to be brought back home.

**(Summary)**

Dr. M at the Faculty of Science, Public University O, decided to conduct research into fluctuations in continental interior palaeomagnetism from different geological eras by studying the intensity and direction of faint magnetism remaining in each layer of stratum. He planned to measure slight magnetic anomalies in each layer by bringing a very low noise level, high-performance triaxial flux-gate magnetometer (gradiometer) into Country E, a country that experiences few major crustal movements. However, University O was not equipped with a triaxial flux-gate magnetometer, so Dr. M had to ask Dr. K, a research collaborator at a national university, to let him use the magnetometer in Dr. K’s laboratory. The date of their departure to Country E was approaching, but one day, an administrator in charge of export controls at Dr. K’s university found that the flux-gate magnetometer was controlled under the Export Trade Control Ordinance, Appendix 1, Section 10, “(ix) Magnetometers”, as well as under the specifications of the METI Goods Ordinance, Article 9, Item (xi)(d). The administrator informed Dr. K that he needed to obtain an export license from METI. Dr. M and Dr. K were both surprised that an “export” license was required, because they were planning to bring the magnetometer to Country E in their carry-on baggage, and then bring it back to Japan once they’d completed the survey. They’d been under the impression that they didn’t have to complete export procedures for items that would be brought back to Japan. Dr. K immediately asked his University’s section in charge of handling export licenses to make the application, and he received a license permitting him to bring the triaxial flux-gate magnetometer from Japan to Country E, on condition that he would promptly send the device back to Japan once the survey was complete. If the administrator in charge of export controls had not discovered that an export license was required, Dr. M and Dr.

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K would have unwittingly committed a violation of the Foreign Exchange Act.

**(Practical Advice)**

In very limited circumstances, exports of items that are to be brought back home may be exempt from export license requirements. A typical example is a computer or mobile phone for personal use. In general, even if an item is to be brought back home, if its technical specifications are subject to export controls (i.e., if they are listed in Appendix 1 of the Export Trade Control Ordinance and the METI Goods Ordinance), an export license must be obtained in advance.

## 2. Examples of implicated research fields, including those linked to WMDs

### (1) Scope of security trade controls for research-related exports (list controls and catch-all controls)

The primary purpose of security trade controls is to control the transnational movements of WMDs and conventional weapons. Security trade controls are enforced under national legislation in all countries that are bound by certain international political agreements.<sup>4</sup>

Note 4) At present, international security trade controls are implemented under multinational agreements between countries participating in one of the following four international export control forums, each of which is run by an international body through which participating countries decide by consensus what security trade control regulations they will enforce. All agreements entered into under these international export control forums are enforced under the national legislation of participating countries:

(i) Wassenaar Arrangement (WA)

A multinational effort that regulates security trade controls applying to conventional weapons, including so-called “dual-use goods” (general-purpose items that could be diverted to conventional weapons), equipment used to produce conventional weapons, and the transfer of related technology.

(ii) Australia Group (AG)

A multinational effort that regulates security trade controls applying to biological and chemical weapons (including their raw materials, production equipment, and transfers of related technology).

(iii) Nuclear Suppliers Group (NSG)

A multinational effort that regulates security trade controls applying to items that could be diverted to the development of nuclear weapons (including dual-use goods that could contribute to nuclear weapons programs, production equipment thereof, and transfers of related technology).

(iv) Missile Technology Control Regime (MTCR)

A multinational effort that regulates security trade controls applying to rockets and unmanned aerial vehicles (including dual-use goods that could contribute to their manufacture, production equipment thereof, and transfers of related technology).

For security trade controls to be effective, countries need to control the transnational movements not only of the WMDs and conventional weapons themselves, but also of their components and equipment used in their manufacture. And the transfer of goods is not the only concern: transfers of technology can also contribute to weapons production. This is why countries also need to control the transnational transfer of technology that can be used in the design, production, or use of weapons.

In addition, goods subject to international controls include some that are commonly used by civilians, such as golf clubs, or carbon fiber that can be used for buildings missiles (these goods are generally referred to as “goods for military and civilian uses”, “general-purpose items” or “dual-use goods”). Special attention is therefore required when transferring these kinds of goods overseas. If you mistakenly assume that a commonly used civilian item is not subject to export controls, you may end up committing a serious violation of security trade control laws. In order that your work can continue uninterrupted, all researchers who handle high quality or

high-performance civilian goods are therefore advised to make completely sure that the export of these goods is not restricted under the Foreign Exchange Act.

In “Reference 1”, you can find a table summarizing the scope of these security trade controls. You will generally need to apply to METI for a license under the Foreign Exchange Act when transferring research-related items belonging to any of the categories in the table, or when transferring technology that could be used in the design, production or use of these items (i.e., technical information transferred in the course of international collaborative research, when offering technical assistance, or when accepting interns). As can be understood from the table, the term “list controls” refers to controls on specific goods that have been listed in the legislation.<sup>5</sup>

Note 5) Items that are subject to list controls are listed in Sections 1 to 15, Appendix 1, of the Export Trade Control Ordinance issued under the Foreign Exchange Act. Transfers of technology that are subject to controls are listed in 15 sections in the “Appendix” of the “Foreign Exchange Order” issued under the Foreign Exchange Act. Here are the links from METI’s security trade control website:

Exports of goods, Appendix 1 of the Export Trade Control Ordinance:

<http://www.meti.go.jp/policy/anpo/kanri/sinsa-unyo/gaihihanntei-tejyun/yusyutsu-betsu1/y1-3.htm>

Provisions of technology, Appendix of the Foreign Exchange Order

<http://www.meti.go.jp/policy/anpo/kanri/kankei-horei/ekimu/gaitamerei/main.html#betsuhyou>

However, even when a general-purpose item is not found to match the technical specifications stated on the control lists, depending on the country of the end-user, other controls may apply, and exporters may be required to investigate the export’s proposed end-user and end-use (these include WMD catch-all controls and Complementary Export Control for Conventional Weapons, and shall hereinafter be referred to collectively as “catch-all controls”). If that investigation uncovers any possibility that the export could be diverted to weapons programs, the exporter will be required to apply for an export license.<sup>6</sup>

Note 6) Goods subject to WMD catch-all controls include goods that, although not identified on control lists, are likely to be used in the development, production, use or storage of WMDs (these goods are identified in Appendix 1, Section 16 of the Export Trade Control Ordinance, which includes all goods apart from animals and plants, foodstuffs, wood, etc.). Destinations subject to catch-all controls are all destinations excluding countries that implement strict export controls (so-called “white countries”, which are listed in Appendix 3 of the Export Trade Control Ordinance). Goods controlled under Complementary Export Control for Conventional Weapons are goods that are not identified on control lists but that are likely to be used in the development, production, or use of conventional weapons. Generally, countries that are subject to UN arms embargos are also subject to controls (11 countries and regions, including Iraq, North Korea, and Afghanistan, to which the export of weapons is prohibited under UN Security Council resolutions). Catch-all controls also apply where a prospective exporter is notified that he or she has to apply for an export license from the Minister of Economy, Trade and Industry. Here are the links from METI’s security trade control website.

Overview of catch-all controls:

<http://www.meti.go.jp/policy/anpo/anpo03.html>

List of controlled goods under catch-all controls:

[http://www.meti.go.jp/policy/anpo/law\\_document/tutatu/t07sonota/t07sonora\\_kanzei\\_teiritu.pdf](http://www.meti.go.jp/policy/anpo/law_document/tutatu/t07sonota/t07sonora_kanzei_teiritu.pdf)

Complementary Export Control for Conventional Weapons, Q&A, and Glossary:

[http://www.meti.go.jp/policy/anpo/kanri/qayougo/hokantekiyushutukisei\\_q\\_a/main2.htm](http://www.meti.go.jp/policy/anpo/kanri/qayougo/hokantekiyushutukisei_q_a/main2.htm)

These links provide an overview of the scope of Japan's security trade control system. In order to be able to adapt to the latest controls, it is recommended that universities keep up to speed on the occasional updates that are made to trade control legislation in response to developments in the domestic and international situation. In April 2009, for instance, the Foreign Exchange Act was partially amended to take account of changes in the international security situation. Here is a summary of the revised provisions (see Reference 2):

(i) Revision of technology transfer controls:

All international transfers of technology that is of concern from a security point of view are now subject to the export licensing system. In order to ensure that the new controls can be properly enforced, individuals planning to carry USB memory or similar devices out of Japan in order to provide technical information overseas will require an export license.

→ When international students and researchers who are returning to their home countries intend to carry with them, either as reference materials or as USB memory, information on specific technology that is subject to export controls, they may need to obtain an export license under the Foreign Exchange Act.<sup>7</sup>

(ii) Penalties and compliance:

Heavier penalties shall now be imposed for exporting controlled goods without a license, and new penalties have been introduced for obtaining a license by dishonest means. The revised provisions also outline standards that exporters must follow, such as the duty to designate one individual to take responsibility for determining whether or not the technology to be provided to a foreign institution is subject to export controls. A new mechanism was also established for advising exporters on how they can comply with these standards.

Note 7) The Foreign Exchange Act defines individuals who have their residence in Japan as "residents", and individuals who have their residence abroad as "non-residents". Foreigners who have remained in Japan for at least six months are deemed to be "residents" (see Reference 3): in other words, once they have been in Japan for more than six months, international students and researchers come to be regarded as residents. It is important to note that if these students and researchers wish to provide a foreign institution with a specific technology, the current provisions may require them to obtain a license. In addition, under the revised Foreign Exchange Act, they may also need to obtain a license before bringing USBs or similar memory devices containing information on specific technology out of Japan.

In this chapter, we will focus on how list controls affect research activities. In Chapter 3, we will discuss the ways in which catch-all controls apply to research activities: that is, where it is the end-user and the end-use of the goods or technology in question that comes under examination.

Before we go any further, you should familiarize yourself with the idea of making "applicability

judgments”: that is, determining whether or not the item to be exported or the technology to be transferred overseas is subject to controls under the Foreign Exchange Act (primarily, whether or not the export is subject to list controls). It is also important to note that, even if you determine that a particular export **is subject to export controls, this does not mean that the export is prohibited**. It simply means that the export or transfer can only be carried out under a license granted by METI. Therefore, once you have applied for and obtained this license, **you will be free to proceed with your research**. It is generally unlikely that exports of goods and transfers of technology that are required for the purpose of academic research will be prohibited on security grounds.

(2) Examples of research fields linked to WMDs (list controls)

Mainstream academic fields where research is done that can be linked to WMDs include nuclear power, chemistry, biology and aerospace. However, in Japanese universities, researchers in these fields clearly do not conduct research that bears any direct relation to WMDs. Having said that, some research activities may require them to handle goods that could form part of, or be used in the production of, either WMDs themselves or the technology used in the design, production or operation of WMDs.

We will now give some examples of specific research subjects, from each research field linked to WMDs, where export controls can apply, and we shall also state the relevant legal provisions and legislation in each case.

(i) Nuclear Power:

(a) Legislation related to this research field:

Major legal provisions related to the field of nuclear power include, applying to use and management within Japan, the “Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors”, and the “Act for Prevention of Damage from Radioactive Isotopes”, and applying to transnational exchanges, the “Treaty on the Non-proliferation of Nuclear Weapons”, and several other international agreements. Due attention must be given to the Foreign Exchange Act when exporting goods or technology related to nuclear power for research purposes (see Reference 4).

(b) Examples of research subjects linked to WMDs and applicability judgments

In Annex, 1 you can see an example of a research classification system in the field of nuclear power. Out of this wide range of research subjects, subjects that are generally considered to have the most potential to be diverted to nuclear weapons programs include research that involves equipment that induces or generates nuclear reactions (nuclear reactors), as well as devices and materials used in the production of that equipment, or in uranium enrichment and plutonium separation and extraction. For your reference, we have outlined below some specific examples of research subjects in the field of nuclear power that have the potential to be diverted to nuclear weapons programs along with example judgments.

**[Research Subject Example 1]** Research on excitation schemes of  $^{235}\text{U}$  using dye laser beams

Research field:           Category: Nuclear fuel cycles and materials  
Specialized area: Isotope separation, isotope application, uranium



enrichment

Research subject: Irradiating a plurality of dye laser beams,  $^{235}\text{U}$  is selectively excited among U (uranium) isotopes for photoionization. Ions generated in this way are recovered using an electrode plate, causing  $^{235}\text{U}$  to be enriched.

Potential diversion: This research could be used in the design and development of uranium enrichment equipment to generate highly enriched uranium as a raw material for nuclear weapons.

Judgment Example: Dye laser oscillators are listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item xxxi: “Gas laser oscillators, solid-state laser oscillators, or dye laser oscillators that can be used for the separation of uranium isotopes”. Accordingly, this item will be subject to list controls if its technical specifications correspond to any of the following “specifications” listed in Appendix 1 of the Ordinance of the Ministry Specifying Goods and Technology Pursuant to Provisions of Appendix 1 of the Export Control Order and the Appendix of the Foreign Exchange Order (MEXT Ministerial Ordinance No. 49; hereinafter, “METI Goods Ordinance”), Article 1, Item xxxvi:

“(xxxvi) Gas laser oscillators, solid-state laser oscillators or dye laser oscillators that fall under any of the following:

(a) to (c) (omitted)

(d) Among exciter laser oscillators designed for use within a wavelength range exceeding 240 nanometers and less than 360 nanometers, and designed to generate a pulse, those falling under the following 1 and 2:

1. Oscillators with a pulse repetition frequency exceeding 250 hertz; and
2. Oscillators with an average output exceeding 500 watts.

(e) to (g) (omitted)

(h) Dye laser oscillators designed for use within a wavelength range exceeding 300 nanometers and less than 800 nanometers that fall under any of the following:

1. Variable wavelength laser oscillators emitting a single-mode pulse (excluding equipment that only performs laser beam amplification) that fall under all of the following i through iii:
  - i. Oscillators with a pulse repetition frequency exceeding 1 kilohertz;
  - ii. Oscillators with an average output exceeding 1 watt; and
  - iii. Oscillators with a pulse width less than 100 nanoseconds.
2. Variable wavelength oscillators emitting a pulse that fall under all of the following i through iii (excluding those falling under 1):
  - i. Oscillators with a pulse repetition frequency exceeding 1 kilohertz;
  - ii. Oscillators with an average output exceeding 30 watts; and
  - iii. Oscillators with a pulse width less than 100 nanoseconds.”

Other devices apart from those mentioned above are specified as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item (vii),

“Equipment for the separation of uranium or plutonium isotopes or their auxiliaries, or components (excluding those listed in (xxxi) below)”. If its specifications match any of the following specifications detailed in the METI Goods Ordinance, Article 1, Item (vii), the equipment will be subject to list controls:

“(vii) Equipment for the separation of uranium or plutonium isotopes falling under any of the following, or auxiliaries thereof or components thereof:  
(a) to (e) (omitted)  
(f) Equipment utilizing laser separation methods;  
(g) and (h) (omitted)”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of the goods specified on the control lists.

**[Research Subject Example 2]** Research on dry reprocessing using metal electrolysis processing of spent metal fuel

Research field: Category: Nuclear fuel cycles and materials  
Specialized area: Fuel reprocessing

Research subject: Spent metal fuel is used as an anode to cause the precipitation of uranium. The uranium is recovered and plutonium, etc., are then separated and recovered.

Potential diversion: This technology can be used in the development of equipment to separate and recover uranium and plutonium to be used as raw materials in nuclear weapons.

Judgment Example: Equipment to separate and recover nuclear fuel materials such as uranium and plutonium from spent fuel is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item (v), “Equipment specially designed for the separation or reprocessing of irradiated nuclear fuel materials or nuclear source materials, or components or controllers thereof”. The specifications detailed in the METI Goods Ordinance, Article 1, Item (v) include “Equipment specially designed for the separation or reprocessing of irradiated nuclear fuel materials or nuclear source materials, or components or controllers thereof”. This equipment matches these specifications and is therefore subject to list controls.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of goods specified on the control lists.

**[Research Subject Example 3]** Research on the nuclear properties of hafnium

Research field: Category: Nuclear fission engineering  
Specialized area: Reactor physics, nuclear data, criticality safety

Research subject: Studying the neutron absorption properties of hafnium, and how neutron absorption affects its composition.

Potential diversion: This material can be used in the control rods of nuclear reactors to

produce nuclear fuel materials to be used in nuclear weapons.

Judgment Example: Hafnium is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item (xxiii), “Metals, waste or scraps of hafnium or hafnium alloys, or hafnium compounds, or their primary or semi-finished products”. If its specifications match any of the following specifications detailed in the METI Goods Ordinance, Article 1, Item (xxviii), the export will be subject to list controls:

“(xxviii) Metals, waste, or scraps of hafnium and hafnium alloys (limited to those with a hafnium content exceeding 60% of the total weight) or hafnium compounds (limited to those with hafnium content level exceeding 60% of the total weight), or primary or semi-finished products thereof”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of the goods specified on the control lists.

(c) Interactions with individuals or institutions overseas that may arise in this field

When university researchers conduct research in the subject areas mentioned above, they may, as illustrated by the examples below, be required to interact with individuals or institutions overseas. Therefore, before starting to promote your research, it is essential to determine whether you need to apply for a license under the Foreign Exchange Act.

- Research on excitation schemes of  $^{235}\text{U}$  using dye laser beams:  
If the research forms part of an international collaborative project, or if the researcher plans to have a laser beam manufactured overseas, the research collaborators or the foreign manufacturer may need to be provided with the design specifications of controlled items or reference materials describing enrichment technology (technology used in separation equipment).
- Research on the nuclear properties of hafnium:  
Researchers developing hafnium control rods to improve the operation of nuclear reactors may need to provide design information or materials to collaborators abroad, or to an institution abroad that operates a nuclear reactor facility, in order to have prototype materials irradiated.
- Research into the development of next-generation fuel:  
When conducting research into new fuel materials that can be used to develop the next-generation of nuclear reactors, in order to investigate fuel properties, researchers may need to have experiments done at nuclear reactor facilities located overseas. This may require them to provide overseas collaborators, manufacturers and nuclear reactor operators with controlled materials, or information detailing their design.

(ii) Aerospace:

(a) Legislation related to this research field:

Major legal provisions related to the aerospace field include, applying to use and management within Japan, the “Civil Aeronautics Act” and the “Aircraft Manufacturing Industry Act”, and applying to transnational interactions, treaties such as the “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies” (Outer Space Treaty) and several other international agreements. The Foreign Exchange Act may apply when exporting goods or technology related to aerospace for research purposes (see Reference 5).

(b) Examples of research subjects linked to WMDs and applicability judgments

In Annex 1, you can see an example of a research classification system in the field of aerospace. Out of this wide range of research subjects, subjects that are generally considered to have the most potential to be diverted to nuclear weapons programs include research in the fields of aerodynamics, structural dynamics, materials, control engineering and propulsion engineering. For your reference, we have outlined below some specific examples of research subjects in the field of aerospace that have the potential to be diverted to missile programs along with example judgments.

**[Research Subject Example 1]** Research on a method for producing carbon fiber reinforced carbon (C/C composite)

- Research field:           Category: Structural dynamics / materials  
                                  Specialized area: high-temperature resistant materials
- Research subject:       Carbon fiber can be used to reinforce inorganic or organic materials, in order to produce a higher performance composite with improved dynamic and functional properties.
- Potential diversion:   Carbon fiber-reinforced carbon (C/C composite) is an ultra high-temperature resistant material. So when incorporated in the nozzle component of rocket motors for missile propulsion, the propulsion system’s performance can be dramatically enhanced.
- Judgment Example:   Composite that can be used in rockets is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 4, (xv), “Structural materials listed below that can be used in rockets or unmanned aerial vehicles: (1) Composites or their molded products; 2 to 5 (omitted)”. If its specifications match the following specifications detailed in the METI Goods Ordinance, Article 3, Item (xvi), the materials will be subject to list controls:  
                                  “(xvi) Structural materials falling under any of the following:  
                                  (a) (Omitted)  
                                  (b) Composites using carbon and carbon fibers designed for rocket use or molded products thereof (limited to those usable in rockets capable of transporting payloads for 300 kilometers or more, or unmanned aerial vehicles capable of transporting payloads weighing 500 kilograms or more for 300 kilometers or more);  
                                  (c) to (h) (omitted)”

Even if the materials in question do not match these specifications, exporters still need to determine whether they fall subject to any of the other provisions in the METI Goods Ordinance. For example, whether the

export includes prepreg or molded products as structural materials capable of use for gas centrifuge rotors, controlled under Article 1, Item (xxii); molded products that use fibers, controlled under Article 4, Item (ii); or fibers, prepregs or preforms that use the fibers, controlled under Article 4, Item (xv).

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of the goods specified on the control lists.

**[Research Subject Example 2]** Research for designing and making prototypes of flying objects using carbon-fiber-reinforced resin composite.

Research field: Category: Structural dynamics/ materials  
Specialized area: Composite dynamics

Research subject: Carbon-fiber-reinforced resin composite (CFRP) is used to design and make prototypes of the flying object's body in order to minimize its weight.

Potential diversion: High-performance composite base materials can be used to make flying objects such as missiles as light as possible, enabling them to carry bigger mounted objects (e.g., warheads) and to fly over a greater range with more fuel on board.

Judgment Example: As in Example 1, composites that can be used in rockets are listed as "goods" in Appendix 1 of the Export Trade Control Ordinance, Section 4, (xv), "Structural materials listed below that can be used in rockets or unmanned aerial vehicles: (1) Composites or their molded products; 2 to 5 (omitted)". If their specifications match the following specifications detailed in the METI Goods Ordinance, Article 3, Item (xvi), the materials will be subject to list controls:

- "(xvi) Structural materials falling under any of the following:
- (a) Composites (excluding prepregs with glass transition points of 145 degrees centigrade or less) made from organic substances reinforced with fibers with specific strength exceeding 76,200 meters and specific elastic modulus exceeding 3,180,000 meters or those with metal in the matrix phase, or molded products thereof (limited to those designed for use in rockets capable of transporting payloads weighing 500 kilograms or more for 300 kilometers or more, goods falling under item (ii)(a) (limited to those usable in rockets capable of transporting payloads weighing 500 kilograms or more) or goods falling under item (ii)(b));
  - (b) (c) to (h) (omitted)".

Even if the materials in question do not match these specifications, exporters still need to determine whether they fall subject to any of the other provisions in the METI Goods Ordinance. For instance, whether the export involve prepreg or molded products as structural materials capable of use for gas centrifuge rotors, controlled under Article 1, Item

(xxii); molded products that use fibers, controlled under Article 4, Item (ii); or fibers or prepregs or preforms that use the fibers, controlled under Article 4, Item (xv).

Similarly, exporters wishing to export flying objects that function as rockets or unmanned aerial vehicles (Appendix 1 of the Export Trade Control Ordinance, Section 4, Items (i) and (i)-2) must determine whether the technology matches the specifications detailed in the METI Goods Ordinance, Article 3, Item (i) and (i)-2.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of the goods specified on the control lists.

(c) Interactions with individuals or institutions overseas that may arise in this field

University researchers conducting research in the subject areas mentioned above may, as illustrated by the example below, be required to interact with individuals or institutions overseas. Therefore, before starting to promote your research, it is essential to determine whether you need to apply for a license under the Foreign Exchange Act.

•When carrying out research on composite or heat-resistant materials as part of an international collaborative research project, researchers may need to provide collaborators with test pieces (samples), including test pieces of carbon-fiber-reinforced carbon composite. They may also need to export materials in order to have tests performed overseas (such as performance tests on carbon-based heat-resistant materials using high-efficiency arc wind tunnels).

(iii) Chemistry

(a) Legislation related to this research field:

There are more than fifty acts and regulations that apply to the field of chemistry. Major legal provisions include, applying to use and management within Japan, the “Poisonous and Deleterious Substances Control Act” and the “Pharmaceutical Affairs Act” which deal with hazard prevention and safety; the “Explosives Control Act” and the “Fire Service Act” which deal with hazard prevention; and the “Chemical Substances Release and Management Act (PRTR Act)” which deals with environmental protection. In addition, there is the “Chemical Substances Evaluation Act” and the “Hazardous Wastes Export Import Control Act”, which also regulate interactions with individuals and institutions overseas. The Foreign Exchange Act may apply when exporting goods or technology related to chemistry for research purposes (see Reference 6).

Many universities have recently started introducing chemical management systems that incorporate substance databases. These databases allow universities to ensure that chemical materials are managed and handled effectively and efficiently and in compliance with all applicable laws. Universities have a duty to strictly implement the Foreign Exchange

Act, while making sure that chemical substances are handled in the prescribed manner and increasing awareness of compliance issues among faculty members.

(b) Examples of research subjects linked to WMDs and applicability judgments

The field of chemistry incorporates a very wide range of subjects, including physical chemistry, inorganic chemistry, organic chemistry, biological function related chemistry and biotechnology, polymer chemistry and materials chemistry. Chemistry also involves a wide variety of applied research. This makes it difficult to provide examples of typical research classification systems in this field.

In addition, it is generally unlikely that researchers in this field will choose to conduct research into a specific chemical substance which we already know how to produce (including substances that constitute the raw materials of chemical agents for chemical weapons). Researchers are also unlikely to need to exchange goods related to these chemical substances with individual or institutions overseas. Considering these circumstances, it is not easy to come up with examples of academic research subjects in this field that can be considered to have a relatively high potential to be diverted to research related to chemical weapons. Having said that, special attention should be given to the field of applied chemistry where certain chemical substances are used that can also be used in the production of chemical weapons, or where these substances are produced as a by-product (i.e., where their production is not the primary purpose of the research). Accordingly, an export license may be required under the Foreign Exchange Act when researchers wish to bring substances they have produced which contain controlled substances out of Japan, when they wish to present to research collaborators overseas a novel method for synthesizing chemicals which produces a controlled chemical as a by-product, or when a foreign researcher who has visited Japan wishes to bring a superior piece of research equipment (production equipment, etc.) with him or her upon returning home.

Under the Foreign Exchange Act, an export license must be obtained before exporting substances that can be used as raw materials for military chemical warfare agents (listed in Annex 3), or when providing technology that can be used in the design, production or use of these substances. In addition, equipment that can be used in the production of military chemical warfare agents and their components (reactors, storage vessels, heat exchangers, pumps, etc.), and which matches the prescribed specifications, is also subject to export controls. Therefore, when handling these chemical substances and equipment, all researchers who interact with individuals and institutions overseas in the course of international collaborative research projects, etc., need to give careful consideration to whether export controls apply.

(iv) Biology

(a) Legislation related to this research field:

Major legal provisions related to the field of biology and which apply to use and management within Japan include the “Act Concerning Prevention of Infection of Infectious Diseases and Patients with Infectious Diseases”, the “Act on Domestic Animal Infectious Diseases Control”, and the “Act on the Conservation and Sustainable Use of Biological

Diversity through Regulations on the Use of Living Modified Organisms” (Cartagena Act). Transnational exchanges are regulated under the “Quarantine Act”. The Foreign Exchange Act may apply when exporting goods or technology related to biology for research purposes (see Reference 6).

(b) Examples of research subjects linked to WMDs and applicability judgments

Research subjects in the field of biology that are likely to fall subject to export controls are identified by subject area, such as bacteria, viruses and toxins. Out of this wide range of research subjects, the area that is considered to have the most potential to be diverted to biological weapons programs is that involving the use of living organisms, toxins, or their genes as raw materials for bacterial agents. For your reference, we have outlined below some specific examples of research subjects in the fields of biology, pharmacy, medicine and biochemistry that have the potential to be diverted to biological weapons programs along with example judgments.

**[Research Subject Example 1] Research on Bacillus anthracis**

- Research field: Category: Bacteriology  
Specialized area: Bacillus anthracis
- Research subject: Research on spores of Bacillus anthracis includes research on the pathogenicity of Bacillus anthracis; research on vaccines for Bacillus anthracis; and research on diagnostic methods for anthrax.
- Potential diversion: This research can be diverted to the production of biological weapons where spores of Bacillus anthracis are processed into a form that can easily be aerosolized, enabling them to be sprayed and trigger pulmonary anthrax. In 2001, in the U.S., several postal packages were laced with Bacillus anthracis spores. This caused 22 cases of anthrax, 11 of which were pulmonary anthrax (5 fatalities), and 11 of which were skin anthrax.
- Judgment Example: Bacillus anthracis is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 3-2, Item (i), “Organisms or toxins, or their subunits or genes used as raw materials for military bacterial agents and defined by the Ordinance of the Ministry of Economy, Trade and Industry”, and in the the METI Goods Ordinance, Article 2-2, Paragraph 1, Item (ii), “Bacteria (excluding vaccines): Brucella abortus, ..., Bacillus anthracis, ...”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of goods specified on control lists.

**[Research Subject Example 2] Research on the botulin toxin**

- Research field: Category: Research on toxins  
Specialized area: Botulin toxin
- Research subject: Research on the botulin toxin includes research on the structure and function of the botulin toxin, research on defensive methods against the botulin toxin, research on the development of a rapid detection system



for the botulin toxin, and research on treating the botulin toxin.

Potential diversion: This research can be diverted to the production of biological weapons where *Bacillus botulinus* is cultured to purify the toxins, which are then mixed with drinking water and foodstuffs, killing those who consume them. The botulin toxin is extremely toxic. In 1995, in Iraq, in excess of 20,000 liters of the botulin toxin was found and discarded. The Aum Shinrikyo Cult that used to operate in Japan is also reported to have been studying this toxin.

Judgment Example: The botulin toxin is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 3-2, Item (i), “Organisms or toxins, or their subunits or genes used as raw materials for military bacterial agents and defined by the Ordinance of the Ministry of Economy, Trade and Industry”, and in the METI Goods Ordinance, Article 2-2, Paragraph 1, Item (iii), “Toxins (excluding immunotoxins): aflatoxin, ..., botulin toxin, ...”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of goods specified on control lists.

(c) Interactions with individuals or institutions overseas that may arise in this field

Researchers involved in, for example, international collaborative research may need to export virus samples as part of their research results. In order to create an identical research environment, they may also need to provide collaborators overseas with goods including bioreactors (for culturing pathogens; fermenters), centrifuges (for enriching pathogens), and freeze dryers (for drying pathogens into powder).

Under the Foreign Exchange Act, an export license must be obtained before exporting living organisms, etc., that can be used as raw materials for military bacterial warfare agents (as listed in Annex 4), or when providing a technology that can be used to design or produce these organisms. Export controls also apply to equipment that matches particular specifications and that can be used to produce or spray military bacterial warfare agents or their components (including fermenters, centrifuges, freeze dryers, and spray/ fog generators).

It is therefore essential that all researchers who will handle these chemical substances or this equipment as part of international activities such as collaborative research projects determine whether or not they need to apply for an export license under the Foreign Exchange Act.

(3) Examples of research subjects linked to weapons other than WMDs (conventional weapons) and applicability judgments (list controls)

As we explained under “(1) Scope of security trade controls for research-related exports (list controls and catch-all controls)”, in addition to WMDs, conventional weapons are also subject to list controls. We will now present some examples of research subjects that may be linked to conventional weapons and may therefore fall subject to export controls.

(a) Legislation related to this research field:

There are several acts and regulations that apply to specific research fields that may be linked to the production of conventional weapons. We will not enter into detailed explanations here, but, to mention a few examples of acts which control day-to-day research activities, the “Radio Act” and the “Telecommunications Business Act” regulate telecommunications, the “Industrial Safety and Health Act” regulates the working environment, and the “Copyright Act” (concerning computer program copyrights) regulates software. The Foreign Exchange Act may apply when exporting goods or technology related to the following fields of research.

**[Research Subject Example 1]** Research on high-resolution infrared imaging systems

- Research field: Category: Precision engineering, information engineering  
Specialized area: Photoelectric properties, image processing, image recognition
- Research subject: Includes research on imaging reinforcing tubes for high-resolution near-infrared light using gallium arsenide or indium gallium arsenide; and research on imaging devices or image recognition devices that use these imaging reinforcing tubes for near-infrared light.
- Potential diversion: This research can be diverted to producing conventional weapons such as night vision devices for nocturnal combat.
- Judgment Example: Imaging reinforcing tubes for high-resolution near-infrared light are listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 10, Item (ii), “Optical detectors or their coolers, or components for such detectors or coolers, or equipment using optical detectors”, and in the METI Goods Ordinance, Article 9, Paragraph 1, Item (iii), “Optical detectors or components thereof” that fall under “(b) Image reinforcing tubes”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of these goods specified on control lists.

**[Research Subject Example 2]** Research on high-performance piezo-ceramic oscillators for sonar

- Research field: Category: Precision engineering  
Specialized area: Sensor engineering, functional materials
- Research subject: Includes research on how to improve the threshold of polarization-inverted electric fields in piezo-ceramics and prevent piezoelectric constant reduction under hydrostatic pressure exceeding 10 MPa (approx. 100 atmospheres), and research on, and building prototypes of, composite piezo-ceramic oscillators for sonar that can be operated under these conditions.
- Potential diversion: This research can be diverted to the development of conventional weapons such as sonar, sea mines and torpedoes.
- Judgment Example: The piezo-ceramic oscillator is listed as “goods” in Appendix 1 of the Export Trade Control Ordinance, Section 10, Item (i), “Underwater detection equipment utilizing sound waves, equipment for determining

the position of vessels, measuring equipment for the speed over ground of vessels, or their components”, and in the METI Goods Ordinance, Article 9, Paragraph 1, Item (i), “(a) Those having a transmission function or components thereof”, “2. Underwater acoustic equipment” which falls under “v. Underwater acoustic equipment which is designed for use at depths exceeding 1,000 meters”.

Export controls under the Foreign Exchange Act also apply to the transnational provision of any technology that can be used in the design, production or use of these goods specified on control lists.

(b) Interactions with individuals or institutions overseas that may arise in this field

University researchers conducting research in the subject areas mentioned above may be required to interact with individuals or institutions overseas as part of collaborative research projects or other international activities. In this field, it is particularly common to find goods that are primarily for civilian use fall subject to export controls. It is therefore essential that researchers make an accurate determination as to whether they need to apply for a license under the Foreign Exchange Act.

### 3. Cases where the end-user and end-use of goods or technology are subject to advance screening

- (1) Investigating the end-user and end-use (catch-all controls: procedures for general-purpose items that are not subject to list controls)

As we explained in Chapter 2, researchers who wish to export goods or technology identified on control lists are required to apply for a license under the Foreign Exchange Act. However, depending on the destination country, there are some cases where catch-all controls apply, and exporters may also be required to obtain a license before exporting or providing goods or technology even if they do not fall subject to list controls. In such cases, even when exporting a non-controlled general-purpose item, the exporter will be required to verify the item's proposed end-user and end-use. If it is deemed likely that the export will be used in the development, manufacture, and use of weapons,<sup>8</sup> the exporter will be required to obtain a license before proceeding with the export. METI runs a useful website on security trade controls. All researchers thinking of making an export should visit this site and carefully read through the explanations it provides regarding catch-all controls. Catch-all controls only apply to exports to countries other than those that implement strict export controls (the so-called "white countries" which are listed in Appendix 3 of the Export Trade Control Ordinance)<sup>9</sup>, so **the easiest way to find out whether controls apply is to check whether the end-user's country is one of the white countries.**

Note 8) The judgment as to whether or not the goods or technology in question are likely to be used in the development, manufacture, or use of weapons is reached by determining whether the end-user and end-use meet any of the conditions specified by the relevant Ministerial Ordinances.

Regarding the end-user:

If there is evidence that **the end-user of the goods to be exported "carries out the development, etc. of nuclear weapons, etc."** or "**has carried out the development, etc. of nuclear weapons, etc.**", it will be deemed likely that the goods in question will contribute to nuclear weapons and other weapons programs, and **it will therefore be necessary to apply for a license**. Possible sources of such evidence include,

- (i) Documents that the exporter has received, such as agreements, pamphlets, and catalogs, or documents that the exporter has been witness to;
- (ii) Information received from the importer or end-user; and
- (iii) Documents prepared by METI (the Foreign End User List).

Regarding the end-use:

**If there is evidence that the goods to be exported are to be used in "the development, etc. of nuclear weapons, etc."**, it will be necessary to apply for a license. Possible sources of such evidence include,

- (i) Descriptions in agreements, or other documents that the exporter has received; and
- (ii) Information received from the importer or end-user.

Note 9) Check this URL to see a list of the "white countries":

<http://www.meti.go.jp/policy/anpo/kanri/catch-all/bepyoudai3nokuni.htm>

- (2) Examples of goods and research subjects that are very closely linked to the development of weapons (specific examples of items subject to catch-all controls)

There are some general-purpose items with specifications that are not subject to list controls but which are identified on METI's list of 40 items that are of particular concern due to their potential use in WMD programs (see Reference 7).<sup>10</sup> Particular attention is therefore required when exporting any of the items on this list as they may fall subject to catch-all controls.

Note 10) Visit the following URL to see this list, entitled "Examples of goods that are highly likely to be used in the development, etc. of WMDs" (40 items):

[http://www.meti.go.jp/policy/anpo/law\\_document/tutatu/t04shinsei/t04shinsei\\_heikikamoturei.pdf](http://www.meti.go.jp/policy/anpo/law_document/tutatu/t04shinsei/t04shinsei_heikikamoturei.pdf)

With regard to exports that may be diverted to the development of conventional weapons, as a rule, destinations subject to control are those countries that are under UN arms embargos (11 states and regions to which UN Security Council resolutions forbid the export of weapons, including Iraq, North Korea and Afghanistan) (see Chapter 2 (1), Note 6)).

### **[Research Subject Example 1]**

Research field: Category: Precision engineering, control engineering, electric power engineering  
Specialized area: Electric equipment engineering

Research subject: Includes research on precise velocity control of synchronous induction electric motors and research on measures against deviated interphase load variation in three-phase AC transmissions.

Related items: Frequency changers  
Names and technical specifications of frequency changers are listed in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item (viii), and in the METI Goods Ordinance, Article 1, Item (viii). If the goods or technology in question correspond to these specifications, list controls will apply. If not, the exporter must refer to Appendix 1 of the Export Trade Control Ordinance, Items in Section 16 (Catch-All Controls) in order to determine whether catch-all controls apply.

Typical examples of related technology: High-frequency distortion reduction technology, frequency control stabilizing technology.

Relation to weapons: This technology can be incorporated into equipment that supplies AC power of the right frequency to run high-speed electric motors that drive a centrifuge for uranium enrichment to produce enriched uranium to be used in nuclear weapons.

### **[Research Subject Example 2]**

Research field: Category: Precision engineering, mechanical engineering, electronic engineering  
Specialized area: Not otherwise specified.

Research subject: This field involves, for example, research on vehicle suspension systems, research on the mechanical properties of anti-vibration rubber (or elastomer), and research on packaging technology for electronic components.

Related items: Vibration test equipment  
Names and technical specifications of vibration test equipment are listed in Appendix 1 of the Export Trade Control Ordinance, Section 2, Item (xvi), and in the METI Goods Ordinance: Article 1, Item (xxi); Appendix 1, Section 4, Item (xxiv); and Article 3, Item (xxv). If the goods or technology in question correspond to these specifications, list controls will apply. If

not, the exporter must refer to Appendix 1 of the Export Trade Control Ordinance, Items in Section 16 (Catch-All Controls) in order to determine whether catch-all controls apply.

Typical examples of related technology: Digital control technology, excitation force improvement technology, etc.

Relation to weapons: This technology can be incorporated into equipment such as vibration generators, which are used to test components of nuclear explosive devices by replicating the vibrational environment at the moment of launch. It can also be used in the development and testing of rockets and unmanned aerial vehicles.

### **[Research Subject Example 3]**

Research field: Category: Precision engineering, materials science, polymer engineering  
Specialized area: Not otherwise specified.

Research subject: This field involves research on the reduction of residual stress in molding carbon-fiber-reinforced resin composite (CFRP) thin plates, research on technology for fabricating CFRP plates (in particular, bonding techniques), research on technology for producing carbon fibers, and the development of technology for spinning and weaving carbon fibers.

Related items: Composite materials using carbon fibers  
Names and technical specifications of composite materials using carbon fibers are listed in Appendix 1 of the Export Trade Control Ordinance, Section 4, Item (xv), and in the METI Goods Ordinance: Article 3, Item (xvi)(b); Appendix 1, Section 5, Item (xviii); and Article 4, Item (xv)(b). If the goods or technology in question correspond to these specifications, list controls will apply. If not, the exporter must refer to Appendix 1 of the Export Trade Control Ordinance, Items in Section 16 (Catch-All Controls) in order to determine whether catch-all controls apply. (However, it is important to note that molded products, or prepreg and other materials incorporating this technology, may be listed elsewhere.)

Typical examples of related technology: Lightning technology, technology to improve heat-resistance and thermal shock properties, etc.

Relation to weapons: These materials can be used in aircraft skin and, as structural materials for rockets, in the nozzles of rocket motors, in the nose of re-entry vehicles, and in other heat protection components.

### **[Research Subject Example 4]**

Research field: Category: Precision engineering, Control engineering  
Specialized area: Not otherwise specified.

Research subject: Research on attitude control (artificial semicircular canal) in humanoid robots, research on anti-skid mechanisms for vehicles, research on standalone car navigation systems.

Related item: Gyroscopes  
Names and technical specifications of gyroscopes are listed in Appendix 1 of the Export Trade Control Ordinance, Section 4, Item (xvi); and in the METI Goods Ordinance: Article 3, Item (xvii); Appendix 1, Section 11, Item (ii), and Article 10, Paragraph 1, Item (ii). If the goods or technology in question correspond to these specifications, list controls will apply. If not, the exporter must refer to Appendix 1 of the Export Trade Control

Ordinance, Items in Section 16 (Catch-All Controls) in order to determine whether catch-all controls apply.

Typical examples of related technology: Output stabilizer technology, etc.

Relation to weapons: This technology can be mounted in missile guidance systems or flight control systems with an accelerometer to measure the direction of velocity. It may also be used in automatic pilot systems, navigation equipment, and so on.

(3) End-users suspected to be involved in WMD programs (institutions on the Foreign End User List)

Even general-purpose items that are not subject to list controls cannot be assumed to be risk-free, since if they should fall into the hands of someone involved in WMD programs, they could end up being used for weapons development. Exporters therefore need to exercise a lot of caution. To help them make a judgment, METI has provided exporters with the “Foreign End User List” (see Reference 8), which identifies institutions abroad and fields of research that are suspected to be involved in the development, manufacture and use of WMDs. As of September 3<sup>rd</sup>, 2010, the list names a total of 331 institutions in nine countries including North Korea, Iran, Pakistan and India.<sup>11</sup> Unless it is obvious that there is no risk of involvement with WMD programs, researchers are required to obtain a license from METI before conducting research with any of these institutions, and before providing them with goods or technology. As we can see, exporters need to pay particular attention when working with any of these institutions.

Note 11) To see the names of specific institutions, etc., consult the “Foreign End User List”, which is accessible via the “Search by Keyword” section of METI’s security trade control website. Check the following URL :

<http://www.meti.go.jp/policy/anpo/law05.html#gaikokuuserlist>

Even **if the end-user is a “university” or “research institution”, exporters should still be very careful, as a license may be required before providing goods or technology to any of the institutions listed on the Foreign End User List.** As illustrated below, the list actually includes universities, research institutions, hospitals, and more. In addition, universities need to exercise just as much caution when accepting researchers or international students from any of these institutions and when providing them with certain technology. The Foreign End User List is occasionally revised to reflect the evolving situation in Japan and around the world, so universities in Japan are expected to keep track of these revisions so that they can make judgments based on the latest requirements.

Table 3-1 Some universities, research institutions, and other institutions listed on the Foreign End User List (excerpt)

(As of September 3<sup>rd</sup>, 2010)

Country	Name of Institution
Iran	Amirkabir University of Technology [M,N], Educational and Research Institute (ERI) [M], Jaber Ibn Hayan Research Laboratories [N], Sharif Technical University [M,N], Tarbiat Modares University [B,C], Tehran University [B,C,N], etc.
North Korea	Kanggye Defense College, Physics Department [N], Kim Cheaek University of Technology [B,C,M,N], Kim Il Sung University [N], Korea Red Cross Hospital [B,C,M,N], etc.

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China	Beijing University of Aeronautics and Astronautics (BUAA) [M], Northwestern Polytechnic University [M], etc.
Pakistan	Quaid-I-Azam University (QAU) [N], Pakistan Institute of Engineering & Applied Sciences [N], etc.

The letters in square parentheses ([ ]) represent the category of concern. “B” is biological weapons, “C” is chemical weapons, “M” is missiles, and “N” is nuclear weapons.



#### **4. Steps exporters should take when they think an item may be subject to export controls**

Before attempting either to export goods or to provide a service transnationally, the faculty member who is directly involved in the research (hereinafter, “you”) is advised to check whether or not the transfer in question is subject to export control legislation. If your university does not have its own export control manuals or reference materials, you are recommended to check METI’s security trade control website (<http://www.meti.go.jp/policy/ampo/index.html>), where you can access the **“Goods and Technology Matrix”**. **This matrix has a useful Excel version that has search function.** If you can access it, the **“Reference Classification for Applicability Judgment (Compass)” (divided into “Compass for Goods”<sup>12</sup> and “Compass for Technology”<sup>13</sup>)**, available on the old version of the website, **is another resource that can help you determine whether controls may apply, although you should be aware that this list does not incorporate recent revisions to the Order and Ministerial Ordinances.** If, having consulted these resources, you determine that your export is likely to be subject to export control legislation, you should proceed to follow the steps outlined in 1 (if your university has a system for security trade control) or 2 (if it does not) below.

Note 12) Check the following URL:

[http://www.meti.go.jp/policy/ampo/kanri/gaihi/tsuri/gaihi\\_1.htm](http://www.meti.go.jp/policy/ampo/kanri/gaihi/tsuri/gaihi_1.htm)

Note 13) Check the following URL:

[http://www.meti.go.jp/policy/ampo/kanri/gaihi/ekimu\\_tsuri/gaihi\\_1.htm](http://www.meti.go.jp/policy/ampo/kanri/gaihi/ekimu_tsuri/gaihi_1.htm)

**In addition, it is the person who is providing the research-related goods or technology to an institution overseas who is legally responsible for determining whether or not it is necessary to apply for a license. If the export forms part of university-based research activities, then it is the university to which the researcher belongs that is responsible for making this determination.** If a researcher or his or her university inadvertently violates the Foreign Exchange Act, **they cannot defend themselves on the grounds of ignorance.** Exporters should therefore be very careful when deciding whether export controls apply.

(1) When the exporter’s university or institution has implemented an effective security trade control support system

First, you should seek advice from the university office that is in charge of export control. If your university has its own procedures for approving provisions of goods or technology to universities or companies overseas, follow these procedures and consult with the office as and when necessary. When consulting with the office, be prepared to provide detailed information including the proposed end-user’s name, country and primary field of work, and to account for how the end-user will use the goods or technology in question. The office in charge of export controls will carefully review the information you have provided to determine whether or not the proposed export or transfer is subject to export-control legislation. If they find that it is, you will be required to apply to METI for a license.

Again, it is important to note that **security trade controls under the Foreign Exchange Act do not prohibit the export of controlled items: they simply require the exporter to obtain a license before exporting these items.** The fact that a license is required in order to export certain goods or technology should not deter exporters from trying to send the item in question to an overseas university or company. Whether or not a license can be granted will be determined

according to the following criteria:

- (i) Whether it is probable that the goods or technology will actually reach the proposed end-user;
- (ii) Whether it is probable that the end-user identified in the application will be the one to actually use the goods or technology provided;
- (iii) Whether it is probable that the goods or technology provided, as well as any goods to be produced using the technology provided, will be used in a way that could pose a threat to international peace and security; and
- (iv) Whether it is probable that the goods or technology provided will be managed properly by the end-user.

The specific details of each application — for instance, whether or not the end-user is listed on the Foreign End User List, or the particular specifications of the goods or technology to be provided — will of course give rise to different determinations. This is why it is important to provide **your university's export control office with the most accurate information possible.** One detail can make all the difference in determining whether or not you will need to apply for a license from METI. Also, once the license has been granted, you can go to this same office to get help completing your customs declaration. Making a little extra effort to gather all the relevant information in the early stages will help you establish a good relationship with the export controls office, a relationship that will be useful to help you through subsequent export procedures.

(2) When the exporter's university or institution does NOT have an effective security trade control support system

If this is the case, you will almost certainly have much more to do, as you will have to take care of all export control procedures yourself, including submitting the application to METI. Having said that, if you follow the right steps you shouldn't encounter too many difficulties. You may also be able to find a freight forwarding company that can take care of certain parts of the process for a commission. However, it is important to note that, even when it is the individual exporter who takes charge of export procedures, the university is still legally responsible for ensuring that export control legislation is complied with and that all necessary applications to METI are submitted.

The first step is to consult with the university office in charge of research support (social collaboration), and explain that you need to send goods to a foreign country for research purposes. In general, even aside from any controls under the Foreign Exchange Act, any proposed transfer of university equipment needs to be authorized by the university office in charge of supplies and property management (or financial affairs). You should therefore discuss details of your plans with this office, and find out what authorization procedures your university has in place regarding security trade control exports under the Foreign Exchange Act.

Once you've consulted with and received authorization from that office, you can start taking steps in preparation for export. It is vital that you start by **thoroughly reviewing the specifications of the goods or technology to be exported to find out what legislation applies.** To do so, it can be useful to refer to the above-mentioned "Goods and Technology Matrix" and "Compass" resources. These tools are a little complicated to use, but it shouldn't take too long to find out whether there are any restrictions in place on sending the goods or

technology in question to a foreign country.

To make a quick and accurate determination, go through these steps in the following order:

- (i) **Check if the goods or technology in question are listed on the control lists (see Chapter 2).**  
If yes, unless your export is subject to an exemption, you will need to apply for a license. List controls generally apply to the kind of high specification (high spec) goods and technology that are relatively easily diverted to military use, and which are not widely used in university research. Having said that, **you still need to take care to make an accurate determination.**
- (ii) **If not, check if the end-user's address (domicile) is in one of the "white countries".**  
If it is, you don't need to apply for a license.
- (iii) **If your export is not listed on the control lists, but the end-user's address (domicile) is not in one of the "white countries", check if the end-user is listed in the "Foreign End User List" explained in Chapter 3, Part 3.** If you find the end-user's name in the Foreign End User List, your export is highly likely to be subject to WMD catch-all controls (see Chapter 3). In particular, it is essential to apply for a license when the "category of concern" that the Foreign End User List assigns to the end-user in question covers the proposed use of the goods or technology you are providing. In addition, please check carefully to see whether your export includes goods or technology listed as "examples of goods that are highly likely to be used in the development of WMDs (40 items)", as explained in Chapter 3, Part 2.
- (iv) Even if, on the basis of Step 3, a license application does not seem necessary to export to the end-user in question, **it is still necessary to understand the nature of the end-user's activities, and to determine whether they may have any connections to military-related institutions or military programs.** If you have any suspicions that the end-user may be involved in any way in the development of WMDs, you will need to apply for a license.
- (v) Even if, on the basis of Step 4, you determine that the end-user poses no threat, in order to be sure whether or not the export is subject to WMD catch-all controls, you now need to verify how the items you are providing are going to be used. In addition, if the end-user is in a **state or region that is subject to a UN arms embargo, you will need to carry out an additional review to determine whether the goods or technology you are providing are likely to be used in the development, production or operation of conventional weapons.** If yes, you will need to apply for a license.
- (vi) Finally, even if, on the basis of Step 5 above, you have determined that you do not need to apply for a license, **check whether METI has sent you a special notice concerning the export of the goods or technology in question.** If yes, you will need to apply for a license.

Figure 4-1 illustrates these steps in a flowchart. If, after going through these steps, you realize that the goods or technology you plan to provide to an overseas institution or non-resident individual (i.e., an international student or visiting foreign researcher) for research purposes is subject to export controls, you will need to obtain a license from METI before proceeding. However, you will not need to apply for a license if your export is a technology (service) that is already in the public domain (that is accessible to more than a small group of people). Export control legislation also contains several special provisions that exempt encryption technology

from the license requirement (see the Ministerial Ordinance on Trade Relation Invisible Trade, etc., commonly known as the “Invisible Trade Ordinance”). As for the provision of goods, the legislation also allows for some exemptions for small-sum transactions (see the Export Trade Control Ordinance). These exemptions are explained in the “Security Trade Control Guidebook” (published by Associate Professor Yukiko Shinya, University of Tsukuba), which is included at the end of the “Guidelines for Establishing and Practicing a Voluntary Control System for Security Trade”. We recommend that you look through these resources carefully. In addition, Table 4-1 summarizes how to approach the tricky area of controls that apply to international students and visiting foreign researchers.

It is important to note that, when applying for a license, the documents you need to submit and the office to which you need to submit them may differ depending on which parts of the legislation your export is covered by. For details, visit the Security Trade Control Policy Division website and select “Application Flow” under “Application Procedures”. You can then select “Specific License Application”, and open “Documentation and Receiving Offices (Goods)” and “Documentation and Receiving Offices (Technology)”.<sup>14</sup>

Note 14) The specific URLs are as follows:

For goods:

<http://www.meti.go.jp/policy/ampo/sinseimadoguti.html>

For technology:

[http://www.meti.go.jp/policy/ampo/sinseimadoguti\\_ekimu.html](http://www.meti.go.jp/policy/ampo/sinseimadoguti_ekimu.html)

Table 4-1 Controls applying to international students and visiting foreign researchers

Recipient		Residency Status	Technology (Service)	Materials/ Equipment (Goods)
Before entry	Less than 6 months	Non-resident	Faculty member (Resident) ⇒ Student, Researcher, Other. (Non-resident) <b>Controlled*</b>	Japan ⇒ Foreign country  Regardless of the residency of the exporter, all exports (movements) of goods from Japan to a foreign country are <b>Controlled*</b> .
			After entry	
		All provisions of technology to a foreign country are <b>Controlled*</b> , regardless of the <u>residency status</u> of the end-user. (e.g., Student or Researcher ⇒ Foreign country)		

The arrow, “⇒”, represents the direction of movement.

\* The university must observe export trade control procedures before providing technology or exporting goods (determine whether controls apply, go through transaction procedures, etc.).

Note: U.S. Export Controls are applied on the basis of nationality (not residency), and therefore cover all exports involving international students.

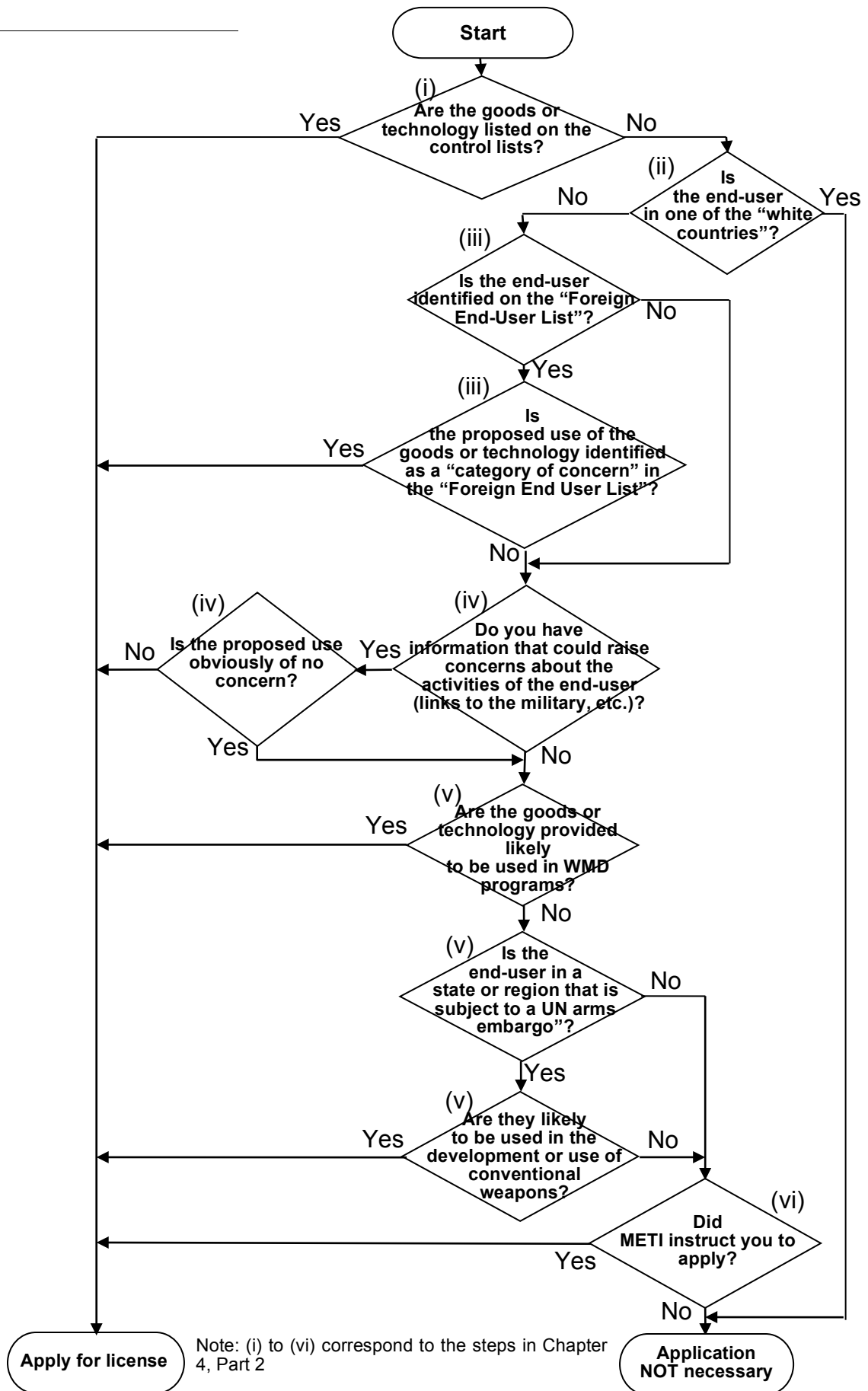


Fig. 4-1 Flowchart to determine whether you need to apply for an export license.

- (2) Contact offices for inquiries regarding export control legislation (determining whether or not an export is subject to controls)

If your university doesn't have office in charge of export controls and it is difficult for you to get advice elsewhere, you can contact your region's Bureau of Economy, Trade and Industry, or the METI Security Export Licensing Division (Phone: 03-3501-2801), with any questions you have regarding list controls or catch-all controls, and any concerns you have regarding your license application. Before making an enquiry, please prepare all the information you'll need, including, for list controls, the specific name of the item in the order along with its technical specifications, and for catch-all controls, the country of the end-user, the item's classification in the Customs Tariff Table, the use to which the item will be put, and verified information on the end-user. Having all this information to hand will help the office handle your enquiry efficiently, and your concerns may be cleared up more quickly than you would expect. For details, including office hours, visit METI's security trade control website (URL: <http://www.meti.go.jp/policy/anpo/kanri/tetsuzuki/madoguchi/main.html>). For details of contact offices, and any other enquiries regarding security trade control, see "Reference 9".

**Whatever you do, don't bypass these procedures on the optimistic assumption that you don't need a license.** If you are in any doubt, be sure to ask.

- (3) The issue of the extraterritorial application of U.S. Export Administration Regulations (supplement)

We have explained what exporters need to know about security trade controls under the Foreign Exchange Act in Japan. However, exporters who will be involved in long-term interactions with companies or universities in the United States should remember that in some situations U.S. trade control laws can be applied extraterritorially, and that exporters may therefore have to deal with "re-export controls". The United States attempts to justify extraterritorial application on the basis that **their Export Administration Regulations (EAR) cover the re-export from countries other than the U.S of goods that originated in the U.S., as well as products manufactured abroad which contain U.S. produced goods.** Many have criticized these controls, saying that they infringe on national sovereignty, but they are nonetheless de facto controls and exporters trading with U.S. organizations have to comply with them.

According to EAR, re-export controls may apply in the following cases:

- (i) When re-exporting (i.e., exporting to a foreign country) goods or technology imported from the United States;
- (ii) When re-exporting (i.e., exporting to a foreign country) goods incorporating parts or materials imported from the United States; and
- (iii) When re-exporting (i.e., exporting to a foreign country) goods or technology produced through the direct application of technology imported from the United States.

Exporters who do not comply with U.S. export control requirements may be forced to cease their transactions with U.S.-based companies or universities, and, if convicted, may even face

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criminal penalties such as imprisonment or fines.

These requirements have greatly complicated export control procedures for exporters involved in U.S. related trade. More details are available on the website of the U.S. Department of Commerce, and **the Commercial Service of the U.S. Embassy in Japan has published its guide to “U.S. Export Administration Regulations”, a Japanese-language explanation of re-export controls that can be accessed at [www.buyusa.gov/japan/ja/ear.html](http://www.buyusa.gov/japan/ja/ear.html)**. Exporters who still have doubts about these regulations can get in touch with the Commercial Service of the U.S. Embassy in Japan:

The Commercial Service, U.S. Embassy Japan  
1-10-5 Akasaka, Minato-ku, Tokyo 107-8420, JAPAN  
TEL: (03) 3224-5060, FAX: (03) 3589-4235

## 5. Basic statistical data

## (1) Personnel-related statistical data

## (i) Changes in the number of international students (As of May 1 each year)

FY	Total Number of International Students	Number of Self-supporting International Students	Number of Government-supported International Students	Number of International Students Dispatched by Foreign Governments
2003	109,508	98,135	9,746	1,627
2004	117,302	105,592	9,804	1,906
2005	121,812	110,018	9,891	1,903
2006	117,927	106,102	9,869	1,956
2007	118,498	106,297	10,020	2,181
2008	123,829	111,225	9,923	2,681

Source: Japan Student Services Organization (FY2008 Results of International Student Enrollment Survey)

## (ii) Number of International Students by Area of Origin

Area	Number of International Students	Percentage	Of Which Are Short-Stay International Students	
			Number of International Students	Percentage
Asia	114,189	92.2	5,915	60.6
Europe	3,819	3.1	1,770	18.1
North America	2,343	1.9	1,584	16.2
Africa	1,084	0.9	44	0.5
Latin America	1,008	0.8	118	1.2
Middle East	842	0.7	55	0.6
Oceania	544	0.4	270	2.8
TOTAL	123,829	100	9,756	100

Source: Japan Student Services Organization (FY2008 Results of International Student Enrollment Survey)

## (iii) Number of International Students by Educational Stage and Type of Institution

	National		Public		Private		TOTAL	
	Number of International Students	%	Number of International Students	%	Number of International Students	%	Number of International Students	%



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Educational Stage	Graduate school	20,247	62.0	1,316	4.0	11,103	34.0	32,666	100.0
	Undergraduate	9,674	16.0	1,302	2.2	49,544	81.9	60,520	100.0
	Two-year college	2	0.1	5	0.2	2,110	99.7	2,117	100.0
	Technical college	462	85.9	0	0.0	76	14.1	538	100.0
	Special institute (Special course)	0	0.0	9	0.03	25,744	99.97	25,753	100.0
	Preparatory education curriculum	0	0.0	0	0.0	2,235	100.0	2,235	100.0
	TOTAL	30,385	24.5	2,632	2.1	90,812	73.3	123,829	100.0

Source: Japan Student Services Organization (FY2008 Results of International Student Enrollment Survey)

## (iv) Number of International Students by Field of Specialization

Field of Specialization	Number of International Students	Percentage
Art and science	29,189	23.6
Social science	48,259	39.0
Science	1,526	1.2
Engineering	19,511	15.8
Agriculture	2,887	2.3
Health	2,768	2.2
Domestic arts	2,772	2.2
Education	2,981	2.4
Art	4,006	3.2
Other	9,930	8.0
TOTAL	123,829	100.0

Source: Japan Student Services Organization (FY2008 Results of International Students Enrollment Survey)

## (2) Research-related statistical data

[Statistics]

## (i) Number of sponsored research projects

(Unit: 1,000 JPY)

FY	Total Number	Foreign companies	Percentage	Total value	Foreign companies value	Percentage
FY2003	13,786	45	0.33	85,904,359	748,395	0.87
FY2004	15,236	39	0.26	101,227,322	117,412	0.12
FY2005	16,960	41	0.24	126,479,747	181,234	0.14
FY2006	18,045	73	0.40	142,035,360	306,127	0.22

Source: Report of August 31, 2007, Meeting of the Committee for the Promotion of Industrial, Academic and Public Cooperation, Council for Science and Technology

## (ii) Number of collaborative research projects

FY	Total number	Foreign companies	Percentage	Total value	Foreign companies value	Percentage
FY2003	9,255	15	0.16	21,620,823	64,383	0.30
FY2004	10,728	32	0.30	26,375,829	100,678	0.38
FY2005	13,020	51	0.39	32,343,275	272,693	0.84
FY2006	14,757	83	0.56	36,843,149	361,456	0.98

Source: Report of August 31, 2007, Meeting of the Committee for the Promotion of Industrial, Academic and Public Cooperation, Council for Science and Technology

## (3) FY2008 Collaborative research projects with foreign companies, top 30 institutions

(Unit: 1,000 JPY)

	Name of Institution	Amount of money received
1	Tokyo Institute of Technology	179,446
2	University of Tokyo	127,478
3	Tohoku University	73,213
4	Keio University	58,197
5	Osaka University	51,071
6	University of Tsukuba	38,968
7	Kyushu University	36,643
8	Nagoya City University	21,260
9	Kyoto University	18,700
10	University of Yamanashi	18,329
11	Kanagawa Institute of Technology	10,000
12	University of Hyogo	9,746
13	Nagoya Institute of Technology	9,606
14	Kumamoto University	8,943
15	Chiba University	7,292
16	Tokai University	7,150
17	Kanazawa University	7,000
18	Hitotsubashi University	6,268
19	Shinshu University	5,000
20	Kobe University	4,888
21	University of Fukui	3,839
22	Hokkaido University	3,438
23	Yamagata University	3,433
24	Electro-Communication University	3,000
24	Nagasaki Institute of Applied Science	3,000
26	Tokyo University of Agriculture and Technology	2,884
27	University of the Ryukyus	2,726
28	Suzuka National College of Technology	2,000
28	Tokyo University of Science	2,000
30	University of Occupational and Environmental Health, Japan	1,876

As of July 29, 2009; Survey on Industry-Academia Collaboration in Universities, etc. (MEXT)

[Questionnaire survey]

The following are the results of a survey conducted in July 2009 in cooperation with the University Network for Innovation and Technology Transfer (UNITT), and reflect responses from departments involved in industry-academia collaborations across 29 UNITT-affiliated universities.

(i) Descriptions of research (by controlled field):

(a) Nuclear power:

- ◆ Number of search results for controlled subjects, by keyword:  
Nuclear reactor: 64 results; Nuclear fuel: 16 results, Reprocessing: 12 results;  
Enrichment: 9 results.
  
- ◆ Examples of specific research subjects:
  - Study of the design of supercritical-pressure light water cooled nuclear reactors (engineering research)
  - Reactor core thermal hydraulics etc., of supercritical-pressure light water cooled nuclear reactors (engineering research)
  - Supercritical fluid (natural science research)
  - Application of information technology in researching nuclear reactors (engineering research)
  - Core design for fast-breeder reactors (energy engineering research)
  - Localized creep damage analysis of pipes in cooling systems after serious accidents (mechanical system engineering research)
  - Study report on reliability demonstration testing of nuclear reactor containment vessels (energy engineering research)
  - Turbine-based power generation systems in sodium-cooled fast reactors (nuclear reactor engineering research)
  - Determining age-related degradation in nuclear power plants (mechanical system engineering research)
  - Cross flow between sub-channels in nuclear reactors (natural science research)
  - Nuclear physics (nuclear reactor experiments)
  - Transmutation of waste in long-established nuclear reactors (engineering research)
  - Nuclear fuel behavior in irradiation fields (engineering research)
  - Methods for dry fuel reprocessing (material science research)
  - Spent fuel solvent extraction (energy engineering research)
  - Research and development of separation technology for difficult to separate long-lived nuclides using natural products (functional materials chemistry research)
  - Advanced reprocessing systems using highly selective and controllable precipitants (nuclear reactor engineering research)
  - Effects of irradiation on the chemical properties of metallic glass (metal materials research)
  - Development of oxygen monitoring technology for use in the submerged treatment of high-level radioactive materials (engineering research)
  - Flow properties in two-phase agitation systems (engineering research)

- Steam oxidization of high temperature aluminized materials (engineering research)
- Transmutation of transuranium elements in nuclear reactors (engineering research)
- System dynamics analysis of fuel cycles (engineering research)
- Uranium cascade theory (energy engineering research)
- Production and use of plutonium that is highly resistant to nuclear proliferation (nuclear reactor engineering research)
- Atomic-scale control using supergravity fields (extreme environment research)
- Evaluating the safety of radioactive waste disposal (engineering research)
- Development of SiC/SiC composites (energy engineering research)

(b) Aerospace:

- ◆ Number of search results for controlled subjects, by keyword:

Composite: 34 results; High-temperature resistant materials: 13 results; Propulsion systems: 12 results; Rockets: 9 results; Autonomous control: 6 results; Guidance control: 4 results; Remote control: 2 results

- ◆ Examples of specific research subjects:

- Dynamics of laminated composite plates (engineering research)
- Probabilistic design methodology for composite structures (engineering research)
- Preparation of carbon nanotube metal composites (materials science research)
- Evaluation of composites (science and engineering research)
- Development of SiC/SiC composites (energy engineering research)
- Destruction dynamics, damage dynamics, and long-term durability evaluation of aerospace composites (science and engineering research)
- Study of hot corrosion behavior of materials (engineering research)
- Evaluation of high-temperature resistant ceramics (engineering research)
- SiC epitaxial growth technology (physics research)
- Tantalum carbide (TaC) production technology (physics research)
- Strengthening of heat-resistant materials for space planes using electron beam irradiation (materials science research)
- Development of next-generation plasma thrusters (aerospace engineering research)
- Basic research on ramjet engines (aerospace engineering research)
- Unsteady combustion of solid propellants (aerospace engineering research)
- Research and development of microplasma thrusters (engineering research)
- Plasma torch igniters for supersonic combustion (engineering research)
- Flame stabilization mechanisms in supersonic combustion (fluid chemistry research)
- Two-staged combustion hybrid rockets (engineering research)
- Nuclear rockets (science and engineering research)
- Improving the reliability of rocket design technology (engineering research)
- Brazing of nozzle skirts using metallic porous bodies (materials science research)
- Research and development of experimental winged rockets (engineering research)
- Small solid rocket thrusters using laser-assisted combustion (engineering research)
- Autonomous flight control of powered parafoils (engineering research)
- Discontinuous control and backstepping method for the underactuated control of VTOL aerial robots (science and engineering research)

- Advanced control of spacecraft using disturbance estimation (engineering research)
- Motion analysis and control of spacecraft (mechanical system engineering research)
- Switching control of underactuated manipulators by introducing a definition of monotonically decreasing energy (science and engineering research)
- Motion control and communication for satellites (science and engineering research)
- Satellite-controlled electric rockets using chemical propellants (engineering research)
- Development of technology to detect liquid hydrogen fuel leaks (engineering research)
- Vibration suppression properties of ground materials (engineering research)
- Research and development of satellite communication systems (electronic engineering research)
- DNS of combustion fields (science and engineering research)

(c) Chemical substances:

- ◆ Number of research subjects related to the production of toxic chemical substances such as potassium cyanide and carbonyl dichloride (Phosgene): 19 results
- ◆ Examples of specific research subjects:
  - Synthesis of phosphine ligands using phosphorus trichloride (engineering research)
  - Development of a novel method for generating carbon-carbon bonds using controlled substances (chemical research)
  - Development of imaging probes for disease-related receptors using controlled substances (pharmaceutical research)
  - Functional materials design and synthetic organic chemistry using controlled substances (engineering research)
  - Development of a novel method for polymer-controlled synthesis using controlled substances (chemical research)

(d) Biology (bacteria/ microorganisms):

- ◆ Number of research subjects related to the production of viruses, bacteria, etc., such as Bacillus anthracis and the avian influenza virus: 18 cases
- ◆ Examples of specific research subjects:
  - Botulinum neurotoxins (life and environmental science research)
  - Analysis of mechanisms for regulating toxin production in Clostridium perfringens (medicine and health research)
  - Development of prophylactic vaccines against viral diseases (medicine and health research)
  - Development of early detection and rapid diagnostic methods for possible terrorist pathogens, etc., and establishment of evaluation methods thereof: Bacillus anthracis, Yersinia pestis, Burkholderia pseudomallei and Mycobacterium tuberculosis (medical research)
  - Detection of food borne pathogens and plant pathogens using visualization tools (medical research)
  - Pathogenicity and diagnosis methods of Chlamydia psittaci (medical research)
  - Diagnosis methods of Coxiella burnetii (medical research)
  - Development of a disease model of the flavivirus infection in monkeys (virus research)
  - Pathogens in monkeys (primatology research)

- Spread of infectious diseases across international borders in Southeast Asia (virus research)

(ii) Institutional systems to deal with export controls on goods and technology being provided to end-users overseas:

Twelve of the twenty-nine universities that responded to the questionnaire had institutional systems in place to deal with export controls on goods and technology being provided to end-users overseas. Their responses, including details of the responsible departments or offices, and methods by which exports are managed, are summarized below:

(a) Number of exports to end-users overseas:

Goods: 47 cases; Technology: 19 cases

(b) Circumstances of these exports:

- As part of collaborative research: 63 cases
- Provisions of samples to universities or research institutions abroad: 29 cases
- As reference materials or data for publication or presentation: 1 case
- Other: 6 cases

(c) Department or office usually in charge of managing export controls (multiple answers allowed)

- Research support: 6 universities
- Industry-academia-government collaboration: 5 universities
- Intellectual property: 2 universities
- Respective departments: 2 universities

(d) How controls are usually managed:

- Through applications from respective departments
- Using checklists and other paperwork to confirm procedures
- Through campus-wide communications (e.g., drafting and distributing handbooks, holding seminars), as well as through providing individual consultation services

(iii) Management of research results, other than those protected as intellectual property:

Fifteen of the twenty-nine universities that responded to the questionnaire had institutional systems in place to manage the provision of all tangible materials (e.g., strains), expertise, etc., that had been obtained as research results to recipients overseas. Details of departments or offices in charge, and methods by which these provisions are managed, are outlined below:

(a) Department or office usually in charge of management (multiple answers allowed)

- Research support: 9 universities
- Industry-academia-government collaboration: 7 universities
- Intellectual property: 5 universities

(b) Management methods:

- There is a department responsible for executing MTAs (Material Transfer Agreements)

for transfers of certain tangible materials to and from external institutions.

- Researchers can make notifications and requests through a database.
- The institution has rules in place regarding research results management.

(3) Export license-related data:

In recent years, several dozen licenses have been granted annually under the Foreign Exchange Act in connection with exports of goods and technology by universities (licenses granted by the Minister of Economy, Trade and Industry for exports subject to list controls). Specific examples of licenses granted to universities include a license for exporting the avian influenza virus to Vietnam, and a license to provide an Australian institution with technology for the design, production and use of preforms and other carbon fiber materials (see Table 5-1).

Table 5-1 Examples of export licenses granted to universities

<b>Applicant</b>	<b>Destination</b>	<b>Goods/ Technology</b>
University A	Brazil	Carbon fiber molded products
University B	Vietnam	Avian influenza virus
University C	China	Aerosol mass spectrometer
University D	Thailand	Infrared thermography
University E	Cambodia	Radar
University F	United States	Spent atomic fuel
University G	Australia	Technology for developing, producing and using preforms and molded products using carbon fiber



## Example of a research field classification system in the field of nuclear power

### 1. A typical example of research project classification:

- (1) We have outlined below, as an example, a research field classification system in the field of nuclear power that is employed by the Atomic Energy Society of Japan, and have given examples of specialized fields that are representative of each category.
- (2) Specialized fields that involve the use of equipment for inducing or generating nuclear reactions (nuclear reactors), devices or materials that form part of this equipment, or uranium enrichment and plutonium separation and extraction, are generally considered to have the potential to be diverted to research related to nuclear weapons.

Category	Specialized field
Nuclear fission engineering	302 <u>Advanced Reactors, Nuclear Design, Nuclear Transmutation Technology</u>
	303 <u>Research Reactors, Application of Neutrons</u>
	311 <u>Reactor Design, Construction and Examination of Nuclear Power Stations, Aseismatic Design, Nuclear Ships</u>
Nuclear fuel cycles and materials	402 <u>Nuclear Fuel</u>
	403 <u>Reactor Materials</u>
	406 <u>Isotope Separation, Application of Isotopes, Uranium Enrichment</u>
	408 <u>Fuel Reprocessing</u>

### 2. Research classification system

Below, you can find a research classification system that is employed by the Atomic Energy Society of Japan, which is given as an example of a research field classification system in the field of nuclear power:

Category	Specialized field
Category I	
General Issues	101 Philosophy and Ethics of Nuclear Energy
	102 Regulatory Engineering and Politics of Nuclear Energy and International Relations
	103 Economic and Social Aspects of Nuclear Energy
	104 Energy and the Environment
	105 Nuclear Education
	106 Nuclear information
	107 Nuclear Non-Proliferation and Safeguards
Category II	
Radiation, Accelerator	201 Nuclear Physics, Nuclear data, nuclear reaction technology

and Beam Technology	202	Radiation behaviors, Radiation Shielding
	203	Radiation Physics, Radiation Detection and Measurement
	204	Accelerator and Beam Acceleration Technology
	205	Application of Beams
	206	Beam Design, Target
	207	Orbital radiation, Laser
	208	Medical reactors and Accelerators
	209	Neutron Sources, Neutron Technology
Category III		
Fission Energy	301	Reactor Physics, Nuclear Data, Criticality Safety
Engineering	302	<u>Advanced Reactors, Nuclear Design</u> , Nuclear Transmutation Technology
	303	<u>Research Reactors</u> , Application of Neutrons
	304	Nuclear Fuel Cycles and Reactor Strategy
	305	Reactor Instrumentation, Instrumentation Systems, Reactor Control
	306	Remote Control, Robotics, Image Processing
	307	Thermal Hydraulics (including Energy Conversion, Transfer, and Storage)
	308	Nuclear System Design, Human-Machine Systems, Advanced Information Processing
	309	Design and Manufacturing of Reactor Components and Transportation Vessel/ Storage Facilities
	310	Operational Management, Inspection and Maintenance of Reactors
	311	<u>Reactor Design</u> , Construction and Examination of Nuclear Power Stations, Aseismatic Design, Nuclear Ships
	312	Nuclear Safety Engineering (including Nuclear Facilities/ Installation Safety, PSA)
	313	Computational Science and Engineering
Category IV		
Nuclear Fuel Cycle and	401	Basic Properties
Nuclear Materials	402	<u>Nuclear Fuel</u>
	403	<u>Reactor Materials</u>
	404	Irradiation Behavior, Irradiation Technology
	405	Reactor Chemistry, Radiation Chemistry, Corrosion Chemistry, Decontamination
	406	<u>Isotope Separation, Application of Isotopes, Uranium Enrichment</u>
	407	Nuclear Chemistry, Radiochemistry, Analytical Chemistry, Chemistry of Actinide
	408	<u>Fuel Reprocessing</u>
	409	Radioactive Waste Management
	410	Radioactive Waste Disposal and the Environment
	411	Decommissioning Technology of Nuclear Facilities
	412	Accountancy, Safeguards Technology
Category V		
Fusion Energy	501	Plasma Technology (including Inertial Confinement Fusion)

Tentative translation

Engineering	502	Fusion Reactor Material Technology (Reactor and Blanket Materials, Irradiation Behavior)
	503	Tritium Technology (Fuel Recovery and Refining, Measurement, Isotope Effect, Safe Handling)
	504	Reactor Component Technology (First Wall, Diverters, Magnets, etc.)
	505	Fusion Neutronics
	506	Fusion Reactor Systems, Design, Application
Category VI		
Health Physics and Environmental Science	601	Medical and Biological Applications of Radiation (including Nuclear Medicine, Biological Effects)
	602	Radiation (Radioactivity) Measurement, Dosimetry
	603	Radiation Control
	604	Environmental Radioactivity
	605	Radiation Dose and Environmental Safety Assessments (including Meteorological Aspects, Global Environment)
	606	Philosophy and Standards for Radiation Protection

(Note) Specialized fields that involve the use of equipment for inducing or generating nuclear reactions (nuclear reactors), devices or materials that form part of this equipment, or uranium enrichment and plutonium separation and extraction, which are generally considered to have the potential to be diverted to research related to nuclear weapons are underlined.

(3) (Annex 2)

Example of a research field classification system in the field of aerospace

1. A typical example of research project classification:

(1) Below, we have provided a typical example of a research field classification system in the field of aerospace.

(2) Specialized fields that involve research into aerodynamics, structural dynamics, materials, control engineering and propulsion engineering are generally considered to have the potential to be diverted to research related to missiles.

A. Field of aerodynamics:

Basic fluid dynamics

Compressible hydrodynamics → Flight performance enhancement technology for missiles

Rarefied gas dynamics → Missile re-entry technology (suborbital flight in upper air)

Aerodynamic heating → Missile re-entry technology (development of warheads)

Numerical analytical approach → Flight performance enhancement technology for missiles

B. Field of structural dynamics and materials:

Thin-walled structural dynamics

Structural dynamics in extreme environments → Design of missile warheads

Composite materials dynamics → Development of higher-performance flying objects

Materials

High-temperature resistant materials → Protection of warheads against aerodynamic heating, Development of higher-performance rocket nozzles

C. Field of control engineering and system engineering:

Navigation, guidance and control engineering → Precision guidance for missiles

Unmanned aerial vehicle systems → Remote control and autonomous control technology for aerospace vehicles

D. Field of propulsion engineering:

Rocket engines → Development of missile thrusters

Solid rocket engines

Liquid rocket engines

2. Research classification system

An example of a research field classification system in the field of aerospace is given below.

A. Field of aerodynamics

Basic fluid dynamics

Ideal fluid dynamics

## Tentative translation

Viscid fluid dynamics

Compressible hydrodynamics → Flight performance enhancement technology for missiles

High-temperature gas dynamics

Rarefied gas dynamics → Missile re-entry technology (suborbital flight in upper air)

Airfoil theory

Aerodynamic heating → Missile re-entry technology (development of warheads)

Aerodynamic noise

Internal fluid dynamics

Rotor aerodynamics

Numerical analytical approach → Flight performance enhancement technology for missiles

### B. Field of structural dynamics and materials

Thin-walled structural dynamics

Dynamics of reinforced structures

Shell theory

Buckling theory

Structural dynamics in extreme environments → Design of missile warheads

Composite material dynamics → Development of higher-performance flying objects

Structural vibration

Numerical analytical approach

Materials

Aluminum alloy, magnesium alloy

Titanium alloy

Composite material dynamics

High-temperature resistant materials → Protection of warheads against aerodynamic heating, Development of higher-performance rocket nozzles

### C. Field of control engineering and system engineering

Flight control engineering

Navigation, guidance and control engineering → Precision guidance for missiles

Flight dynamics

Orbit dynamics

Attitude control theory

Unmanned aerial vehicles systems → Remote control and autonomous control technology for aerospace vehicles

Special airplanes

Airships

Vertical takeoff and landing (VTOL) aircraft

Rocket systems

Satellite systems

Manned space systems

Space exploration engineering

Space utilization engineering

Remote sensing technology

### D. Field of propulsion engineering

Jet engines

Tentative translation

Turboprop engines

Ramjet engines

Rocket engines → Development of missile thrusters

    Solid rocket engines

    Liquid rocket engines

Electric propulsion

Laser propulsion

Fuel science and firing science

Structural materials

Numerical analytical approach

E. Field of flying object engineering

    Flying object guidance theory

    Flying object control theory

    Propulsion theory

## Toxic chemical substances that are subject to security trade controls

1. Substances used as raw materials for specific chemical agents

© **The following substances, or mixtures containing them in quantities exceeding 30% of total weight:**

3-hydroxy-1-methylpiperidine, Potassium fluoride, Ethylene chlorohydrin, Dimethylamine, Dimethylamine hydrochloride, Hydrogen fluoride, Methyl benzilate, 3-Quinuclidinone, Pinacolone, Potassium cyanide, Potassium bifluoride, Ammonium bifluoride, Sodium bifluoride, Sodium fluoride, Sodium cyanide, Phosphorus pentasulfide, Diisopropylamine, 2-Diethylamino ethanol, Sodium sulfide, Triethanolamine hydrochloride, Phosphorous acid triisopropyl, Diethyl thiophosphoric acid, Diethyl dithio phosphoric acid and Sodium hexafluorosilicic acid.

2. Substances with toxicity equivalent to specific chemical agents

© **The following substances, or mixtures containing them in quantities exceeding 1% of total weight for substances listed in “ii”, or exceeding 30% of total weight for substances listed in “iii”:**

(i) Saxitoxin and Ricin

(ii) O,O-diethyl=S-[2-(diethylamino)ethyl] = phosphorothiolate and alkylate salts and protonate salts thereof, 1,1,3,3,3-pentafluoro-2-(trifluoromethyl)-1-propane and 3-quinuclidinyl = benzilate

(iii) Carbonyl dichloride, Cyanogen chloride, Hydrogen cyanide and Trichloronitromethane

3. Substances used as raw materials for the substances with toxicity equivalent to specific chemical agents listed above

© **The following substances, or mixtures containing them in quantities exceeding 10% of total weight for substances listed in “ii”, or exceeding 30% of total weight for substances listed in “iii”.**

(i) Alkyl phosphonyl difluoride (with alkyl groups having 3 carbons or less *only*), O-alkyl = O-2-dialkylaminoethyl = alkyl phosphonite (including cycloalkyl groups in O-alkyl alkyl groups, though limited to O-alkyl alkyl groups having 10 carbons or less, and O-2-dialkylaminoethyl or alkyl phosphonite alkyl groups having 3 carbons or less); alkylate salts and protonate salts thereof, O-2-dialkylaminoethyl = hydrogen = alkyl phosphonite (O-2-dialkylaminoethyl or alkyl phosphonite alkyl groups having 3 carbons or less *only*); alkylate salts and protonate salts thereof, O-isopropyl = methyl phosphonochloridate and O-pinacolyl = methyl phosphonochloridate

(ii) Compounds containing phosphorus atoms having no bond with a carbon atom other than a bond with one alkyl group having 3 carbons or less; N,N-dialkyl phosphoramidic = dihalide

Tentative translation

(with alkyl groups having 3 carbons or less *only*); Dialkyl = N,N-dialkyl phosphoramidate (with dialkyl or N,N-dialkyl phosphoramidate alkyl groups having 3 carbons or less *only*); Arsenic trichloride, 2,2-diphenyl-2-hydroxyacetic acid, Quinuclidine-3-ol, N,N-dialkylaminoethyl-2-chloride (with alkyl groups having 3 carbons or less *only*) and protonate salts thereof; N,N-dialkyl aminoethane-2-ol (limited to those alkyl group carbon number of which is 3 or less) and protonate salts thereof; N,N-dialkyl aminoethane-2-thiol (with alkyl groups having 3 carbons or less *only*) and protonate salts thereof; Bis(2-hydroxyethyl) sulfide and 3,3-dimethylbutane-2-ol

(iii) Phosphoryl chloride, Phosphorus trichloride, Phosphorus pentachloride, Trimethyl phosphite, Triethyl phosphite, Dimethyl phosphite, Diethyl phosphite, Sulfur monochloride, Sulfur bichloride, Thionyl chloride, Ethyl diethanol amine, Methyl diethanol amine and Triethanolamine



Viruses, bacteria, etc., subject to  
security trade controls

1. Viruses, bacteria, etc., used as raw materials for specific bacterial agents

© **The following living organisms, toxins and their subunits or genes:**

- (i) Viruses (excluding vaccines): the African horse sickness virus, the African swine fever virus, the Andes virus, the Ebola virus, the yellow fever virus, the Aujeszky's disease virus, the Omsk hemorrhagic fever virus, the Oropouche virus, the Guanarito virus, the Kyasanur Forest disease virus, the cattle plague virus, the rabies virus, the Crimean-Congo hemorrhagic fever virus, the foot-and-mouth disease virus, the monkeypox virus, the peste des petits ruminants virus, the Sin Nombre virus, the vesicular stomatitis virus, the western equine encephalitis virus, the Saint Louis encephalitis virus, the Seoul virus, the tick-borne encephalitis virus, the Chikungunya virus, the Chapare virus, the louping ill virus, the Teschen disease virus, the Choclo virus, the dengue fever virus, the smallpox virus, the eastern equine encephalitis virus, the Dobrava-Belgrade virus, the avian influenza virus (limited to strains having the H5 or H7 H antigen), the swine fever virus, the Nipah virus, the Japanese encephalitis virus, the Newcastle disease virus, the Hantaan virus, porcine enterovirus type 9, the Junin virus, the blue tongue virus, the Venezuelan equine encephalitis virus, the Hendra virus, the potato Andean latent tymovirus, the potato spindle tuber viroid, the Powassan virus, the Machupo virus, the Marburg virus, the Murray Valley encephalitis virus, the goat pox virus, the sheep pox virus, the Laguna Negra virus, the Lassa fever virus, the lumpy skin disease virus, the Rift Valley fever virus, the lymphocytic choriomeningitis virus, the Lujo virus, and the Rocio virus.
- (ii) Bacteria (excluding vaccines): *Brucella abortus*, *Chlamydia psittaci*, the gas bacillus, *Coxiella burnetii*, *Mycoplasma mycoides* (small colony), the cholera bacillus, trench fever rickettsia, *Shigella dysenteriae*, *Bacillus anthracis*, the typhoid bacillus, enterohemorrhagic *Escherichia coli* serotype O157, *Rickettsia prowazekii*, *Actinobacillus mallei*, *Brucella suis*, *Bacillus pestis*, *Bacillus botulinus*, *Brucella melitensis*, *Mycoplasma capricolum* subspecies *capripneumoniae* (strain F38), *Bacillus tularensis*, *Pseudomonas pseudomallei*, and *Rickettsia rickettsii*.
- (iii) Toxins (excluding immunotoxins): aflatoxin, abrin, clostridium welchii toxin, HT-2 toxin, staphylococcal enterotoxin, conotoxin, cholera toxin, *Shigella dysenteriae* toxin, diacetoxyscirpenol toxin, T-2 toxin, tetrodotoxin, *Viscum album* lectin, verotoxin or Shiga toxin-like ribosome inactive protein, botulin toxin, Volkensin, microcystin, or modeccin.
- (iv) Subunits of toxins falling under (iii) above, or Annex 3, 2, (i).
- (v) Bacteria and fungi: *Clavibacter michiganensis* ssp. *sepedonicus*, *Coccidioides immitis*, *Coccidioides posadasii*, *Cochliobolus miyabeanus*, *Colletotrichum coffeanum* var. *virulans*, *Xanthomonas albilineans*, *Xanthomonas oryzae* pv. *oryzae*, *Xanthomonas campestris* pv. *citri*, *Pyricularia oryzae*, *Pyricularia grisea*, *Puccinia graminis*, *Puccinia striiformis*, *Microcyclus ulei*, or *Ralstonia solanacearum* race 2 or 3.
- (vi) Genes (including chromosomes, genomes, plasmids, transposons, and vectors) having a

Tentative translation

base sequence of nucleic acids falling under (i), (ii) or (v) above, wherein that base sequence of nucleic acids causes the expression of pathogenicity or the production of toxins falling under (iii) above; Annex 3, 2, (i); and (iv) above.

(vii) Organisms (including microorganisms) the genes of which are altered so as to render a base sequence of nucleic acids falling under (i), (ii), or (v) above, wherein that base sequence of nucleic acids causes the expression of pathogenicity or the production of toxins falling under (iii) above; Annex 3, 2, (i); and (iv) above.

(Annex 5)

## **Hypothetical problems involving export controls at universities**

To help you understand how important security trade controls are in the context of university research activities, we have compiled these reading materials, in which we have presented a few hypothetical problems researchers may face when they become involved in international exchange. All of these stories describe realistic situations, and they contain some valuable lessons for faculty members who are engaged in research. Having said that, readers should note that all of these stories are fictional, and do not depict any actual people or events.

### **[Scenario 1] How much can we be expected to know about the scope of export controls?**

Professor A of National University Y was conducting collaborative research with Professor L of University S, Country X, and they were working on developing a new kind of floor inspection technology. One day, they decided that Professor A would send University S a particular piece of inspection equipment that he had developed, so that a floor inspection experiment could be done in Country X. Although the inspection equipment was just a prototype built for the experiment, it was still considered to be property of University Y, so once the experiment was done it was to be sent back to Japan so that Professor A could keep using it in his experiments. University Y didn't have a department in charge of export controls, and as Professor A couldn't find any university personnel who were familiar with the regulations, he decided to ask someone from the freight forwarding company that was handling the export about what procedures had to be done before exporting the inspection equipment. On the basis of the company's advice, he decided to obtain an ATA Carnet which would exempt him from having to pay import taxes when bringing inspection equipment exceeding 10 million Japanese yen in value into country X, and again when returning the equipment to Japan.<sup>1</sup>

However, when the freight forwarding company submitted the customs declaration to send the equipment by airfreight, customs officials pointed out that a certain part of the inspection equipment might require an export license under the Foreign Exchange Act. The agent made an urgent call to Professor A's lab, and said, "Customs has pointed out that a particular part of your equipment might need an export license under the Foreign Exchange Act. Unless we can convince them otherwise by the end of today, they won't approve clearance, and we won't be able to fly out the equipment as scheduled." It had never even occurred to Professor A that he might need an export license, so he couldn't even tell on the spot which part of the equipment customs had taken issue with — all he could think of was how disappointed Professor L would be when he found out the equipment wasn't coming on time. He had to try and keep to the experiment schedule, so, to prevent the floor experiment from being too delayed, he knew that he had no choice but to send out the non-controlled parts on the scheduled flight. He decided that he would fly these parts ahead, and that he would send on the parts that were stuck in the customs as soon as the license issue was cleared up.

Professor A had no idea what kinds of goods were controlled under the Foreign Exchange Act, so, under the advice of the freight company, he checked METI's security trade control website ([www.meti.go.jp/policy/anpo/index.html](http://www.meti.go.jp/policy/anpo/index.html); see Chapter 4 of this booklet for details). The whole process was new to him, so it took him a while, but he was eventually able to find out that the

part in question was listed under “Goods”, and that he therefore needed a license to export it. He immediately submitted an application to the Kanto Regional Bureau of Economy, Trade and Industry, and once he received his license he was finally able to send on the rest of the inspection equipment, one week later than had been scheduled. As a result of this delay the experiment had to be carried out later than had been planned, and Professor A felt bad for all the trouble he had caused Professor L. He was also forced to stretch his limited budget to cover the extra cost of flying the equipment in two installments.

Professor A later found out that he’d been lucky that the destination of his export had been Country X, (one of the “White Countries” explained in Chapter 3, (1)) a fact which made the license application procedure much simpler. He discovered that for certain destinations he would have needed a declaration from the recipient saying that the equipment was not going to be resold, and it would have taken him much longer to get a license. As it turned out, his export had only been delayed by one week, so while the holdup had affected their experiment schedule, except for the additional cost, it hadn’t had too much of an impact on the project overall.

Professor A feels embarrassed for having made the mistake: because University S was one of the first-class national universities of Country X, it hadn’t occurred to him that export controls might apply. He can’t even imagine how difficult things would have been if his collaborator had been in a university in somewhere like Southeast Asia. He regrets not having at least consulted with one of METI’s offices in advance (such as his region’s Bureau of Economy, Trade and Industry, or the METI Security Export Licensing Division).

Note 1) ATA Carnet:

This is a customs document under the ATA Convention (Customs Convention on the ATA Carnet for the Temporary Admission of Goods). The ATA Carnet simplifies the process of making temporary, duty-free imports when bringing goods such as professional equipment (a typical example is equipment for TV news coverage), commercial samples, or goods for exhibitions into a foreign country. The ATA Carnet is convenient as it is accepted by customs in several countries, even if each country normally has different import procedures. When you first obtain a carnet you are required to apply for qualification, which you should obtain through your university. For details, contact an international freight forwarding company or the Japan Commercial Arbitration Association (visit their website here: <http://www.jcaa.or.jp/index.html>).

**[Scenario 2] We have the right to provide international students with technical information, don’t we?**

Although he rarely makes media appearances, Professor U of Research Center S, National University T, is one of the internationally acclaimed researchers who have been producing remarkable results in the development of solid rocket engines. It can be very difficult to control the thrust of flying objects with solid rocket engines after ignition, and in order to cope with the rapid changes that occur in the ascent trajectory, such as changes in external pressure, a lot of creativity has gone into devising the cross-sectional shape of the combustion chambers and propellants. Professor U has the reputation of being the best researcher in this field. In recent years, he has mainly been working on improving propulsion efficiency during rapid ascent trajectory by changing the cross-sectional shape of the propellants, and this original technology has been drawing a lot attention from other researchers in the field.

Professor J, who is a professor at the Department of Mechanical Engineering in the Faculty of Engineering of the same University, has spent years researching systems for injecting fuel into the interior of piston engine cylinders. He is also highly respected for his research on turbochargers involving characteristic curve analysis. In April 20XX, Student M, an international student from Country I, entered the doctoral program of the Graduate School of Engineering Research and started studying in Professor J's laboratory. Student M did not speak Japanese well, which meant that Professor J sometimes had difficulty communicating with him, but he spoke excellent English: before joining University Z in Country I as a researcher, he had received his master's degree in mechanical engineering from a university in the United Kingdom. Thanks to this educational background, he was very good at performing numerical simulation techniques using supercomputers for fluid analysis. At thirty, he was a little older than other students, but he was a hard-working and highly dedicated researcher. Professor J was very happy with Student M, and felt that having such a brilliant doctoral student was a great boost to his own research.

One day, three months after he had arrived in Japan, Student M came to Professor J, and said, "I came to study at your laboratory because I'm interested in studying thermo-fluid analysis in the combustion process in piston engines, a type of internal-combustion engine. But I'm also interested in researching other types of internal-combustion engines, like jet engines and rocket engines. A famous researcher on solid fuel rockets, Professor U, has his laboratory in this University's Research Center S, and I was wondering if I'd be able to join in on some journal-reading sessions in his laboratory, and attend some study groups with industry technicians. Would that be possible?" Professor J could see that Student M was eager to learn about the latest breakthroughs, and was impressed by his enthusiasm. As he listened, he thought about how he could help this diligent student progress in his research career. He happened to know Professor U very well, having been three years ahead of him at the same graduate school in University T. He told Student M that he would check with Professor U and get back to him with the answer. Student M gave him a big smile, thanked him warmly, and bowed several times as a sign of his appreciation.

The next day, Professor J bumped into Professor U, who had left his Research Center to go and deliver his weekly lecture in the Engineering Department. He called out to him,

"U, long time no see!"

"Yes, Professor J. It *has* been ages. We're in the same university, but we hardly get a chance to see each other."

"I have something to talk to you about. Is now a good time?"

"Well, I actually have to be getting to a continuum dynamics lecture for students in the mechanical program."

"When is convenient for you?"

"Well, after the lecture I have something to do in my lab, but how about after that?"

"We could have dinner?"

"That sounds great!"

That evening the two professors went to a restaurant near the University and spent a while catching up. After some time, Professor J brought up Student M: "In my lab, we have an international student from Country I — his name is M. He is such a brilliant guy, and he's also interested in other kinds of internal-combustion engines and is eager to learn about your research. He doesn't speak Japanese very well yet, but he is a seriously devoted researcher and

a very sharp guy. Do you think he'd be able to join in on some journal-reading sessions in your lab, or attend the study groups you have with industry technicians? Everyone will be inspired by his input, for sure." Professor U was pretty open to the request, saying, "Well, I don't want to say no — after all, he did go straight to you. There's just one thing. Aside from my journal-reading sessions, trade secrets can sometimes come up in the study groups with industry technicians, and so I've had everyone in my lab sign confidentiality pledges. I'll want him to do the same. And could you also fax me his resume before he comes? It'll help when I'm introducing him to the technicians." "For sure", responded Professor J, "I'll send it to you tomorrow morning."

As he'd had a late night, the next day Professor U came to his lab about one hour later than usual, to discover that Student M's resume was already on his desk. "So fast", he exclaimed, wondering how Professor J had had the energy to get in and send it so early. He picked up the resume straight away and skimmed through it, along with the Japanese translation that Professor J had evidently prepared for him. He saw that Student M had done his bachelor's degree in mechanical engineering at the Department of Engineering, University Z, Country I. He had then gotten his masters degree in mechanical engineering from the Graduate School of Engineering Research, University N in the United Kingdom, and had gone on to become a researcher at University Z in Country I, before finally joining the doctoral program in mechanical engineering at the Graduate School of Engineering Research, University T. Professor U had the impression that he'd heard of "University Z" somewhere before, but couldn't remember in what context. Just in case, he phoned Professor J to find out a little more about Student M's academic background.

Although Professor U found Professor J's voice on the other end of the phone much too piercing that morning, he managed to find out that Student M had been working as a researcher in University Z's Aerospace Engineering Department, and that he was actually still registered as a researcher there, and was even still receiving salary from University Z. When he heard that, Professor U realized where he had heard of University Z — it was on METI's Foreign End User List as a research institution in Country I which was suspected of being involved in missiles programs (see Chapter 3, "(3) End-users suspected to be involved in WMD programs"). Professor U took a deep breath, and braced himself to break the news to Professor J, afraid that his loud voice was going to get louder still.

"Professor J, I'm afraid that, as things stand, I might not be able to let Student M join our journal-reading sessions and study groups." Professor J was stunned, "What? Why?..." He was about to go on, but Professor U stopped him: "Please listen to me, would you? Let me explain the situation." He continued, "We have an Act here in Japan called the "Foreign Exchange and Foreign Trade Act", and according to its rules we need to apply for a license from METI when we want to provide certain institutions — ones named on a list called the "Foreign-End User List" — with certain types of technology that could be used in the development of weapons of mass destruction. Student M is a graduate student here in Japan, but he still has his status as a researcher at University Z in Country I, and I'm afraid that's one of the universities on the Foreign End User List. Of course, if we can get a license, I'll be happy to let him join us, but considering the nature of my research and Student M's status, I don't think that METI will grant us one..."

Professor J was now agitated: "But it's not like you're developing weapons, right? You're just doing academic research. How can you possibly need a license from METI just to let him join in on your lab's journal-reading sessions and study groups?" Professor U tried asking Professor J

to speak a little more quietly, explaining that he had a headache, but he wished he hadn't when Professor J shouted back, "I was born with this loud voice! I'm just trying to get to the bottom of this!" Professor U realized that he was just adding fuel to the fire, and, having no idea how to assuage Professor J, decided to proceed as politely as possible: "I understand how you feel, Professor J, but please just hear me out for a moment. As you said, it's true that I'm not directly involved in the development of weapons. But it's also true that what I've learned through trying to find the optimum cross-sectional propellant shape for solid fuel rockets could potentially be used in the development of military missiles if it fell into the wrong hands. This is why we are required by law to get a license before handing over this kind of sensitive technical knowledge. And Student M is a researcher in this field who still belongs to an organization that can't be allowed to have access to my findings. I don't mean to scare you, but if we don't comply with the Foreign Exchange Act we could be charged with a crime, and could end up going to prison (up to 10 years, under the revised Foreign Exchange Act) or having to pay a fine (up to 10 million yen, or within 5 times the value of the illegal export, under the Foreign Exchange Act). On top of that, University T could also be liable as our employer and could have to pay a fine. Please understand that this isn't discrimination against Student M because of his nationality. This is simply one of the many administrative policies we need to protect Japan's national security. I mean, hasn't University T accepted Student M as a doctoral student regardless of his nationality? As long as he sticks to studying piston engines, which have nothing to do with missile development, there will be no problem at all."

Professor J was silent at the other end of the phone for what seemed a little too long, before quietly responding, "So you're saying that if you reveal your findings to M without a license from METI, you could face criminal charges for violating the Foreign Exchange Act." When Professor U confirmed this, Professor J was very disappointed, but said, "I have a lot of respect for the great work you've done in a very difficult field — I know that your work has been acclaimed worldwide — and I want to apologize for getting so agitated. I didn't understand what you were trying to say, and my response was totally unprofessional. I will explain everything you've told me to M." But Professor U cautioned him not to share too much with M, saying, "Professor J, for the sake of Student M, we should keep this between us. I don't want to distract him from finishing his studies at your lab and receiving his doctoral degree." Professor J had no choice but to agree.

**[Scenario 3] This prototype is handmade — what difference does it make what it's made of?**

Professor U at the Faculty of Engineering, Private University T, is working on research into ways of removing anti-personnel landmines in post-conflict areas. Professor U had proposed the use of sound waves to detect anti-personnel landmines made of plastic which cannot be detected by conventional landmine detection techniques that use magnetism and electro-magnetic waves. Anti-personnel landmines are generally buried just under the surface of the ground, and so Professor U reasoned that sound waves could prove to be an effective way of detecting them. After performing several trial runs in fields set up for that purpose at her University and at a national research institution, Professor U was convinced that her idea was ready to be applied, and decided to demonstrate her new technology at sites in Country C in Southeast Asia, a region that had been struggling to find ways to clear landmines. She had made arrangements with local NGOs, and had set to work preparing for the on-site demonstration.

The detection device that Professor U had designed was made up of a strong oscillating source capable of generating a wide-bandwidth, large-amplitude mechanical vibration; a commercially available laser Doppler vibrational distribution measurement device that had been manufactured overseas; an arbitrary waveform generator that had been made in Japan; a power amplifier; and a digital storage oscilloscope. The device belonged to the University, and the commercially available parts alone had a value in excess of thirty million yen. University T didn't have an office to deal with security trade controls, so Professor U decided to check with Professor A of University Y, who had been her senior back in university. As it happened, Professor A had once messed up in a similar situation, and so he was well qualified to advise Professor U. On the basis of his advice, she decided to apply at a particular office to get approval from University T before bringing the equipment out of the country, to get a carnet in her own name for all of its components, and then to ship the equipment to Country C in advance, and send it all back to Japan once the demonstration had finished. As she was very busy, she decided to get a reliable international carrier to take care of the license procedures for her. She had to pay a security deposit, but it still worked out less expensive than if she had done everything herself.

However, Professor U decided that, instead of sending the strong oscillating source out in advance along with the rest of the equipment, she'd be better off carrying it with her in her hand luggage. She had built it herself in her lab as a prototype for her experiments, and had made it using an ultra-magnetostrictor, which is a special kind of magnetic material. It wasn't as sturdy as the commercially available ones — it was mechanically stiff but also fragile — so Professor U was afraid that it might get damaged on the way. It also happened to be just the right size and weight to fit into carry-on baggage. She was confident that, even if she got stopped going through security, she'd be able to deal with the situation by giving an appropriate explanation. Meanwhile, the carrier had checked the rest of the equipment, using an operation manual Professor U had given them, and had confirmed that none of it was subject to list controls (see Chapter 2, "(1) Scope of security trade controls for research-related exports"). Just in case, they also contacted the METI Security Export Licensing Division with all the required information (see Chapter 4, "(3) Contact offices for enquiries regarding export control legislation"), including equipment specifications, the country of destination, the name of the end-user, and the proposed end-use of the equipment, and were able to confirm that catch-all controls would not apply.

All the export procedures went ahead smoothly, and on Friday, three days before Professor U was due to leave for Country C, she got an e-mail from the local NGO letting her know that the package had arrived safely. She also got a call from the person who had been handling her shipment telling her that the delivery had gone to plan. Feeling relieved, Professor U thanked the man from the company, saying, "It was much easier than I'd thought. All that's left to do now is carry over the ultra-magnetostrictor oscillating source. Thank you for everything". Picking up on what she had said, he asked her, "Professor U, did you say ultra-magnetostrictor? What kind of device is that?" He sounded worried. After Professor U had given a brief explanation, he asked her to hold on for a moment and the phone went silent. Professor U could make out the sound of typing on the other end.

After ten seconds or so, he came back and said, "Professor U, I'm afraid it looks like you'll probably need a license to bring that device with you to Country C, but you don't have one, do you?" Professor U couldn't believe what she was hearing: "But, it's just a simple device that I made myself. I can't believe that I have to get a license to bring it abroad. And it's already Friday — I don't think I have time to get a license...". She was lost for words. The man from the



company explained that the problem was not with the oscillating source itself, but rather that the ultra-magnetostrictor inside it was a kind of “Metallic magnetic material”, a category listed in the Export Trade Control Ordinance (the Export Order) Appendix 1, Section 5, Item (vi), and its specifications matched those outlined in the METI Goods Ordinance, Article 4, Item (viii)(b). Professor U momentarily considered pushing back her departure to give herself time to get a license, but rejected the idea as soon as she recalled how long it had taken to set up the schedule with the local organizations — it would be impossible to rearrange everything at this point. The man from the company waited for Professor U to respond, but she stayed silent, and so he eventually ventured, “I know nothing about your field so I could be way off, but isn’t there any way you could do the experiment without using this particular oscillating source?” Professor U thought for a moment, and then replied, “Yes, I suppose it could be possible to do the experiment without it. Hitting something like an iron picket with a hammer can act as an oscillating source...” And with that, Professor U decided that this time she’d have to go without the sturdy oscillating source that she’d been so proud of.

The man from the company tried to apologize, saying that he wished he’d picked up on the issue earlier, but Professor U stopped him: “It’s my fault. In fact I should be thanking you — if you hadn’t pointed this out to me today, I would have ended up breaking the law. I really appreciate all your help”. Professor U was calm, but from her voice it was clear that she was dejected. She promised herself that she would never tell Professor A that she’d made this mistake even after all the advice he’d given her, and decided to have a drink alone at a local pub that night.

#### **[Scenario 4] How lucky that our University has an office to deal with export controls!**

Dr. M at the Faculty of Science, Public University O, decided to conduct research into fluctuations in continental interior palaeomagnetism from different geological eras by studying the intensity and direction of faint magnetism remaining in each layer of stratum. In order to do so, he needed to do a geological survey over strata that lie in thick layers and which are therefore not affected by frequent crustal movements in the continental interior. These kinds of strata are to be found in Country E, so Dr. M planned to go there and measure slight magnetic anomalies in each stratum with a very low noise level precise triaxial flux-gate magnetometer (gradiometer). Dr. M exchanged emails with an acquaintance at a university in Country E to discuss his plans, and a local research institution agreed to help out with the survey.

Triaxial flux-gate magnetometers can be used to quantitatively measure the magnetic field in a particular place. They work by generating a sine wave alternating current magnetic field that is just below the saturation magnetic flux density of a ferromagnet such as ferrite. Using a detection coil, they extract high frequency components of magnetic flux density fluctuations by measuring non-alignment with a very small background magnetic field. Since they are capable of measuring the environmental magnetic field along the direction of a magnetic circuit, if they are provided with mutually orthogonal three directions, they can measure all of the vector components of the magnetic field at once, and can also produce a gradient of the magnetic field in each direction. How accurate these measurements are depends on the level of background noise: the lower the background noise, the more accurate the measurement.

Dr. M’s laboratory wasn’t equipped with this kind of high-performance triaxial flux-gate magnetometer, so he asked Dr. K, a professor at one of Japan’s national universities, to let him

use their triaxial flux-gate magnetometer to conduct the survey. As the magnetometer belonged to Dr. K's University, they had to get permission from that University's property management office before bringing the device out of Japan. The application process seemed straightforward. However, one day, Dr. M got a call from Dr. K telling him that an administrator at his University had asked whether they'd remembered to apply for an export license from METI. At that point they hadn't even decided how they were going to send the equipment, and Dr. M didn't know a thing about export procedures.

As well as having procedures in place for bringing university property out of Japan, Dr. K's University had also already established its own system to deal with export controls. The administrator at the University's Export Control Office had noticed the term "triaxial gradiometer" in a document attached to Dr. K's property transfer application which she had received from the Supplies Division, and had a hunch that this device might in fact be a "triaxial flux-gate magnetometer", a device that requires an export license. She visited Dr. K's laboratory to check the device, and once she'd confirmed that it was in fact a triaxial flux-gate magnetometer, she told Dr. K that he would have to get a license from METI to export it, as it fell into the category "(ix) Magnetometers", listed in Appendix 1, Section 10 of the Export Order, and matched the specifications detailed in Article 9, Item (xi)(d) of the METI Goods Ordinance.

It had never even occurred to Dr. K and Dr. M that the Foreign Exchange Act would apply to any kind of academic surveys or research activities, and they were astounded to hear that they'd need an "export license". If they'd had a freight forwarding company handle the shipment, someone from the company would have pointed this requirement out to them. But as the device was not so big and not particularly fragile, they'd been planning to bring it to and from Country E in their carry-on baggage, and had assumed that they wouldn't need to do any extra paperwork. The device didn't look like the kind of thing that would be subject to list controls, but fortunately the administrator had noticed its name and realized that it might fall subject to export legislation, and had managed to prevent Dr. M and Dr. K from unwittingly exporting it without a license.

In addition, some of the researchers that Dr. M was planning to work with in Country E were affiliated with one of the country's governmental research institutions, and, although the details hadn't been made clear, these researchers had sent Dr. M a request asking permission to use the device for something unrelated to the survey. It can't be ruled out that, if Dr. M had brought the triaxial flux-gate magnetometer into Country E without realizing that it was subject to controls, the device might have ended up being used for some questionable purposes.

Dr. K wasted no time in applying for an export license via his University's office, and METI granted the license on condition that the equipment would be sent back to Japan as soon as the survey was done. As per their original plan, Dr. K and Dr. M decided that they would bring the equipment to Country E in their hand luggage, and would bring it back to Japan the same way once the work was done. Needless to say, they also explained to their research collaborators in Country E that they couldn't allow them to use the device for anything other than the scheduled survey.

If the administrator had only processed the property transfer application without taking the trouble to look into the question of export controls, Dr. M and Dr. K would have ended up committing a violation of the Foreign Exchange Act. The very thought of it gave them chills. The whole incident made Dr. M realize how important it was that his own University also establish an

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office to deal specifically with export controls.

## **AFTERWORD**

The Japan Society for Intellectual Production aims to promote greater interconnectedness between industry, academia, and government by looking into what happens when these three sectors, which have no common background, goals or organizational culture, attempt to collaborate, identifying problems that may arise, devising solutions, and formulating our findings into schematized knowledge bases. We take various approaches to achieving these aims.

In recent years, Japanese universities have been starting to interact more and more with foreign companies and research institutions. This presents universities with a new challenge, and means that, on both an individual and university-wide level, there is a need to increase awareness of security trade controls under the Foreign Exchange Act. Understanding these controls, and making arrangements for their implementation, is an essential part of forging and managing relationships with foreign institutions. The ongoing vitality of industry-academia-government collaborations also depends on the extent to which universities are equipped to process and comply with these rules.

In order to meet the needs of Japan's research communities in the face of these evolving circumstances, in 2009 we created our "Guidelines for Establishing and Practicing Voluntary Control Systems for Security Trade" and "Security Trade Control Guidelines for Researchers". In formulating these two sets of guidelines, we received considerable assistance from the relevant divisions and offices at METI and MEXT, including the METI Trade and Economic Cooperation Bureau's Security Export Inspection Office of Trade Control. Scientific knowledge was shared with us by specialists from a wide range of fields, recommended to us by the Atomic Energy Society of Japan, the Japan Society for Aeronautical and Space Sciences, the Chemical Society of Japan, and the Japanese Society for Virology. Our work was also supported by university management organizations such as the University Network for Innovation and Technology Transfer. We set up a working group to formulate these two sets of guidelines in collaboration with the Security Export Inspection Office, and the draft was then meticulously reviewed in meetings with interested parties from related government agencies, societies and management organizations. The working group was originally made up of five people, including myself, Masami Ito, as well as Kazunari Adachi (Professor at Yamagata University), Ryosho Kuwae (Toshiba Corporation and others), Hiroshi Satake (Professor at University of Tokushima) and Taikan Yamada (Professor at Waseda University). I would like to give special thanks to Kazunari Adachi for the contribution he made to the drafting of these two sets of guidelines.

In the past two years, the situation faced by universities in Japan and overseas has undergone dramatic changes, and a few new cases arose that had not been covered in the first edition of these guidelines. Further, since the guidelines were first published, they have been the subject of many comments, criticisms and requests from researchers and personnel at various universities and research institutions. In response to these voices, and to the changing context in which universities are working, we are now releasing revised versions of both sets of guidelines.

I would like to acknowledge the hard work and generosity of Yoshiro Sawada (Professor at Otaru University of Commerce), Yukiko Shintani (Associate Professor at the University of Tsukuba) and Makoto Otsuka (Associate Professor at J. F. Oberlin University) in helping us revise these guidelines. Finally, on behalf of the Society, I would like to offer my sincerest thanks to everyone at the Security Export Inspection Office for their tireless work in developing the first and revised

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editions.

I sincerely hope that researchers will make use of these guidelines to deepen their familiarity with export controls, and that universities across Japan will press ahead in establishing their own systems for dealing with exports controls on an institutional level.

March 22, 2011

Masami Ito,  
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### Note

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Cooperating bodies:

Ministry of Economy, Trade and Industry

Ministry of Education, Culture, Sports, Science and Technology

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