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17 APRIL 1987

Japan Report

SCIENCE AND TECHNOLOGY

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JAPAN REPORT

SCIENCE AND TECHNOLOGY

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INTROGRESSION, MICROINJECTION AND PRICKING DISCUSSED

Tokyo BIO INDUSTRY in Japanese Oct 86 pp 39-44

[Text] Introgression by microinjection and pricking methods of eukaryotic cells is characterized by its high-efficiency. Particularly, the use of these methods is effective for the case when only a small number of cells can be collected. Also, it is possible to apply them to suspended cells. This manuscript mainly describes these two methods while attaching importance to definite operating technologies.

1. Preface

The introgression of cells is an effective method for elucidating vital phenomena from organisms having eukaryotic cells. It has become possible to obtain the actual conditions of genes by processing these genes in test tubes or at the level of base DNA (deoxyribonucleic acid) sequence, because recently, progress in gene cloning has been remarkable. Particularly, a new genetic method so-called, "Reverse Genetics" in which the phenotype (function) of the above genes is assayed in cells has been established. The validity of the new method and achievements which have been obtained up to now are great.

How effectively are genes introduced into various cells on the basis of the above results? This has taken up a large problem, and many introgression technologies such as calcium phosphate method,[1] protoplast blending method,[2] electrophoresis method,[3] etc., have been developed up to now.

Of these many methods, the microinjection method[4] and pricking method[5] and [6] mentioned in this manuscript are more prominent than any other method in respect to the height of introgression efficiency, and it can be said that the usefulness of the two methods is high.

This manuscript introduces introgression according to these two methods while particularly emphasizing the explanation of detailed experimental operations.

2. Features of Methods

With regard to the introgression to eukaryotic cells according to the microinjection method, genes were immigrated into mouse L cells by Capecchi[4] for the first time in 1980. The principle of the microinjection method is as follows: the DNA solution is sucked up into an injector needle made of glass, and is injected into the mouse L cells by sticking the injector needle into them as soon as pressure was applied to the tip of the injector needle. Figure 1 shows this principle.

Figure 1. Typical Chart of Microinjection Method (a) and Pricking Method (B)

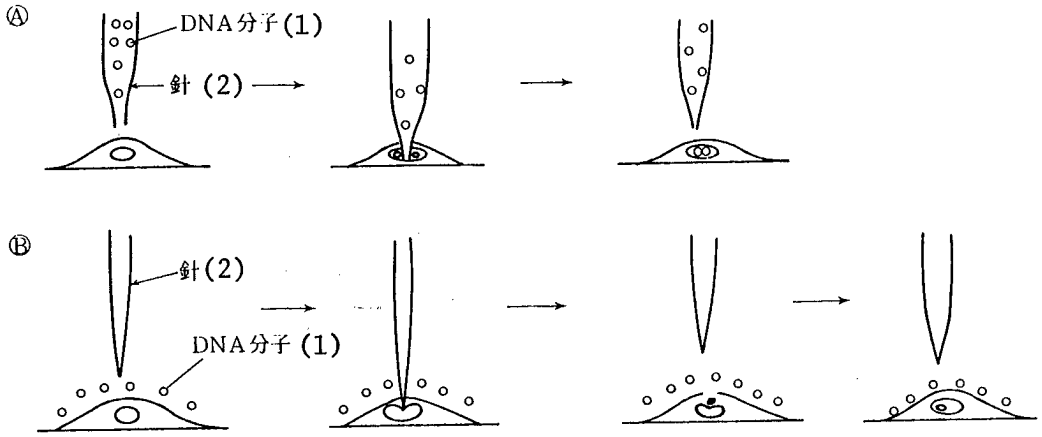


図1 ミクロインジェクション法Ⓐとプリッキング法Ⓑの模式図

Key:
1. DNA molecule
2. Injector needle

As previously mentioned, this method is characterized by high introgression efficiency. Table 1 shows the comparison among various introgression methods regarding efficiency. As clearly indicated in this table, the frequency of stable transformants which can be seen with the use of the microinjection method is 1 per 50 to 100 cells. This figure is extremely higher than that of any other method. This means that the microinjection method is effective when genes are immigrated into in-vivo cells, etc., in which the number of cells collected is limited.

Also, it has been relatively difficult up to now to immigrate genes into suspended cells. Authors show that this method can be applied when genes are immigrated into such suspended cells.[6]

Table 1. Comparison of Introgression Efficiencies According to Immigrating Method

表1 移入方法による遺伝子移入効率の比較

移入方法 (1)	遺伝子 (2)	受容細胞 (3)	移入頻度*(4)
ミクロインジェクション (5)	HSV-TK	LTk⁻	2×10^{-2} [7]
	HSV-TK	MEL Tk⁻	2×10^{-2} [8]
	neo	MEL	5×10^{-3} [9]
プリッキング (6)	HSV-TK	LTk⁻	2×10^{-2} [6]
リン酸カルシウム法 (7)	HSV-TK	LTk⁻	5×10^{-4} [10]
プロトプラスト融合法 (8)	HSV-TK	LTk⁻	2×10^{-3} [2]

* 移入頻度は，安定なトランスフォーマントの出現頻度で示してある。

Key:
1. Immigrating method
2. Gene
3. Recipient cell
4. Immigration frequency*
5. Microinjection
6. Pricking
7. Calcium phosphate
8. Protoplast blending

* The immigration frequency is shown with the appearance frequency of stable transformants.

Although the microinjection method possesses the above feature, it has the disasvantage whereby when the DNA solution is injected into many cells, the tip of an injector needle becomes clogged with pieces of cells. The pricking method was devised and developed by Yamamoto, et. al. with the idea of correcting this problem.[5]

Again refer to Figure 1. The pricking method means that a hole is made with a glass needle into the cells, and DNA molecules contained in the liquid which is outside of these cells immigrates from each hole into the cells. In the same way as the microinjection method, the pricking method has a high introgression efficiency (refer to Table 1). In addition, the pricking method possesses the following features: 1) there is no clog in the tip of an injection needle, 2) the method is suited for performing quantitative experiments, because the amount of liquid injected into cells is constant. On the contrary, it has the disadvantage whereby it is difficult to change the amount (usually, about 10-15 liter) of liquid injected into cells.

In any case, it can probably be said to be important for each experimenter to select methods suitable for the purpose of the respective experiments.

3. Operation

3.1 Machine

Basically, the unit used for the microinjection and pricking methods consists of a microscope and injector needles made of glass, but depending on the kind of units, there is a great difference in the complexity and handling difficulty. To overcome this, an inject scope (type IMT-YFI made by Olympus Optical Co., Ltd.) is devised so that it can be operated very easily. It was developed by Yamamoto, et. al., and is being used by the authors. Photograph 1 (omitted) shows the inject scope. Recently, the IMT-II type injection scope with high operationability has been produced.

Features of this machine are as follows: 1) it is possible to inject the liquid into cells from the upper portion of these cells by vertically incorporating a fine glass tube into the condenser's optical axis of a phase contrast microscope, 2) the machine is devised so that it can be operated only by longitudinally moving the injector needle and transferring the stage of the phase contrast microscope, 3) when cells are pricked with the injector needle from just above these cells, the tip of the injector needle will have no deviation.

Figure 2 shows the structure of the main sections of the machine. The metal tube (2) is fixed in a hole made in the vertical direction along the optical axis through the condensor lens (5) for the purpose of fitting the injector needle made of glass onto the lower tip of the metal tube. The injecting operation is carried out while turning a fine controlling knob longitudinally moving the condenser and injector needle. Also, the machine is devised so that the light emitted from the upper light source is converged in the vicinity of the tip of the injector needle through the ring filter (4) and condenser lens. In addition, a Teflon tube is put on another tip of the metal tube, and the pressure imposed on the tip of the injector needle can be adjusted with an injector connected to this Teflon tube.

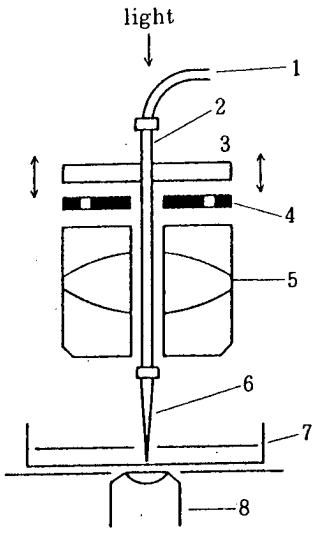
As shown in Photograph 1 (omitted), authors have connected a video camera to the inject scope, and have recorded cell movements during and after operation. The records of such a video camera are very useful for following the position of injected cells and the morphological changes of these cells.

3.2 Adherent Cells

When cells are pricked with an injector needle and these cells move, the injector needle will not stick in them satisfactorily. Adherent cells such as L cells, etc., have no problem with this matter, but when suspended cells are used, they must be fixed by adhesion to cultural laboratory dishes.

Authors have adhered suspended cells to a cultural laboratory dish coated with poly L - lysine. As a result, it has become possible to immigrate genes of these suspended cells by using the microinjection method.

Figure 2. Typical Drawing of Inject Scope
[Extracted from M. Furusawa, et. al.: "Erythropoiesis and Differentiation in Friend Leukemia Cells" (ed. G. Rossi,) Elsvier (1980)]



1. テフロンチューブ
2. 金属チューブ
3. 透明ガラス板
4. 位相差用リングフィルター
5. コンデンサーレンズ
6. マイクロピペット
7. シャーレ
8. 対物レンズ

図2 Injectoscope模式図

M. Furusawa, *et. al*: " Erythropoiesis and differentiation in Friend leukemia cells ". (ed. G. Rossi,) Elsvier (1980) より

Key:
1. Teflon tube
2. Metal tube
3. Transparent glass plate
4. Ring filter for phase difference
5. Condenser lens
6. Micro-pipette
7. Laboratory dish
8. Object glass

The detailed method is as follows.

(1) First dissolve the PM 70000 type poly L - lysine (made by Sigma Co., Ltd.) of 10 micrograms per milliliter in 0.1M boric acid at pH 8.4, and put the solution in a cultural laboratory dish.

(2) After leaving the solution as it is for 6 to 24 hours, remove the solution from the cultural laboratory dish, and wash the cultural laboratory dish once with PBS or a medium having no blood serum.

(3) Put the cell suspension liquid in the cultural laboratory dish.

(4) If the dish in which the liquid is put remains in a carbon dioxide incubator for about 2 hours, cells will adhere to the surface of the dish, and it will be possible to carry out the injecting work.

Authors are carrying out the introgression of Friend leukemia cells (MEL cells) and FM3A cells by using the above method. Also, there is little damage to cells caused by this adherent treatment, and there is little difference between the adherent treatment and the usual static culture in the proliferation rate of cells and the differentiation inductive potency of Friend leukemia cells.

3.3 Manufacturing of Injector Needles

Injector needles used for injection work are manufactured while thinly stretching a glass tube. The outside diameter of the glass tube is about 1 millimeter, and in the case of the microinjection, a glass tube in which there is a thin glass needle inside is used. (Authors use such a glass tube made by IF Shokai.) When liquid is injected into an injector needle without any use of such a glass tube, the liquid will not reach the end of the injector needle. Therefore, it is necessary to be careful not to do this.

Also, optimum injector needles are manufactured on the basis of the result of adjusting the length and thickness of the tip of these injector needles by using a scale for injector needle manufacturing equipment made by Narishige Co., Ltd. According to the authors' experience, it is better to determine the length of a section of the needle tip at 6 or 7 millimeters. Also, when cells are relatively resistant to physical damage caused by injection, it is permissible to thicken an injector needle slightly by striking and breaking it on a cultural laboratory dish, after the injector needle is set on the condenser.

When an injector needle manufactured in accordance with the above method is installed on the inject scope, it is necessary to be careful about the length from the condenser lens to the needle tip. This is because the inject scope is a phase contrast microscope, and the distance between the condenser lens and cells has a large influence on the image. Therefore, it is desirable to set the distance between the condenser lens and the needle tip to about 2.5 centimeters.

3.4 Injecting Operation

After setting an injector needle, put a cultural laboratory dish to which cells are adhered on the inject scope stage, and prick these cells with the injector needle. When the inject scope is used, the number of operations for pricking them is only two, i.e., longitudinal slide of the injector needle and movement of the stage. These operations themselves are very simple, but depending on the method, cells can be damaged seriously, and this damage will lower the injection efficiency. Therefore, care must be taken to the following operational points.

(1) First do not simultaneously carry out the longitudinal slide of the injector needle and movement of the stage.

(2) Particularly, when solution is micro-injected into suspended cells, do not thicken the needle tip extensively. If this is not done these suspended cells will be damaged seriously.

(3) In the case of the microinjection method, do not inject too much solution into the cells. Also, operate the inject scope while checking to ensure at all times that the solution comes out from the needle tip.

4. Application Example

As previously mentioned, it is possible to apply introgression according to the pricking method and microinjection method using an inject scope on suspended cells as well as adherent cells such as mouse L cells, etc. The following are results of introgression to mouse Friend leukemia cells which are suspended cells.[9)]

When the anterior erythroblast is stocked during differentiation, it will become a mouse Friend leukemia cell. The differentiation of erythroblasts is induced by adding DMSO (dimethyl sulfoxide), butyric acid, etc., to the medium, and a model system with high differentiation can be obtained. Authors have made a chmeria gene by combining a structural gene area of thymidine kinase genes from the herpes simplex virus with a place behind an area including about 1 kbp, which is 5' upstream from the cap site of mouse beta globin genes, and have investigated how this chimera gene depends on differentiative induction and how it is manifestly regulated when injected into Friend leukemia cells using the microinjection method.

As a result, it is recognized that when the immigrated chimera gene is a transient-assay which has not been incorporated in the chromosome DNA or when a stable transformant incorporated in the chromosome DNA is investigated, the chimera gene immigrated into cells will be manifested while depending on differentiative induction. This means that beta globin genes are manifestly regulated in a 5'-upstream-1kbp area, intracellular factors which act on the area function without depending on the existent condition of the genes, and it is then possible to analyze the genetic manifestation controlling mechanism by using the microinjection method. The above produces very interesting results.

5. Conclusion

Authors have mentioned the features and operating methods of introgression according to the microinjection method and pricking method up to now. As repeatedly mentioned, the most important feature of these methods is that the introgression efficiency is high. These methods will probably be effective for the case when only a small number of cells can be used in experiments or when the effect of introgression is investigated by using a trangent assay at a level of a cell. Also, it will probably be possible to simultaneously immigrate DNA and a kind of protein into cells.

Recently, new genetic methods such as inhibitation of gene expression according to anti-sense RNA (ribonucleic acid), etc., have been developed,[11] and the importance of introgression methods have been enhanced increasingly. It is expected that the microinjection and pricking methods mentioned in this manuscript will be used in many experimental systems and will be technically improved in the future.

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DEFENSE TECHNOLOGY R&D AS SEEN IN DEFENSE WHITE PAPERS

Tokyo BOEI GIJUTSU in Japanese Jan 87 pp 2-27

[Article by Asaichiro Ozawa, senior consultant of Defense Technology Foundation: "Equipment and Defense Technology R&D as Seen Through White Papers on National Defense (1976-1986)"]

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4.1 Basic Attitude Concerning Acquisition of Equipment
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(Reference: Defense Production and Japanese Industry)

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(Reference: U.S.-Japan Defense Cooperation)

V. Conclusion

I. Introduction

In 1970 when Prime Minister Nakasone was director general of the Japan Defense Agency (JDA), the JDA issued the first defense white paper, "Defense of Japan." It announced "the current status and problems of the Self-Defense Forces," along with stating the views of the JDA concerning "the significance of defense in modern society" and "the ideal defense for Japan," constructively raised defense problems, and treated the Self-Defense Forces as part of the people.

At the time, however, it was close to the end of the 3d Defense Buildup 5-year plan (DBP), which had begun in 1967, and the 4th DBP, to begin in 1972, was in the midst of being drafted. Moreover, there was a pervasive mood for detente throughout the world and it was a time when the extent that Japanese defense capability should be increased in peacetime, i.e., the limits of defense capability, was becoming a great political, social question. For those reasons, it became difficult for the JDA to continue to publish "defense white papers."

Additionally, there was the oil shock in 1973 and the Japanese economy was seeking to get back on track of its previous high-growth economy. Since it was difficult to expect a large increase in defense expenditures, the JDA itself had to abandon defense buildup plans according to the "3- to 5-year fixed method" based on the existing "concept of defense power required." It was not a situation that would allow the issuing of defense white papers for some time.

The goal of Japan's defense buildup is that it must be realistic, achievable in the foreseeable future, and, in a certain sense, complete, with adequate consideration to the two important conditions of the economic and financial situation and the international environment surrounding Japan. A new concept of "basic defense buildup," as the post-4th DBP basic concept, was solidified for the most part under Director General Sakata (former president of the House of Representatives) in 1975.

Therefore, four specific policies (1. a defense think tank, 2. activation of the National Defense Council, 3. establishment of a committee in charge of defense in the Diet, and 4. publication of defense white papers) with the consensus of the people were promoted by Director General Sakata's idea that "No matter how strong of spirit the Self-Defense Forces are, or what superior weapons they are provided, they truly will not have the power to effectively protect the nation without the understanding, support, and cooperation of the people." As one of these policies, the second "defense white paper" in 6 years, based on this "concept of basic defense capability," was compiled and published in 1976 and in general had wide subscription.

Since then, the "defense white paper" has continued to be published each year to date and the 1986 edition was the 12th. Among these 12 defense white papers, the treatment of issues such as "equipment" and "defense technology R&D" has been varied. A full 10 years now have passed since the "Outline of the Defense Plan," which had become the basic doctrine of Japan's defense, was decided by the Miki Cabinet in October 1976. On this occasion, these accounts of equipment and defense technology R&D were assembled and the changes and shifts studied with thought to the role defense technology R&D plays in the concept of future equipment. This is how this article was put together and published. What is stated below was compiled with only the "defense white papers" as data and no other data was referenced. Since the reader should know the limits of the defense white papers, a warning on this point is given beforehand. Consequently, there are many places which quote the defense white papers directly for the most part. Also, it is acknowledged that some points are somewhat redundant. (The portions citing the white papers are indicated by quotes.)

II. Japan's Equipment as Seen From Defense White Papers

1. Limits to Japan's Defense Capability--Equipment Limits

(1) 1970 White Paper (see p 36)

The first defense white paper argues the limits of Japan's defense power from constitutional and policy limits. It states with regard to the limits of equipment that nuclear weapons or equipment which pose a threat of aggression to other countries, such as long-range bombers, attack aircraft carriers, or ICBM, cannot be possessed.

"(5) Limits of Defense Power

"a. Constitutional limits

"(a) Because the defense capability of Japan is for self-defense, the scale must correspond to that necessary for self-defense. The specific extent of self-defense capability meant by that cannot as a rule be stated due to the various conditions of science and technology development and all the circumstances of the time. In any case, however, equipment that poses a threat of aggression to other countries such as long-range bombers like the B-52, attack aircraft carriers, and ICBM cannot be possessed.

"(b) Omitted (Prohibition of Overseas Troop Dispatch)

"b. Policy limits

"(a) The three nonnuclear principles will be held with regard to nuclear weapons. Even though it is constitutionally possible to possess small nuclear weapons if they are within the minimum power necessary for self-defense and do not pose a threat of aggression to other countries, as a policy the course has been taken not to have nuclear equipment.

"(b) Japan's defense capability will be within the limits necessary for self-defense and up-to-date, effective defense capability is to be provided, while maintaining appropriate harmony with social security, education, and other policies. Consequently, it is by no means appropriate that the apportionment of national resources for provision of defense capability should be simply in proportion to increases in economic power and determined by a percentage of the gross national product or national budget."

(2) 1976 White Paper (see p 35)

In the second defense white paper in 1976, after stating about the same as the 1970 edition concerning constitutional limits to equipment under the headline of "the basic significance of defense," the following was stated concerning nuclear weapons:

"As a policy, Japan adheres to the three nonnuclear principles not to possess, make, or bring in nuclear weapons, and will depend upon the deterrence power of the United States via the U.S.-Japan security structure with regard to nuclear threats. It is believed that such nuclear deterrence power is effective and reliable under the close relationship between the United States and Japan. Even though it is possible for Japan to provide nuclear weapons solely for defensive use, it would create great suspicion and anxiety toward Japan among foreign nations, particularly neighboring Asian countries if they were in fact possessed.

"So long as these decisions stand, there is no necessity for Japan to be nuclear-equipped either politically or from a military viewpoint.

"The road which Japan should take is to provide reliable defense power through conventional weapons, adhering to the U.S.-Japan security structure and not directing concern to these nuclear weapons."

(3) 1977 White Paper (see p 80)

Under the headline "Quality of Basic Defense Power," in the 1977 White Paper, the following is clearly and simply stated concerning limits to upgrading the quality of equipment:

"Since Japan's defense capability must be defensive defense, fully devoted to self-defense, in planning for qualitative development and upgrading, weapons used solely for the annihilative destruction of the opponent's mainland, long- or intermediate-range ballistic missiles (ICBM, IRBM) for example, shall not be possessed. Also, the existing policy not to use nuclear weapons shall not be changed."

(4) 1978 White Paper (see p 56)

Under the headline "Pacifism and Defense Power," in the 1978 edition, it is stated that the specific details of defense capability which should be held by Japan should be determined according to the international situation, the standards of military technology, and other conditions of the time, as follows:

"In other words, Japan's defense capability is limited purely to defensive defense, the specific details of which must be judged in the nature of things, according to the international situation, the standards of military technology, and other conditions of the time. Since there must be no mistakes in that judgment, it will be subject to Diet control in addition to complying with particularly prudent procedures in administrative government departments according to the principles of civilian control for extra insurance.

"Selection and employment of the individual weapons to comprise defense capability will be within the scope normally necessary for defensive defense. Consequently, weapons used solely in a capacity for annihilative destruction of another country's mainland -- ICBM and long-range bombers are cited as examples -- cannot be possessed under any circumstances.

"Also, as for nuclear weapons, there will be adherence to the three nonnuclear principles "not to possess, make, or bring them in" ourselves, Japan having requested the abolition of nuclear weapons as the sole nation to have been bombed, and the policy has been taken not to possess them at all, regardless of whether or not possession is permitted under interpretation of the constitution. Under the law, according to the provisions of the Atomic Energy Act, and under the treaties, according to the treaty concerning nonproliferation of nuclear weapons signed in June 1976, as a nonnuclear weapon nation under that treaty, Japan cannot be equipped with any nuclear weapon."

(5) 1979 And Ensuing White Papers

The 1979 edition and ensuing white papers simply have stated the gist of the 1978 edition.

2. Defense Power That Should Be Maintained Based on Basic Defense Capability Concept

2.1 Basic Defense Capability Concept

There is a new way of thinking about the basic defense capability concept that was not seen until the 4th DBP. The premise up to then had been that "the concept of defense capability required" was to deal with "a limited invasion." A major characteristic of the "basic defense capability concept" is to be able to deal effectively with situations up to "both a limited and small-scale invasion." (See pp 52 and 54 of 1977 edition) (Hereafter, the year edition refers to the year edition of the white paper.)

"What is the 'basic defense capability concept'? To state it in a few words, it is thought that the defense capability which Japan should possess in accordance with the 'Outline of the Defense Plan':

"a. stands on the premise that there will be no great changes for the time being in the aforementioned internal or external situation,

"b. has as the chief aim, possession of a posture in which there is a balance taken between provision and organization of the various kinds of functions necessary for defense, including a rear support system, and deployment,

"c. and along with taking an adequate alert posture with this in peacetime, is able to deal effectively with situations up to both a limited and small-scale invasion,

"d. and in addition, when major changes occur in the situation so that a new posture of defense capability is considered necessary, consideration is made toward a smooth shift."

"The previous buildup of defense power had been premised on an invasion on a scale not reaching all-out war or a large-scale military conflict, that is, "a limited invasion." In other words, it can be said that the goal was to build a defense capability which could deal with what it considers a threat having the capability to mount a limited invasion against Japan.

"In contrast, in the 'basic defense capability concept,' the amount of defense capability is not calculated solely considering the amount of threat. For example, it should represent a balanced posture, with no gaps in organization and deployment, and the amount of defense capability is investigated from the viewpoint that an adequate alert posture is taken in peacetime. Taking the approach that the scale of defense power has as its aim the ideal peacetime defense capability is the salient feature of the 'basic defense concept.' By this, it has become possible for the first time to specify clearly the scale of defense capability which is Japan's goal."

On what theoretical basis was this thinking formed? The 1977 edition (see p 52) explains as follows:

"Generally, it is believed that 'a threat' is broadly divided into 'capability' to invade and 'intention' to invade. No matter how great the capability, the threat is not real if there is no intention. It can be said that a threat becomes real when an invasion is made combining intention with capability.

"Capability, which is one element comprising a threat, does not change suddenly since it requires a long time to build up military power, and it has the feature that it can be estimated from the outside and future changes calculated since it is manifested in a material and external form.

"Intention, the other element comprising a threat, is, in the final analysis, the will of a human being and is easily changed depending on the circumstances. It essentially connotes instability and is difficult to detect from the outside.

"With the basic defense capability concept, the view that intention changes easily and is difficult to detect does not change with the concept of defense capability required, but attention additionally is paid to the following points. In other words, the intention here is the will as a nation 'whether or not to invade another country.' The decision to 'mount an invasion' is not handed down at one's pleasure, even for a policy decisionmaker when the magnitude of the result and effects exerted on international politics are considered. In short, this intention is entangled with the international situation and international political structure as a practical issue and its variability can be seen as restricted as a matter of course. Such restrictions can be said to function more strongly the greater the scale of the invasion intended. From this viewpoint, in the 'basic concept of defense capability,' the action of invasion is difficult to ascertain in advance. In other words, large-scale preparations are not conducted and provision can be made in peacetime for an invasion to be mounted by surprise attack with just about the same armament posture."

2.2 Defense Posture Seen By Function

(1) 1976 edition (see p 43)

Under the headline "Basic Character of Defense Capability," the following is stated concerning what defense functions should be possessed and how those defense functions should be provided, organized, and activated in emergencies and in peacetime.

"First of all, various kinds of defense functions are to be provided without fail so that the minimum necessary countermeasures can be taken against invasions by various kinds of methods presumed to be with conventional weapons.

"If Japan's defense capability is functionally lacking somewhere, no countermeasures can be taken at all in that area and it will permit the opponent to act freely.

"Consequently, Japan's defense capability must not be lacking in the various kinds of functions to play the respective roles of air defense, sea defense, and ground defense, functions such as intelligence and command communications, and in addition, the various kinds of support functions to maintain them.

"Second, these various types of functions will be provided and organized according to the topographical features of Japan so that organized defense actions can be implemented from the outset of the invasion in the mainland or any area of the surrounding sea or skies. Also, these organizations will be organically assembled and maintained in a form that has a balance between fighting units and rear support so that comprehensive defense capability can be demonstrated against the invasion.

"Third, in peacetime, along with maintaining a human foundation to implement meticulous training and ensure the superior troops required, emphasis must be placed on activities for the public welfare such as conducting rescue activities when natural calamities or other large-scale disasters occur.

"For these purposes, along with deploying units so that there will be no geographical maldistribution, the related facilities and materials will be provided."

(2) 1977-1985 editions

The following six defense postures as seen by the functions of basic defense capability are indicated in "4. Defense Posture" in the "Outline of the Defense Plan." All the white papers describe them.

[1] Alert posture

[2] Posture to deal with indirect invasion or illegal acts with military power

[3] Posture to deal with direct invasion

[4] Intelligence communication and rear support posture

[5] Education and training posture

[6] Disaster dispatch posture

(3) 1986 edition

Under the headline "Defense Capability That Japan Should Maintain," the 1986 edition combines the 1976 and 1977 editions in a condensed statement. (See p 92)

In "2. Major Buildup Details" of the new Mid-Term Defense Buildup Plan, the following 12 postures are cited. (See page 335.)

[1] Mainland air defense capability

[2] Defense capability of surrounding sea area and capability to ensure the safety of maritime transportation

[3] Capability to deal with a land invasion

[4] Transport capability and mobility

[5] Intelligence, reconnaissance, and command communications capability

[6] Adaptive posture, sustained fighting capability, and resistance

[7] Education and training system and rescue system

[8] Personnel and health services

[9] Facilities

[10] Technical R&D

[11] Support for stationing of U.S. military in Japan

[12] Other (air refueling function, air defense capability at sea, etc.)

2.3 Quantity of Defense Capability That Should Be Maintained

(1) Premise of Basic Defense Buildup Concept

Since up until the 4th DBP, defense capability was essentially relative, buildup was based on the so-called "required defense capability concept" that if the threat increased, defense capability should increase to correspond to it and there was much opposition to a shift to a basic defense capability concept and the establishment of quantitative limits to defense capability in peacetime. There were economic reasons also, however, and a consensus was obtained in JDA with the buildup of basic defense capability based on the following premise. (See 1977 edition, p 55)

"The 'Basic Concept of Defense Power,' as stated before, has as a goal the capability to deal effectively with situations up to 'both a limited and small-scale invasion,' but there probably is no possibility at all that an invasion exceeding one of small-scale will occur in Japan. On this point, in the 'Basic Concept of Defense Power,' such a possibility is judged to be very small because of the international situation, in which efforts for

stabilization are continuing, as stated before, and also due to the international structure of neighboring countries. On the other hand, however, the future of the international situation normally includes uncertain elements, and the future cannot be judged by anyone. If, in particular, the essence of defense is to prepare for an emergency situation, those uncertain elements cannot be ignored.

"For this reason, in the 'Basic Concept of Defense,' while handing down such decisions as generally stated above, in the future the aforementioned international situation and international political structure will be handled on the 'premise' that henceforth 'they will not greatly change for the time being' and standing on this 'premise,' the goal will be to deal effectively with situations up to 'both a limited and small-scale invasion.' Consequently, if a great change in the situation occurs and this 'premise' collapses, naturally expansion and strengthening of defense power will be conducted to offset this and in preparation for that event, various considerations will be made beforehand to enable a smooth shift to a new posture of defense capability.

"However, the great changes in the situation mentioned here do not refer to changes in individual events, but to serious changes concerning the 'underlying tone' of the situation stated before. To state this specifically, as examples, the following points can be called cases for great change.

"a. The U.S.-Japan security structure will be effectively maintained in the future.

"b. Both the United States and the Soviet Union are trying to avoid a nuclear war or a large-scale military war that has the danger of developing into one.

"c. Even supposing that Chinese-Soviet relations will partially improve, it will not extend to a fundamental elimination of the opposition.

"d. U.S.-Chinese relations will continue with mutual reconciliation in the future.

"e. The current conditions in the Korean peninsula will progress for the most part, or at least no great military conflict will occur."

(2) Level of Minimum Defense Capability Required That Should Be Maintained in Peacetime

Based on these premises, the "Outline of the Defense Plan" (see 1977 edition, p 167) indicates specifically in the text the structure that should be maintained for each of the Ground, Maritime, and Air Self-Defense Forces. From this structure, the scale of each of the Self-Defense Forces, as the level of minimum defense power required that should be maintained in peacetime, or in other words, the specific scale

of key units and major equipment, is indicated in the "Attached Tables of the Outline." (See Table 1) However, the framework for these tables was created premised on the equipment systems and trends in armament of neighboring countries at the time the Outline policy was set.

The basis for calculating this scale for each of the Self-Defense Forces appeared in the 1977 edition (see p 63), a summary of which follows.

"a. Ground Self-Defense Force

"(a) For basic defense power, the most important divisions of the GSDF will be deployed with a balance according to topographical features since it is necessary to conduct unit deployment with no gaps nationwide.

"The topography of Japan chiefly is divided by mountain ranges, rivers, and sea straits. If, however, consideration is given to prefectural borders from the convenience of administrative affairs in peacetime, the whole land of Japan is divided into the three districts for Hokkaido of North, East, and Central, the two districts for Tohoku of North and South, Kanto, Koshinetsu, Tokai Hokuriku, Kinki, Chugoku, Shikoku, the two districts for Kyushu of North and South, and Okinawa, for a total of 14 districts. For this reason, 14 units are necessary as units to be deployed regionally in peacetime. If Shikoku and Okinawa have composite brigades deployed due to regional features, and the others, one division each, ultimately 12 divisions and 2 composite brigades are necessary.

"(b) Mechanized divisions, artillery brigades, airborne brigades, training brigades, and helicopter brigades are necessary as units which can operate with mobility to support and replenish divisions as necessary. It is considered that at the minimum, there should be one unit each so that gaps will not be created in the various kinds of functions.

"(c) Important regions for low-altitude air defense are indicated in Figure 11 (omitted). As there are a total of eight regions: Kanto and Kansai which are political and economic centers, Seikan and Kanmon which are strategic points for transportation, and north and central Hokkaido which are important sites for defense, and western Kyushu and Okinawa, eight anti-aircraft artillery groups are to be maintained as surface-to-air guided missiles units for low-altitude air defense.

"(d) The above-stated key units are the center of the Ground Self-Defense Force, and if a rear support branch such as depots to support them are provided, 180,000 men are considered necessary. For this reason, the authorized number of self-defense personnel for the GSDF has been made 180,000 men.

"b. Maritime Self-Defense Force

"(a) Escort flotillas are the basic unit of the antisubmarine surface ship units which operate with mobility. If a situation such as an invasion should occur in a sea area neighboring Japan, at least one such escort flotilla unit must always be maintained in a readiness posture to proceed immediately to the site and undertake the necessary countermeasures.

"However, since it is necessary for ship units to have considerable spare time for ship repairs and the basic training required due to replacement of crew with new men, the highly trained period enabling accomplishment of duties as an escort flotilla under difficult conditions such as darkness and foul weather is limited. Consequently, four escort flotillas are considered necessary in order to maintain at least one escort flotilla regularly in a highly trained status.

"(b) In accordance with the topographical features of Japan, the coastal sea areas have been divided into five sea regions for patrol and defense, and regional district units are maintained for patrol and defense of the respective sea regions. At least one ship division is to be maintained regularly in a mobile posture for each of these regional units. Since 2 divisions are required for every regional unit in order to maintain this posture, a total of 10 divisions are necessary.

"The estimate at the end of the 4th DBP was 4 escort flotillas and 10 divisions deployed to the regional district units. There are 49 destroyers and 12 subchasers for a total of 61 antisubmarine surface ships assigned to these units. It is generally considered necessary to guarantee the maintenance of this number of ships as antisubmarine surface ships for basic defense capability.

"(c) Submarine units are for patrolling and defending the major sea straits as necessary. In order to maintain the structure of deploying one division each to the three sea straits of Soya, Tsugaru, and Tsushima, a total of six divisions, two for each strait, is considered necessary. Normally, 3 submarines per division are necessary for this but since some of the divisions can operate with 2 submarines because of the relationship of tactical sea area and base, operation is to be with a total of 16 submarines.

"The rotary-wing antisubmarine aircraft squadrons are for the defense of both the Tsugaru and Tsushima Straits as well as Keihin, Hanshin, and the major harbors on the Japan Sea as required, and for this purpose it is necessary to maintain five squadrons.

"The minesweeping units are to remove and dispose of mines laid in major harbors and sea straits. Two minesweeping flotillas are to be maintained in order to maintain one minesweeping flotilla each in the eastern Japan Sea region and the western Japan Sea region. At present, minesweeping units are placed in each regional district unit, but the current status probably will be maintained in the future for the most part

since these are indispensable for accomplishing the duties of the regional units.

"(d) It is necessary to maintain the current status of 11 fixed-wing antisubmarine aircraft squadrons in order to implement as required one trip per day in the sea areas surrounding Japan with 300 nautical miles on the Pacific Ocean side and 100-200 nautical miles on the Japan Sea side, as well as to have a minimum of one squadron each for escorting ships as required on ocean routes and coastal routes. Consequently, combined with the rotary wing antisubmarine aircraft previously mentioned, 16 antisubmarine aircraft squadrons with land bases are necessary.

"Also, there are to be 220 tactical aircraft for the MSDF. These center on the aircraft for the previously mentioned fixed-wing antisubmarine aircraft squadrons and rotary-wing antisubmarine aircraft squadrons and include in addition shipboard antisubmarine aircraft and minesweeping aircraft. Combining these, the estimate for the end of the 4th DBP was about 210 aircraft, but an increase of about 10 shipboard helicopters are being considered for a helicopter destroyer (DDH) currently under construction and already authorized in the budget.

"(e) The 'Outline of the Defense Plan' does not clearly indicate ship tonnage. This is because throughout the world the actual state of maritime defense power is indicated by number of ships in a ship classification, not by tonnage. Also, fluctuations in ship tonnage occur depending on the equipment onboard and what specific equipment is carried should flexibly be selected to deal with future armament trends and technology level trends in foreign nations and cannot be established beforehand.

"c. Air Self-Defense Force

"(a) As indicated in Figure 13 (omitted), it is necessary to deploy stationary ground radar at 28 locations nationwide. For this purpose, 28 aircraft control and warning groups are to be maintained. In this case, as indicated in the figure, there must be sufficient capability for low altitude. For this purpose, it is necessary to possess the warning squadrons stated later for early-warning surveillance against a low-altitude intrusion.

"(b) With regard to fighter units, it is necessary to take a standby posture in six districts nationwide, as indicated in Figure 14 (omitted) due to the relationship between the topography of Japan and the operational radius of the fighters. Since this standby must be implemented 24 hours a day continuously throughout the year, readiness is provided by an exchange system for experienced pilots and fighters, but 2 squadrons are necessary for one district due to the relationship of pilot fatigue, training for skill maintenance, and fighter operation time.

"Consequently, a total of 12 squadrons is necessary to take a standby posture nationwide but since normally in addition 1 squadron is necessary chiefly for pilot training in conversion of aircraft types along with fighter modifications, a total of 13 squadrons is necessary for ASDF fighter units. The possession of these 13 squadrons is divided into 10 interceptor-fighter squadrons and 3 support fighter squadrons. The support

fighter units, which primarily have the duty of blocking and attacking at sea or over ground-landing invasion units, also are assigned the duty of dealing with air territorial violations in peacetime.

"The high-altitude air defense surface-to-air guided missile units are indicated in Figure 11 (omitted). Six air defense missile groups are to be maintained for air defense of the various regions of central Hokkaido, Seikan, Kanto, Keihanshin, Kita Kyushu, and Okinawa, which are important political, economic, and defense areas.

"(c) The possession of three support fighter squadrons for blocking a landing invasion and for ground support is as stated above. One squadron is to be maintained for an air reconnaissance unit.

"As stated before, there are limits to ground radar sites alone for early detection and sighting of aircraft penetrating at a low altitude. In order to supplement the deficiencies of ground radar, warning surveillance radar is carried aboard aircraft, as indicated in Figure 15 (omitted), it is necessary to operated these as airborne radar sites. Such aircraft are called airborne early warning aircraft (AEW). Since under the current situation, the early warning surveillance function by AEW aircraft is lacking, one early warning squadron is to be maintained to provide this.

"Three squadrons are to be maintained for air transport units so that the required air transportation can be implemented.

(d) The total number of tactical aircraft for the ASDF is about 430 aircraft. The breakdown is chiefly about 250 interceptor fighters necessary for maintaining the 10 interceptor squadrons and about 100 support fighters necessary for maintaining the 3 support fighter squadrons previously mentioned. The remainder are reconnaissance aircraft, transport aircraft, and early warning aircraft."

2.4 Quality of Defense Capability That Should Be Maintained

(1) Quality as Basic Defense Capability

There are quantitative and qualitative aspects to defense capability. Provision of defense capability by function is not quantitative alone and must be accompanied by the necessary quality to maintain the structure of the Self-Defense Forces. The 1977 edition (see p 80) states as follows that the quality of basic defense capability is necessary to deal with threats and it normally is necessary to plan for qualitative development and upgrading.

"Since defense capability is to block beforehand an invasion against Japan or to expel an invasion should it occur, if the defense capability does not have the quality to meet the quality of the threat, it will be incapable of preventing beforehand or expelling that invasion and with such defense capability, the very objective of possessing defense power cannot be accomplished at all.

"However, the quality of the threat normally continues to develop and be upgraded along with advances in technology. For this reason, in the maintenance of defense capability to meet this, Japan normally must plan for qualitative development and upgrading of defense capability. For this purpose, in the provision of equipment efforts are to be made for improving our technological R&D posture to contribute to upgrading the qualitative level of defense capability along with appropriate considerations for domestic production."

(2) Quality of Defense Capability Indicated in the Outline of the Defense Plan

The Outline of the Defense Plan explains as follows in the 1978 White Paper (see p 77) regarding the need to plan for qualitative upgrading of defense capability and the need for repletion of a technology R&D posture for this purpose.

"The Outline specifies with regard to quality of defense capability, in addition to defense capability by function and quantities of defense capability mentioned previously, that 'efforts will be made to plan for qualitative maintenance and upgrading of defense capability to accomplish Japan's defense objectives,' and 'in provision of defense capability, these will be maintained considering qualitative improvement and upgrading to deal with the trends in technology levels of foreign countries.'

.....

"The buildup of future defense capability for Japan will chiefly be maintenance and upgrading of quality, but the qualitative development and upgrading of defense capability must be planned in a form corresponding to the trends in technology levels of foreign countries, within the scope permitted by the constitution.

"Also, in the provision of equipment items on those occasions, efforts are to be made for repletion of a technology research and development posture in order to contribute to the maintenance and upgrading of qualitative levels of defense capability, along with appropriate considerations for domestic production."

(3) 1979 Edition and Thereafter

In the 1980 to 1983 editions and the 1986 edition, nothing special is noted under the particular heading "Quality of Defense Capability," but in the 1979, 1984, and 1985 editions, the "Quality of Defense Capability" in the 1978 edition is stated with some adjustments. (See 1979 edition, p 79; 1984 edition, p 78; and 1985 edition, p 84)

3. Operational Functions and Equipment Systems That Should Be Maintained as Basic Defense Capability

The scale of the various Self-Defense Forces that should be possessed as basic defense capability, or in other words, a tentative scale of key units and major equipment, is indicated in the Outline of the Defense Plan (see Table 1), but it does not indicate what specific tactics are presumed or what equipment systems should be maintained.

Recently the opinions of some have emphasized the sea and air in considering the situation of a direct invasion and in the basic thinking about which defense tactical capabilities the various Self-Defense Forces should have, but officially there have been almost no changes since the 1976 Defense White Paper. Since the new Mid-Term Defense Buildup Plan was decided in September 1985 and clearly indicated the major buildup details, the 1986 edition states comprehensively the tactical functions and equipment systems that should, therefore, be maintained as basic defense capability.

Table 2 indicates the various tactical functions and the corresponding major equipment from this. (See 1986 edition, pp 105, 121)

Since a diagram of the relation between these tactical functions and major equipment is carried in the Defense White Paper, mention will be made of this.

(1) Air Defense Tactics

Figure 1 is a diagram centering on hardware in the 1978 edition. AEW have not yet been added.

Figure 2 is a diagram centering on software, or in other words, how operations unfold dividing detection/identification and intercept/defeat along with the flow of intelligence and commands, in the 1986 edition.

Though not indicated on the diagram, base air defense weapons (TANSAM, portable SAM, anti-aircraft machineguns) are deployed to ensure base resistance.

(2) Tactics Dealing With a Landing Invasion

Figure 3 diagrams only the GSDF relationship in the 1981 edition.

Figure 4 diagrams the joint operations of the Ground, Maritime, and Air Self-Defense Forces in the 1986 edition. In particular, the respective Ground, Maritime, and Air Self-Defense Forces are equipped with the respective antiship missiles of surface-to-ship missiles (GSDF), ship-to-ship missiles (MSDF), and air-to-ship missiles and the intention that the enemy should be defeated over the ocean is clearly indicated. Furthermore, minefields to prevent landings, field surveillance radar, and scout patrol vehicles are newly added. Also, it is not clear from the diagram, but in the 1981 edition there are only HAWK anti-aircraft missiles, and the 1986 edition includes TANSAM and portable SAM in addition to HAWK.

(3) Antisubmarine Search and Attack Tactics

Comparing Figure 5 in the 1977 edition and Figure 6 in the 1986 edition, the latter newly adds a towed-array sonar system (TASS).

(4) Air Defense Tactics at Sea

Compared to Figure 7 in the 1980 edition, Figure 8 in the 1986 edition shows a lot of new equipment with missiles (SSM, USM), high-performance 20mm machineguns (CIWS) to defeat these, and electronic warfare equipment (IR decoy, chaff).

4. Buildup of Basic Defense Capability and Modernization of Equipment

4.1 Policy for Implementing Buildup of Defense Capability

(1) 1977-1978 editions

The goals of basic defense capability which should be maintained by Japan are specifically indicated in the attached tables of the Outline of the Defense Plan. The 1977 edition clearly describes the method of defense buildup for realizing these goals, or rather, the scale of defense-related expenditures, but the 1978 edition compiles the same contents as follows. (See p 79, 1978 edition)

"The goals of defense capability that Japan should maintain are as indicated above but, on the other hand, the realization and implementation of these goals will be according to the following method.

"First, the planning method will not be not by a so-called '5-Year Fixed Method' plan which defines the details of the buildup for a immediate 5-year period in the process of building toward the goals of the defense buildup as it has been up to now. It will be conducted mainly by a so-called 'single-year method' in which necessary decisions are made year by year.

"The reason is that, while on the one hand, there has been little significance or necessity to indicate the process of reaching the goals as there has been up to now since the future buildup of defense capability is mainly to maintain and upgrade quality rather than increase quantity, it is necessary to be able to deal flexibly with changes in conditions at the time such as the trends in technology levels of foreign countries. Also, considering the economic and financial situation of Japan where there are many fluid factors in changing times, the determination of the large framework of defense expenditures beforehand is inappropriate, and it is believed proper to deal flexibly considering the economic and financial situation year by year.

"Also, from the viewpoint that the scale of future defense-related expenditures should be decided with consideration to a balance with other national policies and a cautious accumulation of expenses necessary for defense, studying internal and external conditions, the basic policy is

indicated in the Outline as 'it will be conducted striving for harmony with other national policies, considering the economic and financial conditions at the time.'

"However, it is believed important that a 'goal' for annual defense-related expenditures be indicated with regard to the immediate defense buildup under this basic policy, to answer any doubts about 'the extent of defense-related expenditures.' The government has made comprehensive judgments on the outlook of the economic and financial situation and future defense buildup based on the Outline and the past record, and has made a Cabinet order separate from the Outline that "in the implementation of defense buildup, for the present, annual defense-related expenditures will be made with the goal that they will not surpass an amount corresponding to 1 percent of the Gross National Product.' 'For the present' here means that based on the aforementioned basic policy indicated in the 'Outline of the Defense Plan,' this decision has not predetermined any fixed deadline and when it is deemed necessary along with changes in internal or external conditions, there is the possibility of conducting a new study with regard to the contents of said decision.

"According to this method, an annual defense buildup will be specifically implemented in the future, but decisions on the following important matters will be made a Cabinet decision in consultation with the National Defense Council from the viewpoint of civilian control.

"1. Changes in unit organization, composition, or deployment requiring revisions to the Self-Defense Force Law (1954 Law No 165).

"2. Changes in the number of authorized Self-Defense personnel or reserve Self-Defense personnel.

"3. Quantities or types of the following equipment:

"--GSDF tanks, major missile weapons, and tactical aircraft

"--MSDF destroyers, submarines, and tactical aircraft

"--ASDF tactical aircraft and major missile weapons

"--Equipment other than that mentioned in Item 3. which requires a long period of several years for provision and requires a large expenditure.

"4. Expenditures requiring a large amount over a long period for development items related to the equipment cited in the above paragraphs."

(2) 1979 to 1985 edition: Mid-Term Operations Estimate

Under the headline "Policy for Defense Buildup Implementation" or "Policy and Matters for Consideration in Defense Buildup

Implementation" from the 1979 to 1985 editions, the "Defense Buildup Policy" of the 1978 edition is simply stated. In proceeding with the annual defense buildups based on the Outline of the Defense Plan, however, it was necessary for the JDA to ascertain, to the degree possible, future trends for the major activities that should be emphasized in order to proceed with actual operations (for example, compilation of operations plan, budget draft). In April 1977, therefore, a "Directive Concerning Defense Plans" was established and a Mid-Term Operations Estimate" was compiled.

Within the framework of the Outline of the Defense Plan and the scope of a budget not exceeding 1 percent of the GNP, the 1978 Mid-Term Operations Estimate (fiscal 1980-1984) in July 1979 and the 1981 Mid-Term Operations Estimate (fiscal 1983-1987) in July 1982 were respectively compiled as internal data for the JDA. It was stated that the fiscal year operations plan and budget draft were created and the buildup of defense capability implemented referencing these.

(See 1979 edition, p 80; 1980 edition, pp 91, 93; 1981 edition, pp 155-156; 1982 edition, p 73; 1983 edition, p 78; 1984 edition, p 79; and 1985 edition, p 79)

(3) 1986 edition (see p 169)

In September 1985, in place of the 1984 Mid-Term Operations Estimate, a Mid-Term Defense Buildup Plan was determined as a government plan for the first time in 13 years since the 4th DBP. Having great significance from the aspect that the defense buildup for a 5-year period, with achievement of the defense capability established in the Outline as the goal, was decided at the government level, the 1986 edition further adds as follows:

"This decision made by the government was due to the government's desire to create a 5-year defense buildup plan and indicate in both aspects of content and expenditures the mid-term direction of defense capability as a government responsibility from the rather appropriate viewpoint of striving for substantial civilian control.

"On the occasion of deciding on this plan, the government published the talks of the Chief Cabinet Secretary detailing efforts to respect the gist of the 5 November 1976 Cabinet decision (regarding immediate defense buildup) with the purport of maintaining in the future the basic government standpoint concerning defense, such as defensive defense, and not to have the immediate annual defense-related expenditures exceed 1 percent of the GNP for said fiscal year as goals."

It appears that the Mid-Term Defense Buildup Plan, with the "goal of about 18.4 trillion yen" as the limit for total defense-related expenditures required to implement the plan, is a return to the "5-year fixed method" like those up to the 4th DBP and not by the post-4th DBP single-year method, but it differs in the following points:

1. Up to the 4th DBP, the final objective of the defense buildup based on the concept of required defense power was not clearly

indicated, but the new Mid-Term Defense Buildup Plan has achievement of the levels in the attached tables of the Defense Outline as the objective.

2. The new Mid-Term Defense Buildup Plan does not employ a "5-year fixed system" like those up to the 4th DBP, but rather a rolling system in which, along with revisions conducted each fiscal year, there is revision of the plan with the creation of a new estimate every 3 years.

4.2 Changes in Buildup of Defense Power

(1) Summary of Changes in Buildup of Defense Power

The 1986 edition (see p 89) summarizes as follows:

"Japan established four defense buildup plans for an immediate period of 3 or 5 years in order to plan for an effective new buildup in defense capability in response to national strength and national conditions, based on the Basic Policy for National Defense. Japan's defense capability through this means is indicated in Table 1 and replete buildups were successively planned. Then, along with the end of the 4th DBP in fiscal 1976, the government decided upon the Outline of the Defense Plan in October 1976 in the National Defense Council and Cabinet.

The Outline did not consider chiefly the details of buildup within a fixed period like the previous defense buildup plans. It clarified the minimum standards of defense capability that should be maintained by Japan in peacetime and indicated a guide concerning the ideal state of Japan's defense, including the maintenance and operation of defense power, and became the authority for Self-Defense Force management and operation. Defense buildup since fiscal 1977 has proceeded in accordance with this Outline."

(2) Achievement Status of Outline Levels

The major points in the status of achievement each fiscal year is as follows:

1. 1977 edition (see p 78) and 1978 edition (see p 77)

The 1977 edition states in terms of scale it already was at about the same level as the objectives of basic defense capability in the 4th DBP. The 1978 edition also had a similar explanation for the most part.

"The present status of deficiencies in terms of scale are one composite brigade and one mechanized division in the GSDF, but these have been newly organized without an increase in current authorized personnel by abolition of existing units. The MSDF is not deficient in key units and only lacks 2 submarines and 10 tactical aircraft. Aside from the complete lack of any early-warning squadrons, the ASDF will be fully provided with the scale required when the NIKE unit currently under construction is completed. Looking at the current status of defense capability based upon the viewpoint of basic defense capability, it has been judged from these

facts that in terms of scale defense capability already is at about the same level as the objective."

2. 1979 edition (see p 81) and 1980 edition (see p 94)

The international situation increased in severity. However, it cannot be said that the underlying tone of the situation as premised by the Outline had greatly changed, and the following purport was stated based on this perception.

"Japan has made an effort for a replete buildup of defense power, but since the achievement of the levels of defense capability set by the Outline has not yet been reached, along with first planning for early achievement of the defense capability posture set by the Outline, efforts will be made for modernization of equipment, provision of an operational posture, and provision of a rear support posture so that this defense capability can demonstrate in reality that strength effectively."

3. 1981 edition (see page 157)

Even at the end of the 1978 Mid-Term Operations Estimate (fiscal 1984), Outline levels would not be achieved and the 1981 Mid-Term Operations Estimate also states that it was created with achievement of Outline levels as the base. It was estimated that even at the end of the 1981 Mid-Term Operations Estimate (fiscal 1987), Outline levels would not be achieved completely, and stated as follows:

"However, even if all the 1978 Mid-Term Operations Estimate were to be achieved as estimated, gaps still would remain in the level of defense capability established in the Outline of the Defense Plan.

"It is a pressing matter for the government to achieve as quickly as possible the levels of defense capability established in the Outline of the Defense Plan and from the viewpoint of the JDA, it is believed necessary to create the 1981 Mid-Term Operations Estimate, which is the next mid-term operations estimate, with achievement of the levels of defense capability established in the Outline of the Defense Plan as the base. (Omission) In accordance with this basic concept, the JDA has begun the full-scale task of creating the 1981 Mid-Term Operations Estimate, with the understanding of the National Defense Council."

4. 1982 edition (see p 109)

The following is stated in an outline of strength after ultimately reaching completion of the defense buildup according to the 1981 Mid-Term Operations Estimate.

"There will be unusual deficiencies due to various circumstances, such as number of tactical aircraft, sustained war capability, and resistance, but overall, in terms of quantity, the estimation is that attainment of the Outline levels has just about been reached. In terms of quality, it is judged that Outline levels will be reached by continuing on

with the current steady buildup tempo, and that this can be maintained. (Detailed explanation omitted.)"

5. 1983 edition (see p 214), 1984 edition (see p 79), and 1985 edition (see p 173)

Like the 1979 edition, the gist is stated that the levels of defense capability established by the Outline have not yet been reached.

(3) Thinking of White Paper Concerning Revision of the Outline or Modification of Outline Attached Tables

1. Since defense capability, which already had reached the levels of the objectives in the 4th DBP in scale, had not reached the levels of the Outline in the 1986 edition (see p 95), regardless of the buildup proceeding according to the 1978 Mid-Term Operations Estimate and the 1981 Mid-Term Operations Estimate in the post-4th DBP, the government stated that it was an urgent task to achieve those levels as soon as possible.

2. As opposed to this, 10 years now have passed since the minimum levels of defense capability necessary in peacetime, indicated in the Outline attached tables, were determined. Due to the opinion that it was completely the government's failure that they have not yet been reached and due to grim changes in the international situation following determination of the Outline, there was, as it is known, an argument to revise the Outline or modify the Outline attached tables. There were also many people who wanted to know the basis for not revising the Outline or modifying the Outline attached tables.

3. The original premise in the basic concept of defense capability has collapsed and the following is the thinking with regard to the expansion and strengthening of defense capability and a smooth shift to a new posture of defense capability. (See 1977 edition, p 56)

"With regard to what considerations are necessary for advancing to a smooth shift to a new defense capability posture, it is difficult to cite specific items in advance since the specific details of a new defense capability posture, or in other words, how far to expand or increase defense capability, will be determined by a new government decision at the time that it is necessary according to the details of the changes of posture. Generally, however, in terms of quantity, even though it is by no means sufficient, it is the possession of quality key personnel and a command of new defense technology; in terms of quality, it is the maintenance of necessary levels and provision of the capability to form a nucleus at any time for a shift to a rather solid posture. It can be said that the issue is that a study should be swiftly implemented in the future hypothesizing different kinds of cases, such as how long a period to strengthen and expand defense capability, by what methods, and what expenditures are required. Also, at this juncture, it is necessary to study not merely the expansion and strengthening of defense capability, but also

the nature of defense considerations in various fields, which are so-called defense-related policies, such as the cultivation of the defense industry, stores of necessary materials, provision of a civilian rescue organization, construction, transportation, communications, science and technology, and education."

4. Combining this basic concept concerning a shift to a new posture, the current international situation, military situation, and domestic conditions, the 1986 edition (see p 93), while not considering a revision of the Outline or modification of the attached tables, stated as follows. In other words, considerable changes in the situation can be handled by a replete quality upgrading through renovation and modernization of equipment without changing the scale of the Self-Defense Forces, and even if the attached tables are modified, there would be no immediate revision of the text.

"There is the aspect of fluctuation in the scale and details of a small-scale, limited invasion more than armament trends of foreign nations and trends in technology level. This point can be handled by the following thinking.

"First, along with indicating the scale of defense capability in the attached tables, the Outline considers replete quality upgrading within that framework with regard to key units and major equipment. By this, it is designed to provide and maintain the most effective and efficient defense capability to deal flexibly with changes in the situation over a considerably long period of time.

"Also, if changes in the equipment system should occur to deal with trends in the technology level of foreign countries, it is also possible to change the contents of the attached tables through Security Council and Cabinet deliberation and decision.

"In this case, even supposing changes to the contents of the attached tables, there would be no immediate revision to the basic concept of the Outline such as 'possession of defense capability to deal effectively with situations up to both a limited and small-scale invasion' indicated in the text.

"The contents of a change in this case is not unlimited and being conducted within the framework of the basic concept of the Outline, it is believed there are limits as a matter of course.

"However, the government has established a Mid-Term Defense Buildup Plan with striving to achieve Outline levels within the framework of the attached tables as the goal. Along with striving for harmony with other national policies, efforts are being made in its steady implementation and currently modification of the attached tables is not being considered, let alone revision of the basic concept of the Outline."

4.3 Changes in Purchase Costs for Equipment and Procurement of Major Equipment

Since in quantity, the defense capability of Japan already had just about reached the levels indicated in the attached tables of the Outline at the end of the 4th DBP, based on the following basic concept for building up basic defense capability, earnest renovation and modernization of equipment has proceeded since 1977 in the post 4th DBP. (See 1977 edition, p 81)

"If defense capability has been fulfilled in scale, the post buildup will be mainly for repletion and upgrading in quality aspects, such as renovation and modernization of the buildup rather than strengthening defense capability quantitatively. The repletion and upgrading in quality should be implemented while dealing flexibly with changes in the situation, such as changes in the trends of technology levels in foreign nations at that time."

Changes in purchase expenditures of equipment items during the interim are per Table 3, having risen about 3.6 times in the 11-year period from 248.5 billion yen in fiscal 1976 to 899.7 billion yen in 1986.

Also, the component ratio to the fiscal budget increased from 16.4 percent (fiscal 1976) to 26.9 percent (fiscal 1986).

The procurement status of major equipment procured by equipment item purchase expenditures during the 1977-1986 period is per Table 4.

Table 1. Changes In Defense Buildup

	1st DBP (FY58-60)	2nd DBP (FY62-66)	3rd DBP (FY67-71)
GSDF			
Authorized SDF personnel	170,000 men	171,500 men	179,000 men
Basic units			
Regionally deployed units in peacetime	6 divisions 3 composite brigades	12 divisions	12 divisions
Mobile operation units	1 mechanized combined brigade 1 tank regiment 1 artillery brigade 1 airborne brigade 1 training brigade	1 mechanized division 1 tank regiment 1 artillery brigade 1 airborne brigade 1 training brigade	1 mechanized division 1 tank regiment 1 artillery brigade 1 airborne brigade 1 training brigade 1 helicopter

			brigade
Low-altitude air defense surface-to-air missile units		2 anti-aircraft artillery battalions	4 anti-aircraft artillery groups (1 other group in preparation)
MSDF			
Basic units			
Antisubmarine surface ship units (mobile operations)	3 escort flotillas	3 escort flotillas	4 escort flotillas
Antisubmarine surface ship units (regional district)	5 divisions	5 divisions	10 divisions
Submarine units		2 divisions	4 divisions
Minesweeping units	1 flotilla	2 flotillas	2 flotillas
MSDF continued			
Land-based antisubmarine aircraft units	9 squadrons	15 squadrons	14 squadrons
Major equipment			
Antisubmarine surface ships	57 ships	59 ships	59 ships
Submarines	2 submarines	7 submarines	12 submarines
Operational aircraft	(220 aircraft) (apx.)	(230 aircraft) (apx.)	(240 aircraft) (apx.)
ASDF			
Basic units			
Aircraft control and warning units	24 groups	24 groups	24 groups
Interceptor units	12 squadrons	15 squadrons	10 squadrons
Support fighter units		4 squadrons	4 squadrons

Air reconnaissance units		1 squadron	1 squadron
Air transport units	2 squadrons	3 squadrons	3 squadrons
Early-warning units			
High-altitude air defense surface-to-air missile units		2 groups	4 groups
Major equipment			
Operational aircraft	(1,130 aircraft) (apx.)	(1,100 aircraft) (apx.)	(940 aircraft) (apx.)

Table 1. Changes In Defense Buildup [continued]

	4th DBP (FY72-76)	Outline of Defense Plan	Completion of FY86
GSDF			
Authorized SDF personnel	180,000 men	180,000 men	180,000 men
Basic units			
Regionally deployed units in peacetime	12 divisions 1 composite brigades	12 divisions 2 composite brigades	12 divisions 2 composite brigades
Mobile operation units	1 mechanized division 1 tank regiment 1 artillery brigade 1 airborne brigade 1 training brigade 1 helicopter brigade	1 armored division 1 artillery brigade 1 airborne brigade 1 training brigade 1 helicopter brigade	1 armored division 1 artillery brigade 1 airborne brigade 1 training brigade 1 helicopter brigade
Low-altitude air defense surface-to-air missile units	8 anti-aircraft artillery groups	8 anti-aircraft artillery groups	8 anti-aircraft artillery groups

MSDF			
Basic units			
Antisubmarine surface ship units (mobile operations)	4 escort flotillas	4 escort flotillas	4 escort flotillas
Antisubmarine surface ship units (regional district)	9 divisions	10 divisions	10 divisions
Submarine units	5 divisions	6 divisions	6 divisions
Minesweeping units	2 flotillas	2 flotillas	2 flotillas
MSDF continued			
Land-based antisubmarine aircraft units	16 squadrons	16 squadrons	14 squadrons
Major equipment			
Antisubmarine surface ships	60 ships	60 ships (apx.)	59 ships
Submarines	15 submarines	16 submarines	13 submarines
Operational aircraft	200 aircraft (apx.) (300 aircraft) (apx.)	220 aircraft (apx.)	150 aircraft
ASDF			
Basic units			
Aircraft control and warning units	28 groups	28 groups	28 groups
Interceptor units	10 squadrons	10 squadrons	10 squadrons
Support fighter units	3 squadrons	3 squadrons	3 squadrons
Air reconnaissance units	1 squadron	1 squadron	1 squadron
Air transport units	3 squadrons	3 squadrons	3 squadrons

Early-warning units		1 squadron	1 squadron
High-altitude air defense surface-to-air missile units	5 groups (1 other group in preparation)	6 groups	6 groups
Major equipment			
Operational aircraft	500 aircraft (apx.) (930 aircraft) (apx.)	430 aircraft (apx.)	389 aircraft

Note 1 Parentheses under operational aircraft is the number of total aircraft including trainers. The number of units are as of end of the DBP period.

Note 2 Since it requires a 2- to 5-year peiod for acquisition of major equipment after procurement (orders), the column "Completion of FY86" is the completion of procurement (orders) by the end of fiscal 1986, and these all indicate strength at time acquired.

Source: 1986 Defense White Paper, p 90.

Table 2. Operational Functions and Equipment Systems

Operational Functions	Equipment Systems
1. Operations for air defense	
Air warning control system function which can quickly detect and identify invading enemy aircraft by means of radar sites and early warning aircraft, and swiftly and effectively conduct assignment and interception control to ally fighters and surface-to-air missiles.	(1) General air defense capability a. Warning control system: Radar site and AEW aircraft. Mobile warning control equipment. Automatic warning control organization (BADGE).
High-performance interceptor fighter function superior in mobility and operational flexibility and particularly appropriate for long distance and a wide scope of air defense.	b. Interceptor aircraft
Air defense function by surface-to-air missiles with capability to deal swiftly, particularly appropriate for air defense of strategic places and regions.	

Air defense function which each self-defense force can implement individually should the various self-defense force bases or units receive an air attack.

c. Surface-to-air missiles:

For high altitude and low altitude.

(2) Base air defense capability

Anti-aircraft machineguns

Air guided missiles

2. Operations to deal with landing invasion

Endeavor as much as possible to defeat enemy invasion at sea with ground, sea, and air defense capability should a landing invasion against Japan occur, so as not to have direct harm reach Japanese soil. In other words, to crush enemy land units before invading Japanese soil and prevent a landing invasion by attack with MSDF ships, air deterrence with ASDF support fighters, and launch of GSDF anti-ship missiles.

(1) Land fighting capability

a. Mobile armor attack capability:

Tanks, armored vehicles, armored combat vehicles,

Self-propelled guns

If there should be a landing on the mainland by amphibious craft of powerful enemy landing units even though invasion units are attacked at sea, GSDF units will endeavor to defend the seacoast.

b. Ground firepower

Field guns, mortars, guided gun missiles

Anti-tank hardware (recoiless guns, anti-tank missiles, anti-tank helicopters)

Furthermore, if the enemy should land, various kinds of defense power will be concentrated in areas near the seacoast, with GSDF divisions and other key units as the main force, and with the cooperation of the MSDF and ASDF, crush the enemy and drive them from the mainland.

Also, against enemy airborne unit attacks or heliborne attacks, along with planning defeat of the enemy before a drop through the air defense operations of the GSDF and ASDF, the GSDF will crush the enemy with firepower after a drop.

c. Sea firepower (anti-ship guided missiles)

d. Air firepower

Surface-to-air missiles

Anti-aircraft machineguns, self-propelled anti-aircraft artillery

If enemy land units cannot be crushed quickly in the coastal areas, position warfare will be conducted using the topography of Japan at strategic points leading inland and in the interim, units will be gathered from other areas, prepared for a counterattack posture, and repel the invasion.

machineguns

e. Mobile power

Tanks, helicopters

f. Other capability

Systems for command, communications, intelligence, electronic warfare, night combat, fortification, barriers, mobile support

(2) Air deterrence and ground and sea operations direct support capability

Support fighters (ASDF)

(3) Air reconnaissance capability

a. ASDF:

Table 2. Operational Functions and Equipment Systems [continued]

Reconnaissance aircraft

b. GSDF:

Liaison/reconnaissance aircraft

Observation helicopters

Unmanned reconnaissance aircraft

(4) Transport capability

a. GSDF:

Tanks, transport helicopters

b. MSDF:

Transport ships

c. ASDF:

Transport aircraft, transport helicopters

3. Operations To Guarantee Safety of Maritime Transportation

If the enemy should obstruct the maritime transportation of Japan, ships navigating the sea areas surrounding Japan will be attacked using submarines and aircraft, and depending upon the circumstances and location, surface ships will be used or mines laid.

Against this, the Self-Defense Forces will stop or gradually decrease enemy troop forces by implementing various operations such as patrols, escorts, air defense, defense of harbors and sea straits and by the cumulative results of stopping effective operations by the enemy, guarantee the safety of maritime transportation.

(1) Antisubmarine warfare capability

a. Antisubmarine surface ships

DDH, DDG, DD, DE

b. Antisubmarine aircraft

Fixed wing antisubmarine aircraft

Antisubmarine helicopters

Table 2. Operational Functions and Equipment Systems [continued]

In other words, ship escorts will be conducted by ships and fixed-wing antisubmarine aircraft as necessary by patroling a wide area of the surrounding seas with fixed-wing antisubmarine aircraft and important regions for ship navigation by ships, along with ascendancy over enemy ships trying to attack Japanese ships deploying to the open sea. On these occasions, Japanese submarines will also independently conduct operations such as patrols and destruction of enemy submarines and surface ships.

In patrols and escorts, the MSDF will implement antisubmarine warfare, antisurface warfare, and air defense warfare according to the mode of the threat.

Also, in coastal areas near important harbors where many ships enter and leave, antisubmarine warfare and antimine warfare to remove enemy torpedoes will be implemented, and attacks and minelaying by enemy ships will be handled. In

c. Submarines (conventional submarines)

(2) Air defense capability at sea

a. MSDF:

Shipboard air defense network incoporating various kinds of anti-aircraft missiles, anti-aircraft guns, and CIWS

Surface ships (AEGIS ships) equipped with various kinds of electronic warfare equipment and command control system

addition, the MSDF will make an effort to block strait passage by implementing antisubmarine warfare, surface warfare, and depending on circumstances, by minelaying warfare against enemy submarines and surface ships trying to pass through important sea straits. The GSDF and ASDF will cooperate on these occasions.

For air defense at sea, in addition to implementation of air defense warfare by MSDF destroyer squadrons, the ASDF will conduct air defense operations within the range to which its capabiilty extends. Air defense warfare by destroyer squadrons will defeat enemy air-to-ship missiles in flight, along with making an effort to defeat enemy aircraft with various types of ship-to-air missiles and high performance anti-aircraft guns, or disengage them by conducting in-depth electronic jamming.

b. ASDF:

Fighter aircraft

c. OTH radar

(3) Anti-surface-ship attack capability

a. Ship guns and anti-ship missiles

b. Torpedo boats and missile craft

c. New antisubmarine helicopter (ship-board) system

(4) Mine warfare capability

a. Mines, various types of mines

b. Minelaying capability

Minelaying ships

Table 2. Operational Functions and Equipment Systems [continued]

Minesweeping tenders

Submarines

Antisubmarine patrol aircraft

c. Antimine warfare capability

Minesweeping craft

Minesweeping tenders

Minesweeping helicopters

Minesweeping sea gear for underwater demolition units

Table 3. Changes in Defense-Related Expenditures (Original Budget) Component Ratio (Unit = billion yen, percent)

Fiscal Year	1976		1977		1978		1979	
Expense	Amount	Component Ratio	Amount	Component Ratio	Amount	Component Ratio	Amount	Component Ratio
Personnel/ provisions	847.7	56.0	930.4	55.0	1,034.5	54.5	1,076.5	51.4
Nonpersonnel	664.7	44.0	760.2	45.0	866.5	45.6	1,018.0	48.6
Equipment purchases	248.5	16.4	293.9	17.4	325.8	17.1	392.5	18.7
R&D	13.5	0.9	15.7	0.9	17.4	0.9	20.4	1.0
Facilities equipment	34.6	2.3	40.9	2.4	46.2	2.4	60.5	2.9
Maintenance	218.7	14.5	245.9	14.5	275.4	14.5	292.1	13.9
Base counter-measures	124.0	8.2	136.1	8.0	164.5	8.7	214.0	10.2
Other	25.3	1.7	27.8	1.5	37.2	2.0	38.5	1.8
Total	1,512.4	100.0	1,690.6	100.0	1,901.0	100.0	2,094.5	100.0

Table 3. Changes in Defense-Related Expenditures (Original Budget) Component Ratio (Unit = billion yen, percent)

Fiscal Year	1980		1981		1982		1983	
Expense	Amount	Component Ratio	Amount	Component Ratio	Amount	Component Ratio	Amount	Component Ratio
Personnel/ provisions	1,100.0	49.3	1,144.4	47.7	1,205.3	46.6	1,225.8	44.5
Nonpersonnel	1,130.2	50.7	1,255.6	52.3	1,380.8	53.4	1,528.4	55.5
Equipment purchases	460.9	20.7	539.9	22.5	580.3	22.4	684.4	24.9
R&D	22.5	1.0	25.0	1.0	28.5	1.1	31.4	1.1
Facilities equipment	61.4	2.8	52.6	2.2	58.6	2.3	53.1	1.9
Maintenance	314.2	14.1	352.0	14.7	408.7	15.8	448.4	16.3
Base counter-measures	232.1	10.4	251.4	10.5	268.9	10.4	274.7	10.0
Other	39.2	1.8	34.8	1.5	35.8	1.4	36.3	1.3
Total	2,230.2	100.0	2,400.0	100.0	2,586.1	100.0	2,754.2	100.0

Table 3. Changes in Defense-Related Expenditures (Original Budget) Component Ratio (Unit = billion yen, percent)

Fiscal Year	1984		1985		1986	
Expense	Amount	Component Ratio	Amount	Component Ratio	Amount	Component Ratio
Personnel/ provisions	1,309.4	44.6	1,414.0	45.1	1,508.6	45.1
Nonpersonnel	1,625.2	55.4	1,723.2	54.9	1,835.0	54.9
Equipment purchases	772.5	26.3	822.1	26.2	899.7	26.9
R&D	36.4	1.2	50.4	1.6	57.7	1.7
Facilities equipment	39.3	1.3	44.2	1.4	56.2	1.7
Maintenance	454.0	15.5	472.2	15.1	481.5	14.4

Base counter-measures	285.5	9.7	296.5	9.5	301.1	9.0
Other	37.5	1.3	37.7	1.2	38.9	1.2
Total	2,934.6	100.0	3,137.1	100.0	3,343.5	100.0

Notes:

1. Equipment purchase expenditures are expenses for purchase of weapons and vehicles, purchase of aircraft, and ship construction.

2. Maintenance expenditures are expenses for housing, clothing, and training activities.

3. Since the amounts are rounded up, the totals do not match.

Source: Defense White Paper 1980 edition, p 260; 1986 edition, p 258; and 1986 edition, p 345.

Table 4. Self-Defense Force Major Equipment Procurement Status

(1) Ground Self-Defense Forces

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A-Type Equipment											
9mm pistol	each					1800	1800	1800	1800	1800	1800
Type 64 small rifle	each	5500	5500	5500	5100	5000	5000	3250	1250	1250	
Type 62 machinegun	each	94	94	94	51	51	51	51	51	59	35
Type 74 vehicle-mounted machinegun	each				38	38	38	33	17	33	8
12.7mm heavy machinegun	each								60	60	26
35mm twin-mounted anti-aircraft machinegun	set	1	1	2	1						

Type 64 81mm trench mortar	each	64	66	69	65	44	43	20	20	25	13
Type 74 105mm self-propelled howitzer	each	5	5								
Type 75 155mm self-propelled howitzer	each	10	15	26	26	30	34	24	13	13	
New 155mm howitzer (FH-70)	each							20	38	43	43

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(1) Ground Self-Defense Forces

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
203mm self-propelled howitzer	each					6	13	12	12	12	12
Type 75 30mm self-propelled multiple rocket	each	6	8	8	8	8	8	8	8		
84mm recoil-less gun	each		85	141	188	219	221	224	223	230	229
Type 60 106mm self-propelled recoilless gun	each	16	10	6							
Type 64 anti-tank missile	set	8	6	4	4						

Type 79 antiship/ antitank missile	set			5	8	9	8	8	12	12	19
Type 74 tank	each	48	48	48	60	72	72	60	60	60	56
Type 73 armored vehicle	each	6	6	6	9	9	9	9	15	16	23
Type 82 command communications vehicle	each						10	10	15	18	22
Type 73 tractor	each	9	9	9							

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(1) Ground Self-Defense Forces

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Type 78 tank-recovery vehicle	each		1	3	3	3	5	5	5	5	5
Type 61 large snow vehicle	each	5									
Type 78 snow vehicle	each		16	22	22	22	22	22	22	22	22
Type 70 self-propelled floating bridge	each		3	3	2	3	3	2	2		
Chemical safeguard vehicle	each									1	2

Type 75 self-propelled surface wind measurement device	each	3	3		3		3	3			
Surface-to-air guided missiles											
Remodeling to improved HAWK	group	0.5 *	1 *	1 *	1 *	1 *	1 **	1 **	1.5 **	1 **	0.5 ***
Type 81 TANSAM	set					4	6	4	7	8	8
Portable SAM	set					14	35	35	26	27	39

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(1) Ground Self-Defense Forces

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Aircraft											
Antitank helicopter (AH-1S)	each	1	1				12	5	5	8	8
Observation helicopter (OH)	each	10 6J	10 6D	12 6D	10 6D	8 6D	6 6D	3 6D	9 6D	7 6D	12 6D
Multi-purpose helicopter (HU-1H)	each	3	2	3	5	5	6	7	4	5	5
Transport helicopter	each	1 V-107A	1 same	1 same	1 same				2 CH-47	3 same	4 same
Liaison/ reconnais-sance aircraft (LR-1)	each	1	2	3	2	1	1	1			

Trainer (TL-1)	each				2						

Note: *= original, **=Improved I, ***=Improved HAWK II

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(2) Maritime Self-Defense Force

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Ships											
DD	each	1 2900t	1 same	3 same	2 same	2 same	3 same	1 3400t	3 same	3 same	1 same
DDG	each		1 3900t			1 4500t		1 4500t			
DE	each	1 1200t		1 1400t	1 same						2 1900t
SS	each	1 2200t	1 same	1 same	1 same	1 same	1 same	1 same	1 same	1 same	1 2400t
MSC	each	2 440t	2 same	2 same	2 same	2 same	2 same	2 same	2 same	2 same	2 same
AOE	each								1 8300t		
AGS	each			1 1100t				1 2000t			
ARC	each	1 4500t									
AS	each					1 3600t					
LSU	each			2 500t							
LCU	each										1 420t
ATS	each										1 2200t

Ship modern-ization	each					1 DDA	1 DDA	1 DDH	1 DDH		

Tonnage is per ship.

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(2) Maritime Self-Defense Force

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Aircraft											
P-3C patrol aircraft	each		8		10		7	7	8	10	10
PS-1 anti-submarine aircraft	each	1									
HSS anti-submarine helicopter	each	4 2A	4 2A	8 2B	2 2B	6 2B	8 2B	5 2B	7 2B	10 2B	13 2B
Airframe for new anti-submarine helicopter (SH-60B)	each							1	1		
US-1 rescue seaplane	each	1	2	1	1			1	1		1
S-61A rescue helicopter	each	1		2		1	4		1	1	
MH-53E minesweeping helicopter	each										4
U-36A training support aircraft	each								1	1	

KM-2 beginner pilot trainer	each	5	5	3		1	2				1 improved

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(2) Maritime Self-Defense Force

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
TC-90 instrument flight trainer	each	1	1	2	2	4	3	2	1		1
OH-6d beginner training helicopter	each						2	1	2		

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(3) Air Self-Defense Force

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Aircraft											
F-4EJ interceptor	each	12									
F-15 interceptor	each		23		34		23	13	17	14	12
F-1 support fighter	each	18	15	5	3	2	2	3	3		
C-1 transport	each	2		1							
C-130H transport	each					2	2		2	2	2
CH-47 transport helicopter	each								1	1	3

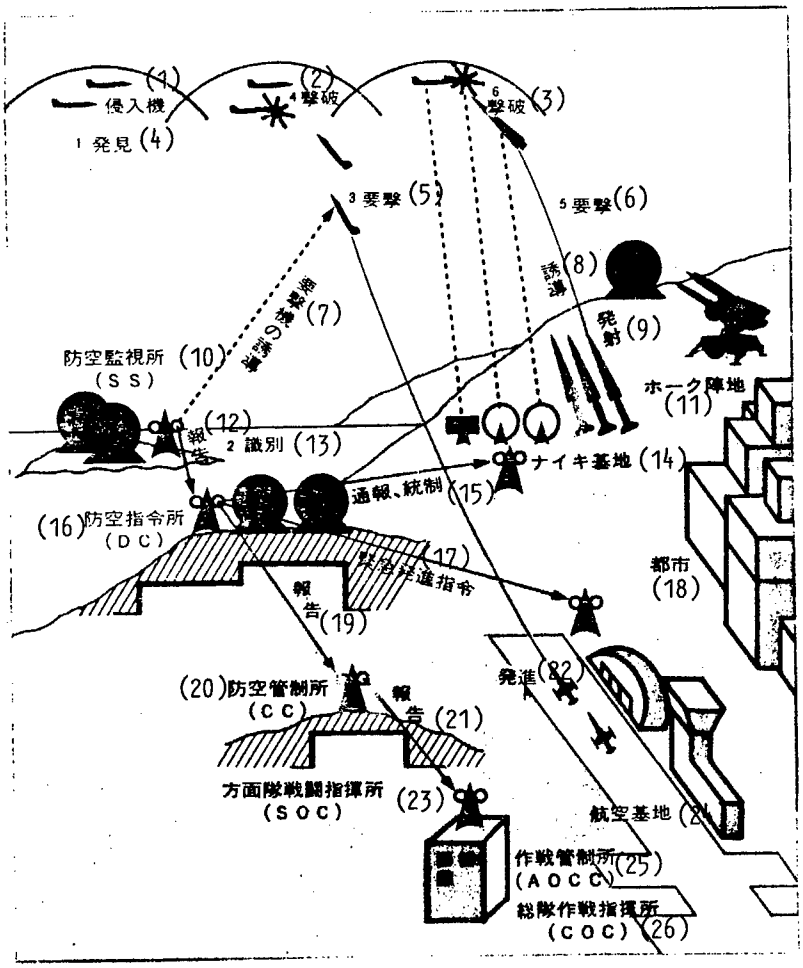
V-107A rescue helicopter	each	1	1	2	2	2	1	1	3	5	4
MU-2 rescue search plane	each			1	1	1				2	
MU-2 flight inspection plane	each	1									
T-3 beginner trainer	each	12	14	12	6						
T-2 advanced trainer	each		3	11	4	6	5			4	

Table 4. Self-Defense Force Major Equipment Procurement Status [continued]

(3) Air Self-Defense Force

Equipment Item		Fiscal Year									
Name	Unit	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
T-4 intermediate trainer	each										12
E-2C early-warning aircraft	each			4		4					
Surface-to-air missiles											
Type 81 TANSAM	set					2	3	1	3	5	4
Portable SAM	set					6	30	12	24	24	48
PATRIOT	group									0.5	1

Figure 1. Air Defense System



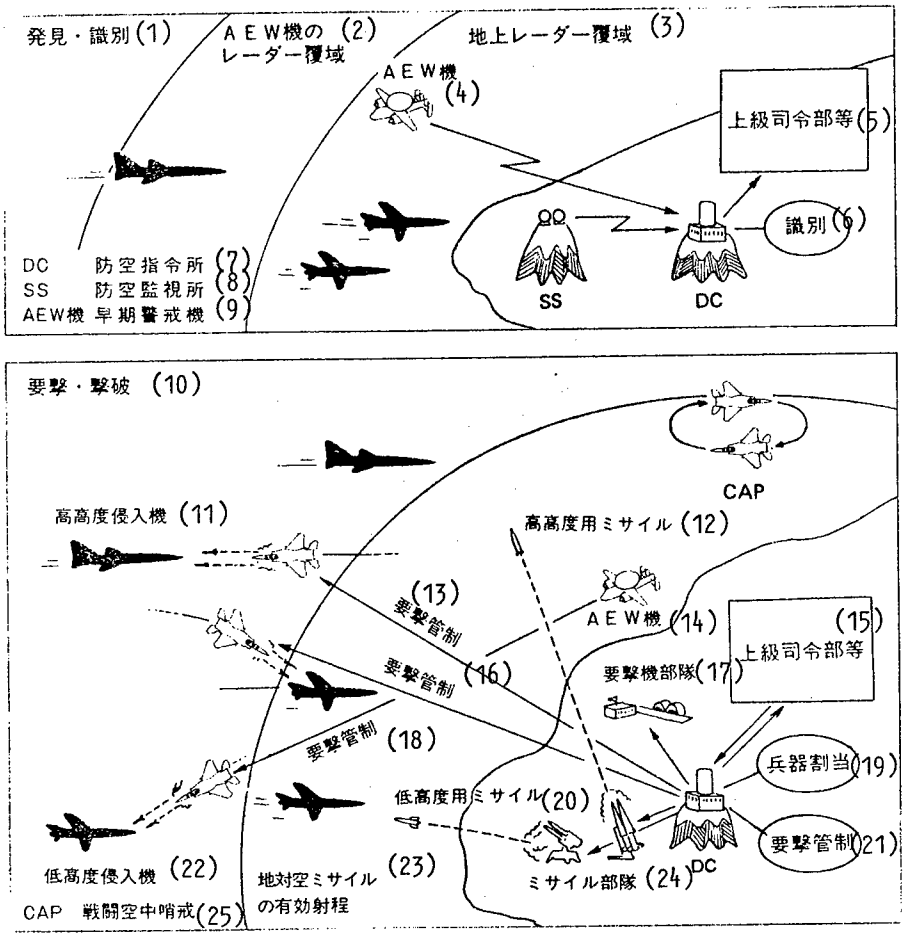
Key:

1. Invading aircraft
2. Defeat
3. Defeat
4. Detection
5. Interception
6. Interception
7. Interceptor guidance
8. Guidance
9. Launch
10. Air defense surveillance station (SS)
11. HAWK position
12. Report
13. Identification
14. NIKE position
15. Notification, control
16. Air defense direction center (DC)
17. Scramble command
18. City
19. Report
20. Air defense control center (CC)
21. Report
22. Scramble
23. Sector operation center (SOC)
24. Air base
25. Air operation control center (AOCC)
26. Combat operation center (COC)

Note: Detection of air target, identification, guidance of interceptors to target, assignment of target of surface-to-air guided missiles, and in addition, dispatch of necessary information are accurately conducted automatically and swiftly using a computer by the BADGE System.

Source: Defense White Paper 1978 edition, page 102.

Figure 2. Examples of Air Defense Operations



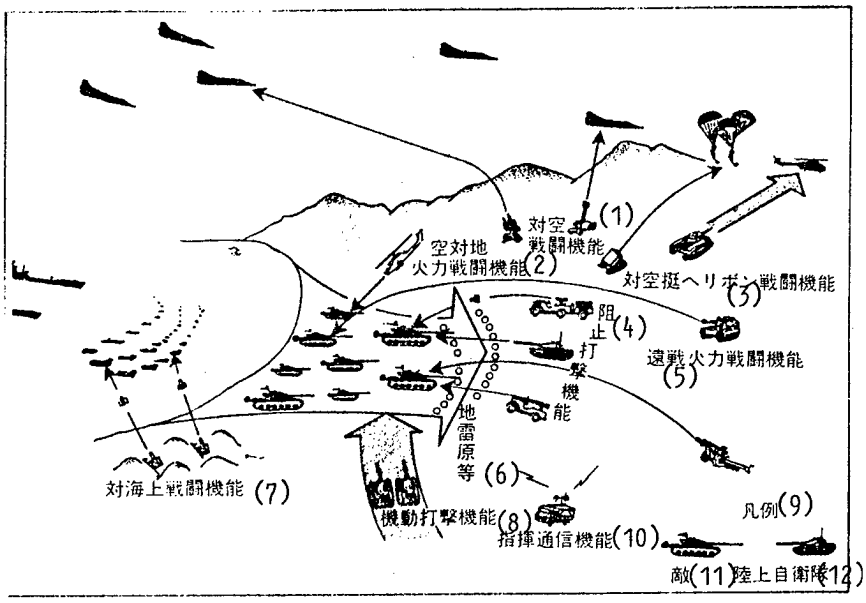
Key:

1. Detection/identification
2. Radar coverage by AEW aircraft
3. Surface radar coverage
4. AEW aircraft
5. Senior command unit
6. Identification
7. DC Direction Center
8. SS Surveillance Station
9. AEW aircraft Early Warning Aircraft
10. Interception/Defeat
11. High altitude invading aircraft
12. High altitude missile
13. Intercept control
14. AEW aircraft
15. Senior command unit
16. Intercept control
17. Interceptor unit
18. Intercept control
19. Weapon assignment
20. Low altitude missile
21. Intercept control
22. Low altitude invading aircraft
23. Surface-to-air missile effective range
24. Missile unit
25. CAP Combat air patrol

Arrow = flow of information, directions

Source: Defense White Paper 1986 edition, page 106.

Figure 3. Major Combat Functions In Ground Defense Operations

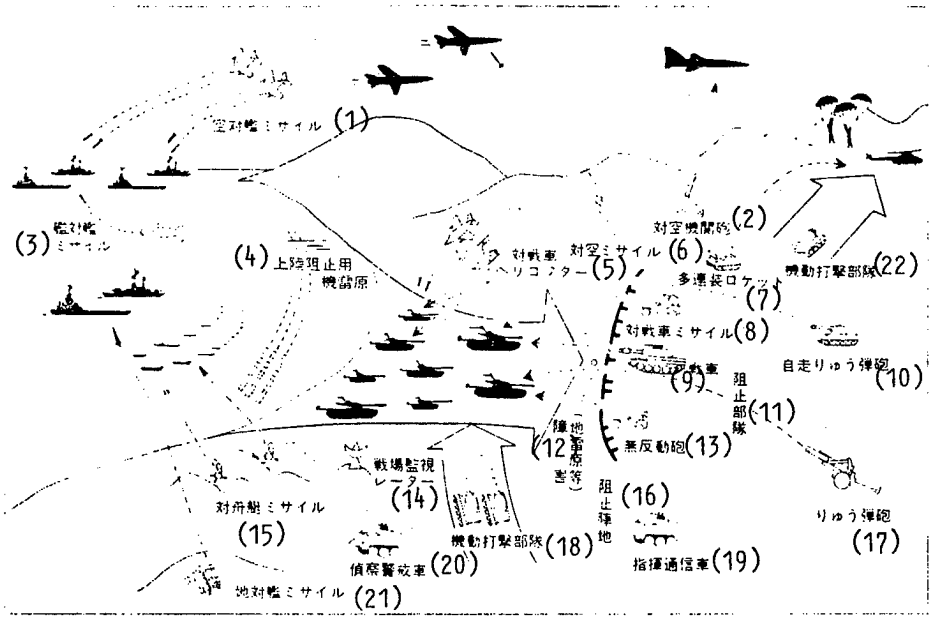


Key:

1. Anti-aircraft combat funtion
2. Air-to-surface firepower combat function
3. Anti-airborne heliborne combat function
4. Block attack function
5. Long-range firepower combat function
6. Land mine field
7. Anti-sea combat function
8. Mobile attack function
9. Legend
10. Command communications function
11. Enemy
12. GSDF

Source: Defense White Paper 1981 edition, page 118.

Figure 4. Example of Operations Dealing With Landing Invasion



Key:

1. Air-to-ship missiles
2. Anti-aircraft machineguns
3. Ship-to-ship missiles
4. Mine field to block landing
5. Anti-tank helicopters
6. Anti-aircraft missiles
7. Multiple rockets
8. Anti-tank missiles
9. Tanks
10. Self-propelled howitzers
11. Blocking units
12. Obstacles (mine fields, etc.)
13. Recoilless guns
14. Battlefield surveillance radar
15. Anti-ship missiles
16. Blocking units
17. Howitzers
18. Mobile attack units
19. Command communications vehicle
20. Reconnaissance patrol vehicle
21. Surface to ship missiles
22. Mobile attack units

Note: Major equipment in Figures 2 and 3 (including those under research and development

Warning surveillance equipment: battlefield surveillance radar, reconnaissance patrol vehicle.

Anti-sea firepower: surface-to-ship missile, anti-ship missile.

Ground firepower: howitzers, self-propelled howitzers, multiple rockets.

Anti-tank firepower: tanks, anti-tank missiles, recoilless guns.

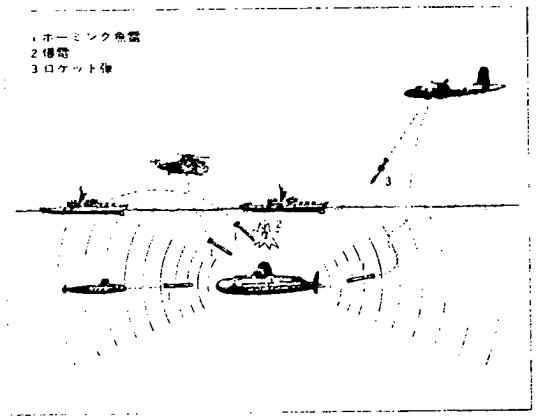
Mobile attack power: tanks, armored vehicles, self-propelled howitzers.

Anti-aircraft ground firepower: anti-aircraft missiles, anti-aircraft machineguns.

Command/communications: command communications vehicle, various types of communications instruments.

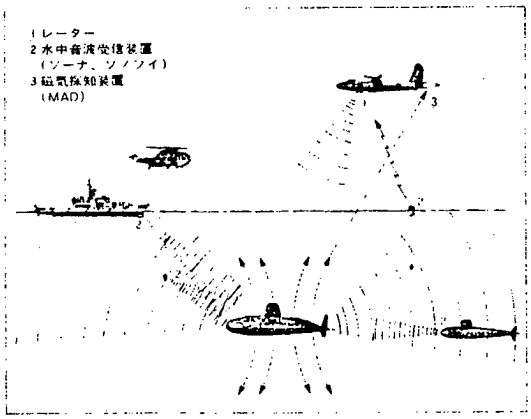
Source: Defense White Paper 1976 edition, page 108.

Figure 5. Anti-Submarine Search and Attack



Key:

1. Homing torpedoes
2. Depth Charges
3. Rocket missile

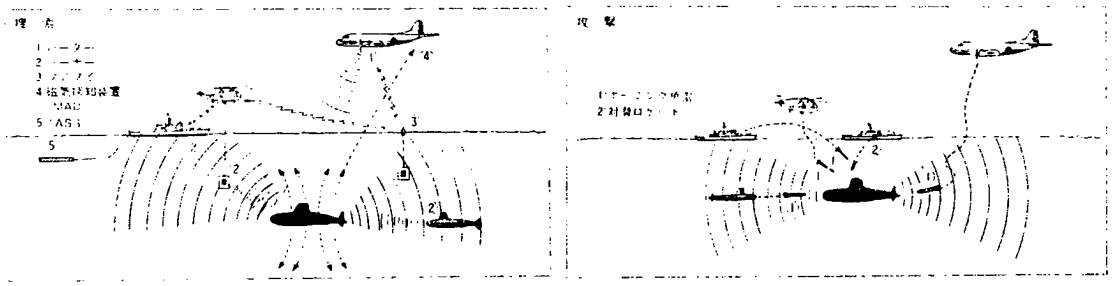


Key:

1. Radar
2. Underwater acoustic reciver (sonar, sonobuoy)
3. Magnetic detector (MAD)

Source: Defense White Paper 1977 edition, page 113)

Figure 6. Example of Anti-Submarine Warfare



Key:

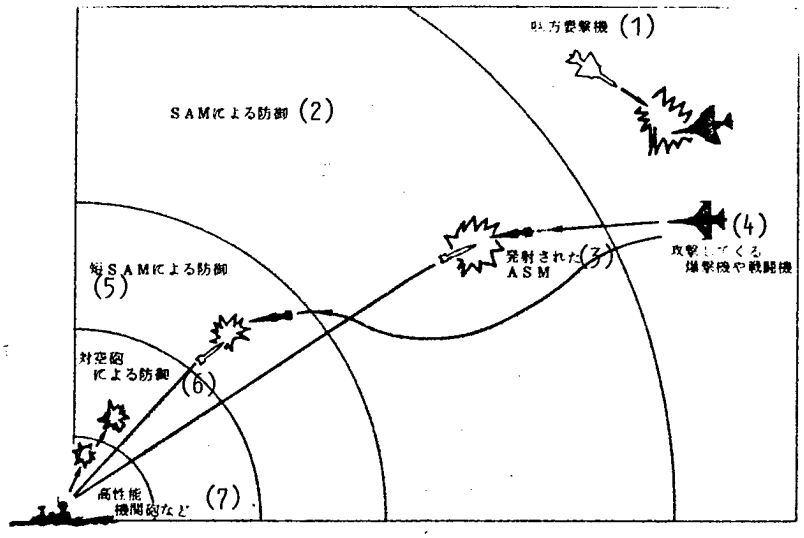
1. Radar
2. Sonar
3. Sonobuoy
4. Magnetic detector (MAD)
5. TASS

Key:

1. Homing torpedoes
2. Anti-submarine rocket

Source: Defense White Paper 1986 edition, page 111)

Figure 7. In-depth Defense System for Air Defense Operations

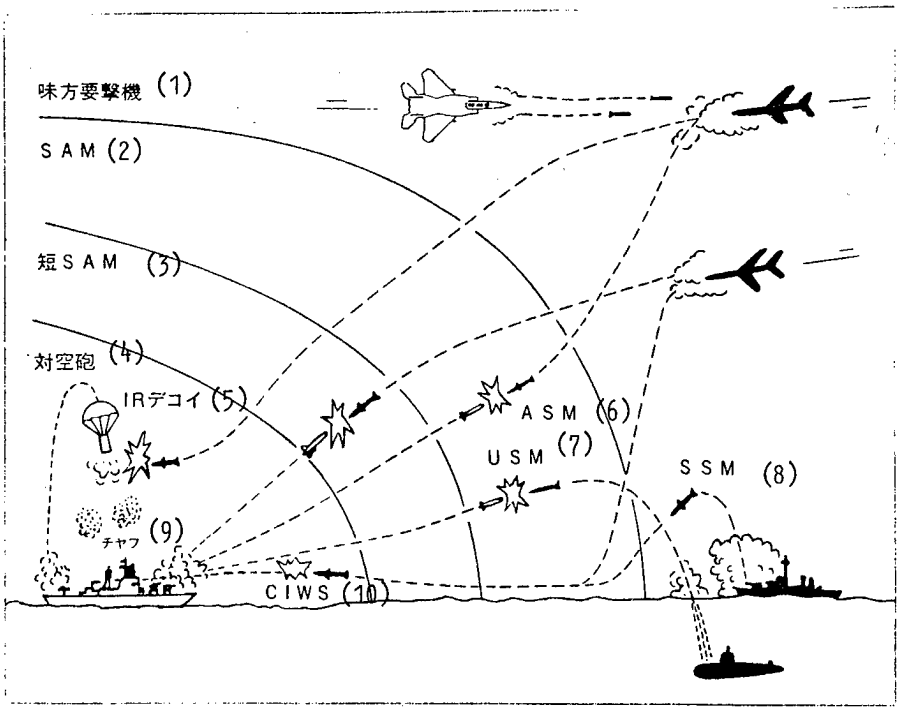


Key:

1. Ally interceptor
2. Defense by SAM
3. Bombers and fighters come to attack
4. ASM launched
5. Defense by TANSAM
6. Defense by anti-aircraft guns
7. High performance machineguns, etc.

Source: Defense White Paper 1980 edition, page 114.

Figure 8. Example of Defense At Sea



Key:

1. Ally interceptor
2. SAM
3. TANSAM
4. Anti-aircraft guns
5. IR decoy
6. ASM
7. USM
8. SSM
9. Chaff
10. CIWS

Source: Defense White Paper 1986 edition, page 112.

Source: Defense Antenna, Summary of Operations Plan, No 199 (Feb 1977), p 2; No 212 (Jan 1978), p 12; No 226 (Feb 1979), p 2; No 239 (Feb 1980), p 14; No 253 (Feb 1981), p 2; No 266 (Feb 1982), p 2; No 279 (Feb 1983), p 2; No 292 (Feb 1984), p 2; No 305 (Feb 1985), p 10; No 318 (Feb 1986), p 2; Summary of Budget, No 199 (Feb 1977), p 28; No 212 (Jan 1978), p 28; No 226 (Feb 1979), p 9; No 239 (Feb 1980), p 22; No 253 (Feb 1981), p 12; No 266 (Feb 1982), p 12; No 279 (Feb 1983), p 24; No 292 (Feb 1984), p 16; No 305 (Feb 1985), p 26; No 318 (Feb 1986), p 23.

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