Military Technological Strategy and Armaments
Concepts of Japanese Imperial Army
-- Around the Post-WWI Period ---

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Introduction

The Time Magazine issued on August 21, 1995 carried an article titled "Onward Cyber Soldiers". It reported that the Department of Defense of the United States has a broad plan covering the military and civilian affairs that will bring on a "revolution of battlefields" to "Information Warfare," equivalent to the introduction of tanks in WWI and the atomic bomb in WWII. It also reported that Vice Chairman of the Joint Chiefs of Staff praised it as "America's gift to warfare," and the US Army is also aiming to "digitize the battlefield" by linking every soldier and weapons system. The article said this was aroused by the recognition that the vulnerability of the United State in information warfare will become a serious issue in the national security in the foreseeable future.

Appearance of tanks certainly exerted significant impact in the ground operations and tactics after WWI, and invention of the atomic bomb brought dramatic changes in the international political strategies after WWII. In this sense, those phenomena may be regarded as the military revolution brought on by technological innovation of weapons. And today, the United States believes that development of the information technologies will induce the military revolutions.

It is an important issue in the national security policy of any nation how to determine the military strategies, what kind of armaments to maintain and how to secure the "qualitative" supremacy in the revolutionary period of innovation of weapons technology.

The author defines the "qualitative" supremacy of the military power here not only the supremacy in armaments, i.e. the weapons and weapons system, military facilities and the quantity, but supremacy in the operation tactics, strategies and the level of training as well. Therefore, the author shall discuss with the recognition that acquisition or keeping of "qualitative" supremacy of armaments is a greater issue in dealing with the innovation of weapons technology in this paper. The author shall study with the viewpoint that achievement of the supremacy depends on the armaments schemes and armaments concepts.


NIDS Security Reports No.2 (March 2001), pp. 116-159.
as seen in the case of information warfare of the United States described above and more essentially the strategic concepts, namely the technological strategy concerning the weapons technology within them.

The author therefore defines that the "quality" of armaments includes reinforcement of the new combat power by new weapons as well as the functions and performance of individual weapons. For this reason, even when the replenishment of the armaments was increase of the quantity of weapons, if the major intention was expansion of the combat power or addition of new functions, the author shall regard it as enhancement of the "quality" of armaments. The "quantity" of armaments shall mean the quantity of the number of troops, soldiers and weapons, and shall be virtually the same concept as the "quantity" of the military power.

WWI, Japan was confronted with the military revolution based on innovation of weapons for the first time and to deal with it as the major issue in the national security policy in the post-war period. The Imperial Army certainly learned a lesson from WWI, fully realized the utter inferiority of their weapons and supporting industrial strength in comparison with those of the major powers, and started to modernize the Army. After many twists and turns, the Army finally found the direction for modernization at the "Ugaki Disarmaments". This period may be considered as the time when the concept of "quality" was added to the traditional concept of "quantity" of armaments with priority given to artillery. Such being the case, the technological strategy should inevitably have been conceived as the function to coordinate the two.

Among few preceding studies on the armaments of the Japanese Imperial Army after WWI2, Taeru Kurono's "The Armaments Concepts of the Japanese Imperial Army" is remarkable. Kurono discussed the national defense policy of the Imperial Japan and the armaments concepts of the Imperial Army from the end of the Russo-Japanese War until the early Showa Period (late 1940s) from the viewpoint of conflict between "quality" and "quantity". He wrote that in the post-WWI period, Japan was driven by necessity to solve the fundamental problem of armaments, whether to maintain the "quantity" or to reduce the "quantity" and enhance the "quality", and that the Ugaki Disarmaments was the only armaments revolution conducted with a clear objective to reduce the "quantity" and enhance the "quality".3

Based on those preceding studies, this paper shall discuss that if the Ugaki Disarmaments

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was mainly focused on enhancement of "quality" in the armaments renovation, what kind of technological strategy was exercised to show the future direction of the armaments of the Imperial Army through the coordination between the "quantity" and "quality" of the armaments, as well as whether the direction was appropriate for the problems the Imperial Army was facing at that time and for the international environment concerning the weapons technology after WWI.

The military technological strategy may be considered to be considered under the military strategy or national security strategy and support the upper strategies as a general rule. The objective of the technological strategy is to ensure qualitative supremacy of the military power taking full advantage of the sciences and technologies, namely maintenance and enhancement of the "quality" of armaments. The technological strategy may be defined as the indication of the concepts and ideals of the research and development of weapons required to effectively achieve the objective.

It is also deeply involved with the science and technology policies and international trading policies in view of sharing of the technological bases between the military and the civilian or transfer of weapons and their technologies. Furthermore, it can be considered to have additional elements in reinforcement of alliance or ensuring of bargaining power both at peacetime and wartime as part of the diplomatic and national security policies as seen in the transfer of military technologies to the United States and in the Japan and the United States cooperation in equipment and technology under the present technological cooperation system between Japan and the United States. When those are comprehensively considered, it should not necessarily accede to the upper concepts without exceptions.

In other words, the technological strategy indicates how to conduct research and development in order to obtain and maintain the "qualitative" supremacy of deterrent or counterattack capabilities, i.e., the direction of the "quality" of armaments in view of the national defense, and how to maintain comparative supremacy in weapons or related technologies in order to exert the bargaining power in reinforcement of alliance, trading or diplomacy in view of the diplomatic policy.

Therefore the technological strategy can be defined as the indication of the "ideal way and line of thoughts to obtain and maintain supremacy in weapons and their technologies and to reflect it in the strategies and national defense policies."

1 Weapon Technology and Armaments of the Japanese Imperial Army before WWI

(1) Transition of weapon administration system and thought of "indigenous weapon developments"

The Japanese Imperial Army was founded to take after the French system in 1870. The German General Staff Office system was introduced in 1878, and the chain of command was separated from the military administration. In 1885, the Military Staff College invited Major Meckel from Germany, introduced the German style military system and strategies, and the
German influence gradually became stronger. Modeling after the German system, however, was limited to the military system and strategies, and introduction of the weapons came from other countries as well. In 1880, for instance, Tsuneyoshi Murata, an instructor at Army Toyama School designed the Model 13 Murata gun modeled after glos gun made in France. Tokusaburo Ohta, manager of gunner arsenal of Osaka mastered the manufacturing technology of Italy and started trial production of 7 cm field gun/mountain gun in 1892. Other major weapons manufactured in the Meiji Period (1868 to 1913) included the Model 30 rifle and Model 31 rapid-firing field gun/mountain gun designed by Nariakira Arisaka who later became the Director of Army Weapon Development and Evaluation Bureau, Model 38 rifle and Model 38 carbine designed at the Bureau, and machinegun model 38 and automatic pistols designed by Kijiro Nanbu.4

It was after the Southwestern Rebellion in 1978 when the Army started the research and domestic production of the weapons. After the end of this Rebellion, the riots and disturbances in Japan died out, and the Army was able to start replenishing the armaments at last. What the Army learned in the hard way in the Rebellion was not only the shortage of weapons but their extreme obsolesces as well. The slogan "indigenous weapon development" was advocated as an urgent need around this time.5 The "indigenous weapon development" at this time, however, did not mean domestic production of the equipment with Japan's own weapon technologies, but was limited to production of weapons through imitation, remodeling and mastering the manufacturing technologies of foreign weapons. This thought of the "indigenous weapon development" continued to survive in the weapon administration of the Army.

A military inspection party was dispatched to France in 1925s, and ordered prototypes of weapons. There is a recollection in a memoir that the negotiation was difficult because the Schneider Cte. of France that received the order expressed disapproval. They were told that, "Japan seems to have a bad habit of buying weapons from foreign countries and manufacturing them at home afterwards. The Hotchkiss machinegun is a good example. If you order field guns and 10cm howitzers, we want orders for at least 100 each." The Hotchkiss machinegun episode here referred to the purchase of it from France in 1896 and subsequent remodeling of it by Nanbu to the Model 38 machinegun.6 This episode is a good example that the "indigenous weapon development" in the Meiji Period was targeted to domestic production by imitation of foreign weapons and technologies and the Army could not easily abandon this thought.

5 Ibid., P.101. Concerning the indigenous weapon development, it was Iwao Oyama who first advocated "no independence of weapons, no independence of a nation" after his return from presisiu-France War. Hohhei Enkaku-Shi, Vol1 (Kaike-sha, 1964), p.3.
Therefore, if the term technology is interpreted as skills or art of using things well, the "indigenous weapon development" in the Meiji Period was supported by the thought to learn "how to skillfully make weapons" and manufacture weapons with the learned skills.

It was therefore necessary to learn or steal the "ingenuity to skillfully manufacture weapons." Murata and Arisaka, who where the authorities of firearms in the Meiji Period had experiences of studying in France, which led to their abilities to design weapons. Those who had studied abroad in those days were called "resident observers in foreign countries", and later "residents of foreign countries" in 1900. The residents were dispatched with the objective to concentrate in academic discipline, but they had to submit detailed investigation reports that describes details of researches and investigations and detailed reports on items salutary to the military and on items ordered to conduct temporary investigation in addition to their studies. At the armaments reorganization in 1925, engineers were to be dispatched as part of the "military science research facility enhancement", but it was obvious that residents in foreign countries had already bore the duty of collecting information concerning the weapon technology at an earlier stage.

The weapon administration system was also reorganized with the focus on fostering the "ingenuity to skillfully manufacture weapons." The Army established the Artillery Conference in 1876 and the Engineer Conference in 1883, before and after the Southwestern Rebellion. After several amendments, these Conferences gradually revealed the characteristics as the advisory organizations for the Minister of War who planned and evaluated the policies on the skills of the artillerymen and engineers and improvement of weapon materials. The two Conferences were joined in 1903 to be the Army Weapon Development and Evaluation Bureau. The reasons for this restructuring were that each Conference had been conducting evaluation, research and planning individually and lacked mutual communication and assistance, that evaluation had not proceeded smoothly for the relations between firearms and castle building and other cases that covered both artillerymen and engineers due to complicated office work, and that inconveniences in manufacturing and supplies were caused by different systems and quality requirements for equipment with the

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10 Establishment of the Artillery Conference was in the Order No.71 "Hohhei Kaigi Gaisoku", April 26, 1876, (Meiji 9 Nen Hohrei Zensho), and establishment of the Engineer Conference was in the order No.14 "Kohhei Kaigi Jorei," and Imperial Order No.13 "Kohhei Kaigi Jorei", both of January 24, 1890, (Meiji 32 Nen Hohrei Zensho.)
11 Imperial Order No. 12, "Rikugun Kohhei Kaigi Jorei" and Imperial Order No.13 "Kohhei Kaigi Jorei", both of January 24, 1890,(Meiji 32 Nen Hohrei Zensho.)
same objectives because the two Conferences had conducted separate evaluations.\textsuperscript{12}

The duties of the newly established Weapon Development and Evaluation Bureau was to research and investigate the items concerning the technological weapon materials for artillerymen and engineers and submit proposals to or advise the Minister of War.\textsuperscript{13} The "research and investigation" in the duties were intended to promote improvement and progress of the weapon technology and materials, same as the objectives of the Artillery and Engineering Conferences, but the Weapon Development and Evaluation Bureau did not aim to conduct original development and create its own new weapons.

The word "research" in the description of the duties of the Artillery and Engineer Conferences was for the "foreign artilleryman (engineer) item", which indicated that they had the strong characteristics to research and investigate the foreign weapons and technologies and "evaluate" whether the imported weapons or the imitated and improved versions of domestically manufactured weapons would contribute to the Army's armaments.

The Weapon Development and Evaluation Bureau had borne the name "Technology Investigation Bureau" in the first amendment draft, but after the deliberation by the councilors, the term "Evaluation" was adopted. They assigned captains to lieutenant colonels of infantry, artillery, engineer and transport corps to be the judges in charge of research and investigation. This fact implies that the characteristics of the duties were similar to those of the Artillery and Engineer Conferences.\textsuperscript{14}

The Weapon Development and Evaluation Bureau during the Russo-Japanese War had piles after piles of items awaiting research and investigation. The Chief and remaining officers worked every day even on the New Year's Day until late at night. Supplies of ammunitions and other consumables, in particular, were short, short and short, giving headaches to the Evaluation Bureau that had to manage them.\textsuperscript{15} This statement indicates that the Weapon Development and Evaluation Bureau was not managing the emergency improvement of the weapons or countermeasures against new weapons of the enemy, but was mainly concerned with investigation and supplies of alternatives to deal with the shortage of consumables.

The Weapon Development and Evaluation Bureau was certainly an organization to evaluate the "ingenuity to skillfully manufacture weapons." The "Army Powder Laboratory" was also established at the same time. It was positioned subordinate to the Tokyo Artillery Arsenal, which is an indication that it was a laboratory to think out the "ingenuity to skillfully manufacture weapons."
manufacture gun powder".16

(2) Recognition of "quality" of armaments by the Army

The proposition of the weapons administration of the Imperial Army in the Meiji Period was how to actively introduce the "ingenuity to skillfully manufacture weapons" from foreign countries to enable domestic production in order to achieve "indigenous weapon development". The objective was to enhance the "quality" of the weapons by adopting the latest weapons and their technologies as a matter of course since the awareness of the "indigenous weapon development" was generated from the painful realization of the obsolescence of their weapons. The "quality" of weapons is an important element in structuring the "quality" of the armaments as the hardware strength, but the question is how the Army regarded the "quality" of armaments in those days.

In the next year after the foundation of the Imperial Army, Acting Minister Aritomo Yamagata and Assistant Vice-Ministers Sumiyoshi Kawamura and Jyudou Saigou proposed the necessity of maintenance of security, coastal defense and replenishing of the armaments. This proposal presented that, "when a strong enemy in the north is drawing near every day, how could we neglect to formulate a farsighted national policy?" and emphasized the necessity for the national defense against Russia. The subsequent replenishment of armaments was based on the defense against Russia in this proposal.17 The armaments in those days had to start from an increase of divisions and other "quantitative" expansions as they were still at a foundation stage, and paid little concern in consideration of the "quality" with a possible exception of the demand for improvement of the firearms at the Russo-Japanese War.

A change within the Army, however, was beginning to emerge concerning the "quantity" and "quality" of the armaments after the victory in the Russo-Japanese War. There was a budding of a thought to place priority on "quality" against the movement to demand further expansion of the "quantity" in the armaments in the post-war period.

The concept to emphasize the "quantity" is found in the written opinion for post-war management which Yamagata, then Chief of General Staff, submitted to the Cabinet in August 1905 before the end of the Russo-Japanese War. In his opinion, Yamagata argued that it would be appropriate to regard the peace in the post-war period as a long-term cease-fire because Russia would plan a revenge and scheme southern advance sooner or later, it was an urgent duty to expand the armaments of the Army and Navy, and it was necessary to contain Russia by maintaining the Anglo-Japanese Alliance, approaching to Germany and exhausting every possible diplomatic means. He planned to increase 17 division skeletons and 16 second

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reserve divisions at the end of the war to maintain 25 divisions at peacetime and 50 divisions at wartime.\textsuperscript{18}

On the other hand, Gentaro Kodama, then Chief of Staff of the Manchuria Area Forces, submitted Important general issue that should be referred to upon post-war management of our Army in his written opinion\textsuperscript{19} and opposed to Yamagata's opinion as disproportionate to the national power. Kodama thought to emphasize reinforcement of the "quality" with the maximum of 19 divisions at peacetime and to supplement the shortage of the number of divisions as a strategic unit with alliances and other diplomatic measures. In fact, even in the late 1920s, the production and supply capabilities for weapons and ammunition could accommodate the maximum of 30 divisions due to the low level of weapon manufacturing capability in those days.\textsuperscript{20}

The opinions of Yamagata and Kodama agreed that the number of the strategic units to be replenished was still short and shortage should be supplemented by diplomatic measures, but differed on the level of the number of strategic units, as to whether to continue to emphasize expansion of the "quantity" or to enhance "quality".

Kodama, in the above written opinion presented a question, "expansion of armaments should not complete unless it is accompanied with repletion of armaments. Was our armaments before the last war complete?", and went on to say, "the battle capability of an army is not in the number of soldiers, but in the truly functionalistic actual abilities," thus argued that "repletion" must be given priority over expansion in the post-war armaments.

"Repletion" in Kodama's opinion is the battle capability with "truly functionalistic actual abilities", and he specifically proposed to secure reserve power for attacks by changing the number of guns in an infantry battalion at wartime to 1,000, to prepare for the future increase of guns by adding 1 brigade of field artillery and 1 regiment of field heavy artillery to a corps, and to quicken the transportation for more prompt logistics operations by preparing the railway materials in peacetime and expanding the railway regiment in the future. He appealed for the necessities for enlargement of the calibers of rifles, improvement and progress of field and mountain guns, employment of howitzers as the main gun for field operation and besieging depots, and improvement of machineguns and trench mortars.

Those proposals demanded repletion to enable improvement of firepower and ensuring brisk commanding leadership, and repletion of armaments in the "quality" instead of the "quantity". They may be evaluated well as the first introduction of the concept of the "quality" to replace the "quantity" in repletion of armaments to the Army. The emphasis, however, was the improvement and enhancement to enable the maximum exertion of the

\textsuperscript{19} "Waga Rikugun No Sengo Keiei Ni I Kaishi Sanko To Subeki Ippan No yoken", ("Teikoku Kokubo Hohshin-to Sakutei Tenmatsu gaiyo," Major General Giichi Tanaka, possession of the war History Division, Defense Research Institute).
\textsuperscript{20} Kurono, "Kindai Ni Okeru Nippon Rikugun No Gunbi Koso," pp.3-4 and 15.
powers of individual weapons although they indicated the direction toward “quality” of the weapons in the future, and they were not the concept of the weapons system and weapons research in the technological strategy viewpoint.

The thought of the “quality” of the armaments proposed by Kodama had gone through many twists and turns in the confrontation with the Yamagata’s plan, and was constricted into Yamagata’s concept of giving priority to the enlargement of the “quantity” with establishment of 50 divisions at wartime in the end.21

It should be noted that the thought of the “quality” of armaments in Kodama’s proposal for enhancement of the “quality”, namely fostering of the “truly functionalistic actual abilities” described earlier, was different from the “quality” of armaments in Ugaki Disarmaments discussed in the next section since the latter denoted addition of new battle capability functions.

2 Lessons from WWI and groping for modernization

(1) Investigation on lessons learned from the war and recognition conducted by Temporary Military Affairs Investigation Committee

It was after WWI that the Imperial Army started groping of conversion from the “quantity” to “quality” in repletion of armaments. It was triggered by the recognition of modern warfare indicated as the result of the investigation on lessons learned from WWI conducted between the two world wars.

When WWI broke out in July 1914, the Imperial Army established a Temporary Military Affairs Investigation Committee in September 1915 and conducted investigation and research on the military affairs of European countries engaged in the war although the Japanese Imperial Army did not directly participate in the warfare in Europe.22 The investigation was led by a major general and a total of 41 (later 46) members were additionally attached to the Ministry of War, the General Staff Office, other important government agencies and schools. Their activities covered a wide range, from the combat operations, organization and equipment, logistics, men and horses, sanitation to wartime industries and national mobilization. The results were reported monthly since 1916. Annuals titled “Sansen Shokoku no rikugun ni tuite” (Armies of participants of the war) that carried the summary of those monthly reports were published in 5 volumes from 1917 to 1920. The Temporary Military Affairs Investigation Committee submitted a large number of opinions concerning improvement and

21 Ibid., pp.5-6.
renovation based on the investigation results.\textsuperscript{23}

The largest lessons the Temporary Military Affairs Investigation Committee learned were as follows. First, the future warfare would involve national mobilization including total mobilization of the people to ensure war potential manpower and mobilization of the industries to secure war supplies, i.e., the total national war system. Second was the recognition of rapid innovation of weapons driven by emergence of tanks, poison gases and other new weapons as well as improvement and progress of machineguns and aircraft. Measures to deal with the preparation of a total national warfare and weapons innovation became important issues for the armaments reformation of the Imperial Army.

The annuals of the Temporary Military Affairs Investigation Committee defined the relationship between the industrial power and armaments at a total warfare as follows. Armaments are absolutely indispensable in maintaining, expanding and developing the industrial power, and at the same time, industrial power is a directly required tool to maintain, nurture and expand armaments, particularly the battle capability. For this reason, they recognized that industrial power is an extremely powerful major element for armaments.\textsuperscript{24}

This lesson was gained from the recognition that the relative superiority or strength in the post-war period could not be judged simply by the numbers of soldiers, vessels and equipment, but it was necessary to evaluate those together with the industrial power of the nation. WWI was truly a "great revolution in the concepts and philosophy."

Furthermore, the great revolution on the industrial power and armaments generated by the total warfare created a sense of growing crisis in the military power of Japan. The annuals carried an observation of the condition of the industrial mobilization conducted to meet the huge wartime demands for weapons, ammunition and equipment at each nation that participated in the war as follows. The wartime industries were not newly established to meet the demands created by the war, but by conversions of peacetime industries. The supply capacities for the military demands during the war could not remarkably exceed the industrial power they had had before the war.

Although the industrial power of Japan in those days had made great progress especially in the steel and other metal industries during the two world wars, the annual expressed the fear that the wartime military power that the Imperial industries could support at the moment would probably bespeak of itself. They proposed an opinion that it was necessary to drastically develop the manufacturing technologies and manufacturing capabilities of the industries for the war supplies and similar articles.

The sense of growing crises entertained by the Temporary Military Affairs Investigation


\textsuperscript{24} Sansen Shokoku No Rikugun Ni Tsuite (Dai 5 Han), (Appendix to 1917 Kaiko-sha Kiji, Possession of the War History Division, Defense Research Institute), 1917, pp. 34-44.
Committee was well expressed in the comparison of various industrial powers of major participants of the war and comparison of industrial powers of major participants of the war by numbers of workers. For instance, while the output of steel in Japan immediately before the war was 260,000 tons, that of steel in the United States was 37,150,000 tons, Germany 18,890,000 tons, Great Britain 6,900,000 tons and France 4,250,000 tons. The smallest amount of France was still more than 16 times higher than that of Japan. The number of workers in the metal industry and chemical industry was around a quarter or less compared to those of the Great Britain, United States and Germany. The textile industry alone had a comparable number of workers to those in the above three nations. They clearly indicated the ground for the frustration to the reality that the mainstream in Japan was the light industry and Japan lacked the industrial structure to fight through total warfare.

Next, the annual had an article that conveyed their being surprised of find that as a result of the weapon development competition, the progress of weapons was innovatively driven as the new products that paid back the endless development of human intelligence and efforts. The nations that participated in the War were engaged in a fierce competition of development of new weapons or improvement of existing weapons freely driving the scientific technologies, and their determination to be always ahead of others and forestall the others was out of the ordinary. They observed that the practical applications and utilization of science and technologies have progressed in good harmony of development since the war and it was natural that this competition of weapons development would continue after the war as evidenced by the reported discovery of a new poison gas in the United States.

The Committee recognized that despite the efforts to develop new weapons and improve the existing weapons since the start of the War, the Army had been unable to achieve any good results due to the shortage of the research fund. As for the expansion of the calibers of the rifles, they could not even start it although they did realize the necessity, not to speak of the new weapons introduced in the War because the Army was still at the level of studying part of them and even those that had reached to the point of production of a prototype were far from being complete, and thus the weapons of the Imperial Army today were inferior to those of the nations that participated in the War.

The following was the comparison of researches of the weapons between the participants of WWI and the Japanese Imperial Army concerning the tanks, high-angle guns, poison gases, aircraft and other new weapons that were to be the focus of armaments reformation of the Army after WWI. Tanks were the new weapon that Great Britain first introduced to break through the enemy's encampment at the War of Somme in 1916. At the last stage of WWI, Great Britain, United States and France possessed 3,300 tanks and Germany 1,000 tanks.

25 Ibid. Attached charts 2 and 3.
27 Ibid., "Ohshu Sengo Ni Okeru Jidosha Oyobi Tanku Tohkei."
The Imperial Army at first adopted the English word “tanke”, and since a tank was categorized as a vehicle, the Investigation Committee for Army Vehicles established in 1912 was to conduct the investigation. The Committee bought a reference tank from Great Britain in 1918 and started investigation on the performance, operability and handling methods. By 1919, they proceeded to the operational study, and the infantry division began to recognize it as new battle function at offensive transport by surprise attack operations.28

A poison gas was first used by France in 26mm gas howitzer shells in 1914 in the European war, but it was Germany that quantitatively and systematically used gas at the projection to the French army on the battlefield of Ieper in the next year. The Army established the “Temporary Poison Gas Investigation Committee” in 1918 to make temporary investigation on the gases, projection methods and protection equipment because they had anticipated chemical warfare at the advance to Siberia and needed to protect the personnel from the threat of poison gases. The interest in chemical warfare, however, thinned out rapidly as the Army withdrew from Siberia.29

Contrary to such conditions of investigation on tanks and poison gases, the Army had started investigation on aircraft and antiaircraft artillery from an early stage. The Army established a Temporary Military Balloon Investigation Committee in 1909 to study the balloons and aircraft. Introduction and mastery of foreign technologies became temporarily difficult during WWI, but Faure mission came to Japan from France in 1919, bringing aircraft, airborne radios, aircraft machine – gun and other aircraft related equipment. The main training subjects of this mission were operations and battle techniques, but it also contributed to development of the aircraft technologies, and the licensed production system in Japan was established. As many as 8 civilian manufacturers had started or had been newly established for aircraft manufacturing by this time because aircraft was regarded as a promising future weapon and protection and encouragement could be expected from the Army.30

The Army had already been interested in the antiaircraft artillery since the days of shooting the balloons, and had manufactured one "prototype 75mm" before WWI31, and started full-fledged development with the policy to develop 7cm and 10cm field antiaircraft artillery in 1918.32

30 War History Division, Defense Research Institute, Senshi Sosho Rikugun Kohku Heiki No Kaihatsu Seisan Hoky, (Chou Shimbun-sha, 1995), pp.36-37 and 53.
32 “Ido-shiki Kohkuki Shagekiho Shinsa No Ken”("Showa 6 Nen Kogai-daiichi Eizon Shorui,” Ministry of War, Possession of the War History Division, Defense Research Institute and Tadakatsa Numauchi, “Kohshaha Oyobi Kikanjuho,” op.cit., Hohhei Enkaku-shi, Vol.3 pp.45-46. The “Ido-shiki Kohkuki Shagekiho Shinsa No Ken” was submitted to the General Affairs Section (Gun Section) in May 1918, minister’s office in 1917, it was compiled in that year.
A. Reformation of the weapon administration

The Army started drastic reformation of the traditional weapon administration system in April 1919, a year after the end of WWI and newly established the Army Technology Headquarters, Army Technology Board and Army Scientific Research Laboratory along with the investigation on the lessons from the war by the temporary military affairs investigation committee.

The new Technology Headquarters was established to expand the functions of the traditional Weapon Development and Evaluation Bureau, absorb the weapon inspection duty of the Ordnance Depot and transfer the designing duty to the Artillery Depot in order to further advance and develop the Imperial Army's technologies in realization of the experiments in the European War and the actual conditions of the Imperial Army's technologies. It was aimed to separate the evaluation, inspection, investigation, research and testing services of weapons and weapon materials from the designing and manufacturing services to promote improvement and progress of weapons and weapon materials.

The new Technology Board was separated from a committee that had been established within the Weapon Development and Evaluation Bureau as an advisory organ to the Minister of War. This was due to the regret that the traditional committee had been limited to a service in the Weapon Development and Evaluation Bureau and had not conducted the research and investigation services with sufficient incorporation of the operational requirements. While the committee in the Weapon Development and Evaluation Bureau had been held only when the Minister of War instructed it, the Technology Board was clearly defined as the supreme judgment agency in the weapons administration that was to deliberate and offer advice on the important items concerning the Army technologies as instructed by the Minister of War.

The new Scientific Research Laboratory was established with the aim to conduct wide range application of science and technologies in the studies on weapons with the traditional Army Powder Laboratory as the core because it was recognized that research and investigation on science that should be the foundation of the basic technology were required in order to advance the Army technologies in realization of the experiments in the European War and the conditions of the Imperial Army's technologies. The Scientific Research Laboratory was assigned the duty of investigation and research of science concerning weapons and weapon materials, and established the 1st section that dealt with mainly physical items and the 2nd section that dealt with mainly chemical items. While the Powder Laboratory was subordinate to the Artillery Depot and a section of the Weapon Development and Evaluation Bureau, the Scientific Research Laboratory was a subordinate of the Technology Headquarters of the
Research and Investigation Agency. The weapon administration system of the Army was organized with the Technology Board as the leading organ, Artillery Depot as a production organ and Ordnance Depot as the logistic organ, and the systematic organization was at last formulated.

The series of reformation of the weapon administration system was executed because the necessity was painfully recognized through the “experiments in the European War” and “conditions of the Imperial Army” as described in the reasons for the establishment of the Technology Headquarters and the Scientific Research Laboratory. No specific facts were given in those two reasons, but the "experiments in the European War" could be the lessons learned by the Temporary Military Affairs Investigation Committee, namely the recognition that the broad applications of science and technologies had enabled dramatic, not gradual, advancement of weapons resulting in changing the traditional concept of warfare.

The "conditions of the Imperial Army" could be the recognition that compared to Europe and the United States that had gone through weapon innovation, the Imperial Army had been far behind in improvement and advance of traditional weapons and had vulnerable research foundation for science and technologies required for their broad application in the weapon researches and production of new weapons.

The proposal for improvement submitted by the Temporary Military Affairs Investigation Committee concerning the reformation of the weapon administration system included Ohshusen No Jikken Ni Kangami Seishiki Seiteisha Wa Kaisei No Mokuteki O Motte Kenkyu O Yousu Beki Heiki Ni K ansuru Iken" (Opinion concerning weapons that require the system definers to study with the target of reformation in realization of the experiments in the European War, January 12, 1915) and "Sankoyo Toshite Shinshiki Heiki Kounyu Ni K ansuru Iken" (Opinion Concerning Purchase of new weapons for reference, December 24, 1915) submitted to the ministry of War, and “Teikoku Rikugun Gijutsu Seido Kaisei Iken” (Opinion of reformation of technological system of the Imperial Army, June 1915) submitted to the relevant bureaus and sections in the Ministry of War. The “Teikoku Rikugun Gijutsu Seido Kaisei Iken”, particular, must have triggered the weapon administration system reformation in 1918 if speculated from the date of submission, but the content is unknown.

B. First formulation of the weapon research policy

While the weapon administration system was reorganized and application of science and

33 "Gijutsu Honbu-rei Hoka Ni-johrei Seitei Narabi ni Rikugun-sho Kansei Hoka Ni-johrei Chu Kaisei No Ken" ("Taisho 8 Nen Kokushu-Daiichirui-Eizon-Shorui," Ministry of War, Possession of War History Division, Defense Research Institute). The "distinction" of the relations between the Weapon Development and Evaluation Bureau and the Powder Laboratory means receiving instructions from an authority or commander which was not in the line of command or subordination relation for the purpose of more ensured, effective and easy execution of a duty for a certain item. For Details, see "Senshi Shosho Riku Kaisen Nenpyo" War History Division, Defense Research Institute, Choun shimbun-sha, 1980, p.337.
technologies was being promoted, the "Policy for Weapon Research of Army Technology Headquarters" was formulated for the first time in July 1920. Katsuichi Ogata, who was Chief of Army Technology Headquarters then, took to heart that it was necessary to set a solid policy approved by the Technology Board in order to enliven the weapon researches by the Army at the opportunity of the weapon administration system reformation, and had the research and development policy drafts drawn for guns, ammunition and vehicles. After completion of the first section, the second section was to be prepared. The research and development policy for the engineers' equipment in the second section was compiled and decided as the weapon research and development policy for the Technology Headquarters. The Chief of Army Technology Headquarters submitted the weapon research and development policy of the first section in June and the policy of the second section in August to the Minister of War.

The reason Ogata felt the necessity for formulation of the weapon research policy was the absence of a policy of the Army on weapon researches, which had limited the researches to those from personal ideas and requests of the chiefs of the General Staff Office or Artillery Inspectorate, resulting in wasted efforts, time and expenses when the personnel in charge had been transferred.

The weapon research policy consisted of "General", "Policy of Research of Weapons managed by the First Section," and "Policy of Research of Weapons managed by Second Section". The "General" chapter defined the overall policy or principle, which seemed to strongly reflect Ogata's ideas. The policies for the research of weapons managed by each section described the outlines of the targets and reasons for the researches for each weapon or equipment, and the contents varied, from the specifications of the required performance and dimensions to those with a simple list of items.

The concept of the weapon researches in the "General" chapter was to consider that mechanical power shall widely be employed in addition to the human or animal powers in the operation and transportation of weapons in view of the trend of the advance in the military technologies with the basis of application in that it should include everything required in mobile warfare and position warfare, but lay more emphasis on the mobile warfare. This concept had taken into account the application of mechanical powers learned in the lessons from WWI. It also showed that no dramatic changes should be given to the weapon system and inherited the application concept before WWI that had emphasized mobile warfare with manpower and animal power because they were meant for rough roads in the presumed battlefields in China and Manchuria.

36 Ibid.
37 "Rikugun Gijutsu Honbu Heiki Kenkyu Houshin No Ken"("Showa 6 Nen Koushu-Daigorui-Sono-Ichi-Eizon-syorui,"Ministry of war, possession of the War History Division,Defense Research Institute). This document was also submitted in July 1920, but it seemed to have been compiled in 1931 for its relations with the amendment of op. cit. "Idoh-shiki Koukuki Shagekiho Shinsha No Ken" and other relevant weapon evaluation.
The outline of the research was as follows: the principle is to do our utmost best to create the technologies that meet the strategic and tactical requirements, and to consider making it easy to supply logistics at wartime with due consideration to the conditions of the domestic industries for the materials of weapon manufacturing. In other words, it was presumed that the new technologies to be adopted must be those that could be produced domestically in consideration of availability of the raw materials, domestic industrial bases and technological capabilities.

The targets of the researches were those we should start anew and those that could become important after significant modification, but it also stipulated that we should as a principle give partial modification and use even those that would become obsolete upon researches on new weapons. The new weapons introduced between the two world wars must have been positioned as "those we should start anew," and although it showed motivation to research new weapons, it was based on the principle of economizing by using and improving obsolete weapons. It must indicate vulnerability of the domestic industries and technological foundation of Japan in those days.

Furthermore, the attitude on researches of new weapons remained ambiguous even after the establishment of the weapon administration system. It was indicated in the difference between the discussion proposal of the Technology Headquarters to the Technology Board titled "Weapon Research Policy of Army Technology Headquarters." and the resulting proposal, submitted later by the technology Headquarters to the Chief of General Staff and Inspector General of Military Training titled "Weapon Research Policy of Army Technology Headquarters." The earliest "discussion proposal" included a section of "Vehicles" in the "Weapon Research Policy for the First Section" which stipulated that "we shall investigate a small-size 'tank' of Renault of France" and showed the intention of the Technology Headquarters to start the research. In the later proposal, however, the "Vehicle" section itself had been deleted. This must be due to the decision of the Technology Board to assign research on vehicles to the Investigation Committee for Army Vehicles as before.

The Army had conducted investigation and research on new weapons with a weapon technology in process of development by organizing a committee or a board consisting of relevant personnel of different fields. The Technology Headquarters prepared the bill with presumption to abolish this committee system and conduct all researches and investigations by themselves. The Technology Board maintained the traditional attitude and decided that among the items in the inquiry, the Technology Headquarters would conduct the researches only when they were related to the weapons under the control of the Technology Board.
Headquarters\textsuperscript{41} and the weapons under research and investigation by committees should be outside the control of the Technology Headquarters. There were the Investigation Committee for Radiotelegraphy and Temporary Investigation Committee for Poison Gas as in addition to the Investigation Committee for Army Vehicles in those days.

Investigation on poison gases was omitted in both bills. It might have been due to nonexistence of a relevant section in the Technology Headquarters or omitted at the planning stage as the interest had thinned out after the end of WWI.

The first definition of the policy for weapon researches was praiseworthy in a sense that it organized individually conducted weapon researches under one policy for the first time and systemized it based on the new weapon administration system giving authority after deliberation of the Technology Board. Ogata's attempt to organize a comprehensive research policy for all equipment of the Army except aircraft, however, was amended to be limited to the researches conducted by the Technology Headquarters after deliberation of the Technology Board. As a result, it could not define the technology strategy that would indicate the direction of weapon researches with long-range view on the Army equipment, and could not adequately adopt the lessons learned in WWI. It was limited to the organization by the Technology Headquarters of improvement and trial plans for weapons that had been conducted separately at different sections, after all.

More than half of the weapons and equipment mentioned in this weapon research policy were completed by autumn in 1921.\textsuperscript{42}

\section*{(3) Efforts and failure of modernization}

\subsection*{A. Amendment of national defense policy and promotion of weapon researches}

The Imperial Army made drastic reformation of the weapon administration system, renovated the organization, defined the weapon research policy for the first time, and prepared the condition to develop the “quality” of armaments. In June 1918 before the reformation, the Army also amended the national defense policy set in 1907 (first amendment) and decided the armaments concept and political warfare strategy.

It was Giichi Tanaka, Vice-chief of General Staff, and Kazushige Ugaki, Chief of the first division who took leadership in this amendment. Their concept was based on the application of the modern weapons and total warfare with national mobilization learned from the lessons of WWI. In other words, it was a total war concept that they would maintain the traditional short war concept that pursued fighting a decisive battle at the early stage of a war, obtain supremacy by that victory, build advantageous bases for long total warfare, devise self-supporting means, and subsequently fight decisive battles at required fronts. The emphasis

\begin{footnotesize}
\begin{itemize}
\item[\textsuperscript{41}] Op. cit., “Rikugun Gijutsu Honbu Heiki Kenkyu Houshin No ken”.
\item[\textsuperscript{42}] Ogata, “Ogata Taiken-ki”, P.192.
\end{itemize}
\end{footnotesize}
was laid on improvement of the organization with reinforcement of firepower, modernization of the equipment and other measures to enhance the “quality” of armaments.\(^ {43}\)

The Army started to reinforce the aviation corps and railway replenish and improve the weapons, and other means to complete the new armaments in 1920 with the national defense spending, in addition to the repletion of the machinegun corps, mountain gun corps and aviation corps that they had started in 1917.\(^ {44}\) It was the weapons research by the Technology Headquarters based on the weapons research policy that technologically supported this replenishment of armaments.

It is not certain how much spending was actually appropriated to the research items included in the weapons research policy. According to the “special weapons manufacturing and testing expense” which seemed to mean the weapons research among the expense items of the Army budgets since 1918, however, while the expense in 1918 was around 300,000 yen (total Army budget in 1918: about 120,000,000 yen), it was tripled to around 800,000 yen in the next year. Equivalent spending continued until 1922 as planned.\(^ {45}\) Other spending on weapons research by the committees other than the Technology Headquarters included continuation of the “radiotelegraphy research expense” and “vehicle research expense”, and addition of “poison gas research expense” from 1921.\(^ {46}\) While the manpower at the former Weapon Development and Evaluation Bureau was about 300 officers and subordinates, it was doubled to around 600 at the Technology Headquarters by 1923.\(^ {47}\)

Completion of the armaments was planned in accordance with the military strategy of the national defense policy, and the weapons researches started to enable utilization of weapons with official budgets in those days. The weapons researches at this point, however, were focused on improvement and enhancement within the traditional weapons system as evidenced in the weapons research policy although the target was modernization of armaments, and it had not achieved the definition of how to ensure the “quality” of the Army’s armaments in the future based on the new weapons introduced after WWI. Furthermore, application of science and technologies to weapons, which was the lesson learned from WWI, and required fundamental researches remained inactive in reality.

Although the objective of the Army Scientific Research Laboratory was to conduct fundamental researches on the weapons technology that would support the researches to utilize the weapons conducted by the Technology Headquarters, the total number of the researchers of senior officers and subordinates was around 100 and the allowed expense was

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\(^{44}\) “Taisho 9 Nendo Rikugun Tsuika Yosan Kouyou” (“Rikugun Yosan Kouyou, 1920-1931, possession of the War History Division, Defense Research Institute).

\(^{45}\) “Rikugun-shou Toukei Nenpou,” 31st –35th (Possession of War History Division, Defense Research Institute).


about 50,000 yen. For this reason, the Second Section in charge of mostly chemical items was merely following the steps of the former Powder Laboratory, and the researches on mostly physical items by the newly established First Section remained at the low level of investigation on them in actuality.48

B. Armaments reshaping in 1922 and failure in modernization

The Imperial Army took the first step for modernization of armaments in any event. In reality, however, the Army faced a financial crisis caused by the post-war depression from 1920 when they took the first step, and the national finance became tight. Furthermore, the Russian Empire extinguished by a revolution in 1917, which was regarded as lessening of threat for the time being. In 1922, in addition, the Navy Disarmament Treaty was signed and the Imperial Diet proposed the Army Disarmament Bill, which indicated growing tendency for disarmament of the Army.49 Under such circumstances, the Army started to reform armaments from July 1922 to respond to the public opinion that demanded reduction of the military expense and proceed with improvement of armaments.

This reorganization of armaments in 1922 was initiated by Hanzo Yamanashi who assumed the post of Minister of War in June 1921 succeeding to Tanaka with the policy to supplement the national power by minimizing the war potential at peacetime and replenishing the new weapons and equipment50, and it is called the Yamanashi Disarmament today. The content was to reduce the war potential at peacetime to over 50,000 (equivalent to 5 divisions) by reducing the companies of each arm, abolishing the independent guard headquarters, discontinuing additional complement, and abolishing and reducing the number of the government offices and schools as an effort to raise fund to improve armaments to the requirements of modern warfare. It was planned to gradually equip the infantry with light machineguns, artillery, antiaircraft guns and vehicle towed heavy artillery with a total expense of 96.13 million yen from 1923 to 1925 as the “completion of new weapons and equipment”. The Army budget of 1923 (total Army budget: 203.5 million yen), however, indicated mere 2 million in “national defense completion expense (new weapon manufacturing expense)”, and the “aircraft completion expense”, “weapon completion expense” and “vehicle research expense” for the research on tanks, which had been continued as armaments completion expense since the end of WWI, were all reduced. The only remarkable point is the budget of around 300,000 yen for the “chemical weapon research and equipment expense” included in the national defense completion expense, which initiated the cradle period of the chemical weapon research by the Scientific Research Laboratory.51


51 Ibid., and “Taishou 12 Nendo Rikugun Yosan Kouyou” (op. cit., “Rikugun Yosan Kouyou”).
Although the armaments reorganization included reduction of war potential equivalent to 5 divisions to meet the public demand for disarmament, the number of divisions as strategic units was not reduced but maintained. This concept of maintenance of the number of the strategic units was reflected in the national defense policy amended in February 1923 (second amendment), which indicated that the total war concept adopted at the first amendment was replaced with the traditional short war concept held before WWI. Chief of Staff Yusaku Uehara and Commander of the 15th Division Kunishige Tanaka supported this short war concept. It intended to maintain as much regular force as possible to fight a decisive battle at the first stage of a war because execution of total warfare was impossible considering the national power of Japan in those days.52

This meant that the movement for modernization was stopped in less than 3 years after the start of the weapons research system that had intended to convert the traditional short war concept to total warfare concept, endeavor for completion of the "quality" of armaments and conduct researches on weapons that could generate the "quality" in the first amendment of the national defense policy based on the lessons learned in WWI.

Such regression to the conditions before WWI was caused by the continuation of the expansion of armaments advocated by Yamagata before WWI, namely the emphasis on the "quantity" and insufficient recognition of the reality that armaments had shifted to the relations between the "quantity" and "quality" by the renovation of the weapons after WWI under the changes in the domestic and international situations including financial difficulties, trend for disarmament and decline of threats. In other words, there was no awareness that it was not the matter of selection between the "quantity" and "quality" of armaments but the coordination of the "quantity" and "quality" of armaments according to the domestic and international situations. It was at the occasion of the Ugaki Disarmament that such awareness dawned in the Army. The failure in modernization at this time became a factor in generating the sense of crisis for the delay in armaments.

3 Armaments modernization concept in Ugaki Disarmament and Ugaki’s technological strategy

(1) Reinforcement of the "System Investigation Committee" and full-fledged efforts for modernization

The Imperial Army established the System Investigation Committee with the objectives of investigation of the various systems in the Army and application of the lessons learned in WWI while proceeding with the reformation of the weapons administration system in 1919. This System Investigation Committee was chaired by a Vice-minister of the Imperial Japan

Army and consisted of competent chiefs, directors and section chiefs of the Ministry of War, General Staff Office and Military Training Division as well as the chairman of the Temporary Military Affairs Investigation Committee. The System Investigation Committee must have reported the armaments reform plan at the armaments reshaping in 1922 at Yamanashi Disarmament, but had not conducted any remarkable activities. Perhaps the System Investigation Committee had had little significance at the armaments reshaping in 1922 that was not necessarily active in modernization of armaments because its objective was execution of modernization of armaments assuming total warfare.

Giichi Tanaka, who resumed the post of the Minister of War succeeding to Yamanashi who had executed the armaments reshaping in 1922, strengthened the System Investigation Committee with the objective to conduct more fundamental research than before in December 1923. He ordered Kazushige Ugaki, who had resumed the post of the chairman of the System Investigation Committee as the Vice-minister of the Imperial Japan Army in October in the same year, to investigate and deliberate the various systems in the Army and draw an amendment plan concerning armaments with the objective of improvement in all aspects of the military affairs with due consideration to the domestic and international situation and particularly to the actual conditions of the Army.

Ugaki raised 7 principle policies at the investigation and deliberation as a chairman. The focus of those principle policies was armaments to be prepared for the future warfare. In other words, standards were set to prepare for armaments that could stand long wars although a short war was preferable, to devise means to accommodate both wars with the military alone and wars that would involve the entire nation with general mobilization, to prepare for the system to accommodate the economic warfare that could exhaust the national power, and to realize the system of national mobilization in both tangible and intangible forms.

This armament concept of Ugaki truly reflected the total warfare concept aimed at the first amendment of the defense policy and the Army was beginning to resume modernization. The sense of crisis by the delay in modernization in Ukage, however, was apparently different from that held at the time of the first amendment. Ugaki indicated his fear that some people held suspicion that the Army had too many divisions but the organization and equipment might not be adequate for the future warfare, and there were not a few who held the same suspicion within the Army. At the first amendment, the fear concerned the condition that the armament of the Army remained in the “Russo-Japanese War organization” compared to the

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participating nations in WWI, but by this time, the apprehension mostly concerned the generation of distrust to the Army that had neglected modernization.

Ugaki expressed his opinion concerning the existence of such apprehensive air not only among the general public but also within the Army that he held sense of great crisis in the future of the nation and the people and the military with no belief of unfailing victory would never win the laurel crown of victory. He defined that it was the most important point to consider to sweep out the distrust in the people and in the Army and provide "assurance of unfailing victory" and "belief in supremacy". It was one of the metaphysical objectives of the armaments reshaping in 1925 which started from investigation and deliberation at the System Investigation Committee to implant the assurance and belief in the Army as the spiritual support.

The method Ugaki attempted to adopt to achieve modernization was to distinguish the degrees of urgency and needs of various facilities in the organization and conduct appropriate selection to enable so-called self-sustaining because recovery of the national treasury was not to be expected "when the destitution of the national treasury has reached its extreme. He expressed his determination that although there would be many difficult problems to solve and various oppositions would occur at the execution of "appropriate selection," he prayed for accomplishment of this duty with utmost sincerity and resolution together with all of you.

In addition to the financial difficulties caused by the post-war depression that had triggered the armaments reshaping in 1922, new increase in the Army budget was even more unrealistic at this time due to the Great Kanto Earthquakes in 1923. Ugaki had the sense of crisis that there was not a second to be wasted in proceeding with modernization of armaments in spite of the difficulties, and determined to start the reformation even if he had to raise expenses by reducing the number of the strategic units.

The System Investigation Committee submitted the "first investigation report" of the result of investigation and deliberation to the Minister of War in July 1924. This report was compiled by Kazusuke Tsuno who succeeded to Ugaki as Ugaki assumed the post of Minister of War in January in the same year. The first report covered the investigation on the important items that significantly concerned with expense among more than 100 improvement proposals submitted by the committee members, and listed 16 new construction plans and 10 reorganization cases.

The first report concerned daring to reduce even the number of strategic units to raise the expense required for modernization following the policy of "so-called self-sustaining" of...
Ugaki, which was the largest difference from the armament reshaping in 1922. The improvement plan was determined under the following basic policy since it was impossible to complete every aspect of the Army with the squeezed expense. The new facility must be the most significant case in view of completion of the Imperial Army. The saved expense should not be used for cases that could be executed later or cases that are related to other ministries and thus inappropriate of the Army to execute it alone, but should be spent mostly on the improvement of organization and training facilities. Specifically, they would endeavor for preparation of aircraft and other new weapons to execute completion of the Imperial Army.62

The System Investigation Committee tried to proceed with modernization with determination to execute the first disarmament since the foundation, namely modernization with self-sustaining, specifically reduction of the strategic units. This could be regarded as the Army having become aware of the idea of compensating "quantitative" reduction with "qualitative" fulfillment for the first time. The effort to complete the armaments immediately after WWI could try for improvement and enhancement of the "quality" without stepping onto the question of the "quantity". The armament reshaping in 1922 left the concept of the "quality" ambiguous because it was intended to maintain the "quantity."63 The first investigation report, however, was a fruit of the idea to compensate the "quantitative" reduction of the armament with the "qualitative" fulfillment as a result of the needs to coordinate the new concept of the "quality" brought on by the progress of science and technologies and the traditional concept of the "quantity."64

How did the first investigation report intend to materialize the "quality"? In the "New Construction Policy (NCP)" proposed in the improvement draft, the major items that concerned the "quality" were "Air Corps Expansion and Completion (ACEC)," "New Establishment of a Tank Corps,"(NETC) "New Establishment of antiaircraft artillery corps (NEAC)" and "Technology System and Ordnance Depot Reorganization and Establishment of Chemical Weapons Laboratory."(TSODREC)

For the required expenses for those, it was the ACEC that had the largest appropriation, with about 41% (about 9 million yen) of the total operation cost of around 21.65 million yen of the required expense and about 27% (about 18 million yen) of the total temporary expense of about 66.58 million yen. The next were the TSODREC with about 9% (about 2 million yen) and about 5% (3.23 million yen) of the required expense respectively. Appropriation to other preparations was all under a small percent of the required expense.65

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62 Ibid.
64 In Sensou – Sono Tenkai to Yokusei (Keiso Shobo, 1997) by Akira Kato, et.al., it was pointed out that after the industrial revolution, the armaments competition possessed two aspects, namely the quantitative competition and qualitative competition. P.80.
The ACEC plan contained reinforcement of 8 air squadrons (4 new fighter reconnaissance squadrons and 4 new bomber squadrons) and 2 balloon squadrons to the air corps constructed from 1915 and reinforced in 1920. The peacetime organization of the air corps was aimed at 10 fighter squadrons, 10 reconnaissance squadrons and 4 bomber squadrons with a total of 24 squadrons, and 3 balloon squadrons. The NETC contained establishment of 1 tank battalion in the Infantry School as a guide corps. The NEAC contained establishment of 2 anti-air artillery battalions as the mainstay for air defense preparation for important cities and at mobilization.66

The scales of those new corps, however, were at the level of "budding of modernization" as the foreword of the first investigation report pointed out that it was far too short of our expectations as an improvement plan for the Imperial Army, and it is a foundation for the required ceaseless improvement. The situation was the same for the Aviation Division that had been expanding since WWI, and it was regarded as addition in this plan is still insufficient to complete the power required at wartime.67 In other words, even if the "quality" might be completed, it would not supplement the shortage of the "quantity" in that reformation.

It was, however, designed to allow evolution of the Army Aviation Division from the traditional surveillance operations to expulsion, bombing and other offensive missions by preparing the same number of fighter squadrons and surveillance squadrons, and especially by organizing the bomber squadrons for the first time in the ACED. Adition of the tank and anti-air battalions was intended to provide new power to replace the traditional firepower. The reinforcement with additional functions was not a mere means of modernization by replacement of obsolete weapons but the modernization of the armaments that had the potential for change or conversion of the weapons system with the possibility to develop into the doctrine similar to those of the German blitz at the beginning of WWII or the Air Land Battle of the United States after WWII.

The "Reorganization of Technological System and Ordnance Depot and Establishment of Chemical Weapons Laboratory" was not a mere reformation of the weapons system but contained the following proposals to generate the "quality" of armaments. They were increase of spending for the evaluation and research by the Technology Headquarters and the test and research by the Scientific Research Laboratory to promote progress of the military technologies, increase of the personnel spending of the Scientific Research Laboratory for the research and investigation on chemical weapons, establishment of a chemical weapons division at the Technology Headquarters and the military medical college, and installation of technological information agencies in Europe and the United States.68

Increase of the research spending was targeted at replenishing and reinforcing the

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66 Ibid.
67 Ibid.
68 Ibid.
Scientific Research Laboratory in particular. In the special bill for the technological system reformation committee that had provided the basis for the first investigation report, it was stipulated that it was necessary to have the Scientific Research Laboratory independent as the central agency for scientific mobilization at wartime and a central agency that engaged in research and testing of military technologies in addition to the basic researches with the objective to create new weapons. It was thus necessary to give special consideration to sufficient fund for testing and researches.69

The researches on practical applications of new weapons were brisk in those days after the reformation of the weapons administration and the decision of the research policy of the Technology Headquarters after WW1. They, however, were still slow in the basic researches for the lesson learned from WWI, namely application of scientific technologies to weapons. Promotion of the progress of the military technologies was aimed for reinforcement of the weapon research system to improve the "actual conditions of the Imperial Army" concerning the weapon research that was the reason for establishment of the Technology Headquarters and the Scientific Research Laboratory, namely the vulnerability of the basic research foundation. This aim seems to indicate that they had finally evolved from the traditional attitude of the Weapon Development and Evaluation Bureau that had studied the "ingenuity to skillfully produce weapons" to the attitude of creating weapons through own researches.

The investigation by the System Investigation Committee had been reviewing the establishment of an independent agency in the "chemical warfare corps organization plan" as a means to improve the investigation and research on chemical weapons. The Chemical Weapon Group in the second section of the Scientific Research Laboratory had started the researches on chemical weapons as part of the replenishment and improvement research for weapons and ammunition prescribed in the armaments reshaping in 1922. The System Investigation Committee, however, recognized that it was essential at least to establish a standing agency that should conduct thorough researches to counter offensive actions because it was necessary to prepare for the possible chemical warfare in the future in view of various researches on chemical warfare and the traditional palliative researches would result in inferiority to Europe and the United States.70 Despite this recognition, the establishment of an independent chemical warfare section was shelved in the first investigation report with the reason of excessive expense, and the research system was to be incorporated into the Scientific Research Laboratory.

Establishment of a technology information agency was targeted at investigating the technologies in Europe and the United States, enabling appropriate purchasing manner for

69 Ibid.
foreign weapons and facilitating immediate procurement of required resources at wartime. It seems that inclusion of the procurement plan at wartime in the reasons was brought on by the experience with aircraft for which introduction of the weapons, technologies and raw materials for manufacturing was difficult during WWI. If, however, the target of the “technology system and ordnance depot reformation and establishment of chemical weapon laboratory” was completion of a system that could establish independence of weapon research to create the “quality” of armaments, the target for establishment of the technological information agency must have been eager absorption of technological information of Europe and the United States rather than purchasing of weapons.

The budget for the Army for 1925 was drawn based on the first investigation report and was approved at the 50th Imperial Diet. This was the armaments reshaping in 1925, so-called the Ugaki disarmament.

(2) Modernization concept of the armaments reshaping in 1925 and Ugaki’s intentions

A. Modernization concept in the armaments reshaping in 1925

The armaments reshaping in 1925 was the armaments revolution that established “self-sustaining” by painfully daring to reduce four divisions that had significant relevance in national defense and had long history in foundation and various war records together with reorganization and abolition of some other troops in accordance with the first investigation report by the System Investigation Committee. The armaments reshaping in 1922 had had passive attitude of trying to modernize the weapons without reducing the “quantity” of the armaments but waiting for recovery of the national finance. The armament reshaping in 1925, on the other hand, was a revolution to cut the number of strategic units of “four divisions”, in other words reduce the “quantity” of the armaments, provide power with new functions to replace it and reinforce the research on weapons in order to supplement the “quantitative reduction” with ensured “quality” of the armaments.

What kind of “quality” did the armaments reshaping of 1925 aim to complete? The new establishment included “Completion of Air Squadrons (EAS)”, “Establishment of a Tank Battalion (ETB)”, “Establishment of Anti-air Corps (EAC)”, “Improvement of Military Science Research Facilities (IESRF)”, “Training of Communication for All Forces and Integration of Researches” and “reorganization of the vehicle corps to vehicle school”, namely 6 out of 16 proposals. New decisions that had not been mentioned in the improvement proposals were “organization and improvement of light machineguns and their materials”, “partial execution of youth training” and “expense required for abolition and reorganization of troops.” Those that were to be abolished or reorganized to raise the expense for the above

71 Op.cit., “Rikugun Seido Chousa Iin Daichiji Chousa Ni Kansuru Ken Houkoku.”
72 “Rikugun Gunbi Seiri To Taishou 14 Nendo Yosan Ni Tsuite” (op. cit., “Rikugun Yosan Kouyou”).
were "abolition of troops in the four divisions", "reorganization of transport troops", "reorganization of war horses replenishment section" and "discontinuance of defense completion".73

The plan involved spending of the annual average of 17.55 million yen for the ordinary expenses and a total of 36.34 million yen for the extraordinary expenses for the new facilities with the financial resources raised from abolition and reorganization at an annual average of 17.58 million yen for the ordinary expenses and a total of 14.04 million yen for extraordinary expenses for 4 to 8 years. The first budget for 1925 included the total budget for the Army at 192.19 million yen (about 12% decrease from the preceding year). The allowance for the new facilities was about 7.74 million yen for the ordinary expenses and about 4.93 million yen for the extraordinary expenses, which occupied around 7% of the total Army budget.74 It should be obvious how full-fledged the armaments reshaping of 1925 was when compared to the armament reshaping of 1922 that only involved 2 million yen for new weapon manufacturing in the extraordinary expenses in the budget of its first execution year 1923.75

The following is the comparison between the first investigation report and the improvement proposal. While the proposal indicated addition of 8 air squadrons and 2 balloon squadrons, it was decided to create 10 air squadrons (6 fighters and 4 bombers squadrons) and 1 balloon squadron. The target was a total of 26 air squadrons (11 fighters, 11 surveillance and 4 bombers squadrons) and 2 balloon squadrons at peacetime. As an organizational reform, the Army Aviation Division was abolished and the Army Aviation Headquarters was established to make the Air Profession independent. The separation and independence of the research section of Tokorozawa Aviation School in the proposal was amended to establishment of a technology section in the Army Aviation Headquarters to promote researches on aircraft technologies.

While the proposal mentioned establishment of 1 tank battalion (2 companies), it was decided to establish 2 tank battalions (about 20 tanks to a battalion). While the proposal mentioned establishment of 2 battalions (4 companies to a battalion) and 1 battery of antiaircraft artillery troops, it was decided to establish 2 battalions (3 companies to a battalion with a total of 24 antiaircraft guns) and 1 company (with 2 antiaircraft guns). As for the "improvement of military science research facilities", it was also decided to improve the research and manufacturing facilities at Technology Headquarters and elsewhere, expand the Scientific Research Laboratory by establishing a laboratory for chemical weapons in particular, and maintain resident engineers in Europe and the United States for technological research, adopting virtually all proposed plans.76

73 Ibid.
74 Ibid.
75 “12 Nendo Rikugun Yosan Kouyou” (op. cit, “Rikugun Yosan Kouyou”).
Modernization by the armaments reshaping in 1925 was still "budding of modernization", as the first investigation report mentioned, in content. Concerning the aviation division, however, it tried to reinforce to the power 1.6 times higher than before by establishing more fighter squadrons than in the proposal in the first investigation report. It may be said that the Army set forth the intention to lay importance in aviation for the first time and started thorough devotion on nurturing aviation power since the decision involved further fulfillment than those mentioned in the proposal in reinforcement of both system and structure.

It was also decided to dare domestic manufacturing of aircraft although it would incur higher expenses in order to allow development of both government and civilian aircraft industry and to ensure logistic supplies at wartime. A booklet "Rikugun no Sinsisetu ni taite" (Re: New facilities of the Imperial Army), which seemed to have intended enlightenment of the people prior to the execution of the armaments reshaping of 1925, explained it as follows.

It argued that although there were opinions that it will be better to employ cheaper foreign made aircraft to fulfill the required quantity, it would be impossible to promptly meet the demand at wartime unless we had thoroughly nurtured the domestic industrial strength at peacetime. It had taken 13 months for the United States with abundant natural resources and well developed industry to be able to send domestically manufactured aircraft to the battlefield. Japan with poor natural resources and underdeveloped industry would face far more difficulty than the United States to be able to promptly prepare the aviation power at wartime. Therefore, it was necessary for Japan to nurture the capabilities of the government and civilian factories in Japan in order to complete the required aviation power, prepare facilities for ceaseless further researches and to be independent in the aviation technology and manufacturing more than Europe and the United States with superior industrial power.77

There was a technological strategy concept here. In other words, it was a strategy to aim for establishment of the weapon researches and production system with nurturing of aviation technologies and aviation industry foundation at the core. Fulfillment of the aviation troops was intended to start completion of the system with the attitude to emphasize aviation power in accordance with the policy for domestic manufacturing. This concept was based on the facts that the durability of the aircraft in those days was as short as 6 months, it took a long time to import, and defects occurred frequently.78

Another technological strategy was seen in the IMSRF. The "Re: New facilities of the Imperial Army" described as follows concerning the improvement of the research and manufacturing facilities at the Scientific Research Laboratory and the Technological Headquarters and maintenance of resident engineers in Europe and the United States. At the innovation period of weapon technology with remarkable progress in the science and

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77 Ministry of War, Rikugun No Shin Shisetsu Ni Tsuite (1924, possession of War History Division, Defense Research Institute) pp.5-6.
technologies after WWI, "it is essential to continuously endeavor for original innovation and creation" by completing the research system that allotted the practical research to the Technology Headquarters and basic research to the Scientific Research Laboratory "in order that the Imperial Army can compete with the major powers in Europe and the United States without falling behind." It was the "only measure left for the Imperial Army to compete with the progress of the major powers endowed with physical resources," which was an indication that it was a technological strategy for a country with limited resources that aimed for technological independence.79 The aim of maintenance of resident engineers was collection of technological information. In detail, 6 to France, 3 to Great Britain, 5 to the United States and 3 to Germany, or a total of 17 resident engineers were dispatched1.

B. Ugaki's determination for armaments renovation

A budget related document titled "Armaments Reorganization and Budget for 1925" indicated the following recognition. The major European powers and the United States had totally innovated their armaments and expanded the range of application of science and technologies in warfare. They had also made significant efforts in training of the personnel in preparation for warfare, which had become more remarkable recently. Despite these circumstances, the Imperial Army had received little stimulation as it had been located outside the battlefields of WWI, and armaments had not been improved. The level of the Imperial Army was significantly low and inferior to those of the European powers and the United States. It was not qualified to compete with the major powers at all, which is a truly regrettable situation. It decisively concluded that the cause lay in the armaments reshaping in 1922 that had merely been intended to fulfill a small part of new weapon researches in a long time.81

It was a severe criticism to the armaments reshaping in 1922 that had carried over the short war concept, adhered to maintenance of the traditional "quantity" of armaments and caused delay in modernization. It strongly reflected the distrust Ugaki had felt himself at the armaments reshaping in 1922.

Ugaki was the Inspector General of Military Training at the time of armaments reshaping in 1922. He criticized the armaments reshaping plan as it had no signs of adoption of the lessons learned from WWI. It was poked around by outsiders, given one compromise after another, added one amendment after another, and reached to the point that it looked as though a birth of a deformed child. And he called it a "kneaded-out plan". It was so remotely diverted from modernization he had imagined, and he was enraged that "it is preposterous that the compensation for reduction of 50 some thousand soldiers and 10,000 horses was only 6 light machinegun companies. He said sarcastically that "if the only positive idea and the very

focus of armaments reshaping or correction of defective weapons was allowed to take 13 years, it must mean that war potentials of 2 or 3 divisions could be dissolved without any significance. He conceived that it was more than obvious that they were unaware of the situations in the world and were slave to the obsolete way of thinking. Improvement was required.82

This concept was materialized in the "reduction of 4 divisions", the mainstay of the armaments reshaping of 1925. It must have been an expression of his anger, conveying that since the national finance had fallen into severer condition by the Great Earthquakes of 1923, no one was entitled to complain about reduction at the level of 4 divisions.83

The reduction of 4 divisions at the same time was intended to regulate in advance the public opinion that strongly demanded disarmament with dissatisfaction with the insufficient armaments reshaping in 1922, and to take advantage of and guide the public opinions into renovation of the Imperial Army. In other words, it made the general public aware how abolition of divisions would exert painful effects locally by this sudden decisive judgment, and "the attitude of the Imperial Army to listen to the voices of the people and consider the welfare of the people had swept away the bitter feelings of the people against the Army that had lasted for some years and offered an approach to reconciliation and accord for both parties. This "reconciliation and accord for both parties" of the people and the Army was the background reason for the armaments reshaping of 1925 by U gaki.84 He thus initiated modernization of the armaments, not disarmament, at the best possible time turning the adverse circumstances into advantage.

(3) Technological strategy concept or U gaki and the characteristics

Additional "improvement of military science research facilities in the armaments reshaping in 1925 was a reflection of U gaki's intention to establish facilities for application of science and research and investigation of science to provide the belief for unfailing victory to the military and civilians.85 U gaki entertained apprehension in the condition where most of the officers believed they were inferior to the potential enemies in the "quantity" and "quality" of the weapons and ammunitions. He believed that it was essential to show the facts to provide confidence to the military that we will absolutely win victory in both quantity and quality. He sensed that he must give the quality that would enable exertion of tactics to win superiority at the goal even with inferior quantity during all stages before that and confidence

83 According to K uro, Teikoku Kokubou Houshin No Kenkyu – Riku Kaigun Kokubou Shisou No Tenkai To Tokuchou – , The General Staff Office that insisted on maintenance of 40 divisions and the Ministry of War that insisted that about 30 divisions were appropriate confronted with each other at the "meeting to decide wartime capability", and U gaki decided to "maintain up to 32 divisions to reduce the Army to accommodate for modernization and Supplies of armaments and reduce 4 divisions to maintain 17 regular divisions." P.238.
85 Ibid., P.632.
based on the facts that would enable such in order to provide confidence that we would absolutely win victory. He thought the "facts" here meant the science and technologies that could support the "quality" of armaments, and developing them would generate "confidence based on the facts" that would lead to the belief in winning victory. He thus raised a policy to endeavor for positive application of the essence of technology and establish facilities to promote further progress of science in the reform this time at the end of the principle policies as a chairman of the System Investigation Committee. How did Ugaki hope to achieve the "quality to enable exertion of tactics", namely the "quality" of armament and "confidence based on the facts", in other words progress of science and technologies? He wrote as follows in his diary in November 1925.

Until we reach to the level of the major powers, we can import and employ completed articles as much as we like without any blustering. It is necessary that the Japanese researches always set the targets higher than their level. Unless we proceed with the principle of creation and devising on that higher level, it would be difficult to emerge from the level of pursuit being always behind the major powers. It seems especially true in science, particularly in the weapons technology.

Ugaki's concept here indicated the modernization policy for armaments and the targets for weapon researches. In other words, in modernization of armaments to catch up with the innovation of weapons technology after WWI, the first step should be importing weapons from Europe and the United States to meet the requirements for the time being, but in weapons research, the targets should be set one step ahead to pull out of subordination to Europe and the United States. There was a judgment that waiting for the growth of the domestic industrial foundation and development of science and technologies would cause further delay in modernization and make Japan always subordinate to Europe and the United States. It was a true indication of Ugaki's technological strategy.

Ugaki dispatched a European and American military observation mission led by Katsuichi Ogata, Chief of Army Scientific Research Laboratory in February, immediately after the approval of the budget for the armaments reshaping in 1925. The Ogata mission visited the United States, France and Great Britain from February to October 1925 with the objective to investigate the current conditions of the general military affairs, especially of the superior weapons of Europe and the United States. In actuality, however, it seemed to have been intended for Ugaki's idea "to import and employ completed articles as much as we like."

Ogata reported the results of the observation mission at the officers conference in December of the same year as the "report on the military affairs of Europe and the United States." He stated as follows in his "personal view on the current conditions of our Army weapons and equipment and their improvement" citing comparison with Europe and the United States. The current weapons and equipment of the Imperial Army were even more inferior to the so-called world-war types with a few exceptions. While Europe and the United States were advancing the research for new weapons with a remarkably rapid progress, the Imperial Army was miserably slow and always behind them in progress. The causes were, first the Imperial Army had not emphasized on researches and investigations, and second propagation of knowledge on science in Japan was inferior to those in Europe and the United States. He analyzed that Japan had fewer scientists engaged in practical researches that could be employed in weapon researches and the Army could not utilize civilian weapon manufacturing companies as practiced in Europe and the United States but was forced to conduct it on its own, causing unsatisfactory weapon research at the Army and consequent subordination to Europe and the United States.

Ogata appealed for the means "to recover a step in our delay promptly" as a "personal opinion on improvement" as follows. It was the "1925 models," advanced versions of the world-war types, that Europe and the United States were studying today. If we were to start the same projects, it would be obsolete by the time we finished them, and we would not be able to emerge from subordination. Therefore, the wisest policy today would be to "place orders for the designing and prototypes of the near future models to the securest foreign weapons manufacturers for our own use, and pour our research resources and efforts to the further future models that were to be one step ahead of those. He insisted that "employment of foreign made weapons was practiced in all other countries, and it was not a national shame at all. In order to promptly catch up with the delay of today, unless we made decisive judgment with such determination, we would always be behind others and could never emerge from subordination."

Ogata’s statement was apparently in line with the technological strategy concept of Ugaki. Ogata was expecting that the unsatisfactory conditions of the weapons research at the Army would be improved by the military science and research facility improvement in the armament reshaping of 1925 as described earlier. In other words, the objective of the Ogata mission was early realization of modernization of armaments in accordance with Ugaki’s intention, and Ugaki’s concept can be positioned as technological strategy in the armament reshaping in 1925. Ugaki had already raised the principle policies of promotion of science and technologies and positive application of the weapons technologies as the chairman of the System Investigation Committee earlier. Ugaki’s technological strategy was targeted for enhancement of the

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90 Ogata, "Oubei Gunji Shisatsu Dan", p.25.
91 Ibid., p.27.
"quality" in the future, and he placed the target at "breakaway from subordination to Europe and the United States" to make up for the delay in modernization in the period of innovation for weapon technologies.

4 Effectiveness of Ugaki’s technological strategy in the period of innovation of weapon technologies

(1) Effectiveness of the policy for modernization of armaments

Ugaki’s technological strategy was to “import and employ the completed articles as much as we like without blustering until we reach the level of major powers” in proceeding with modernization of armaments. This concept was an emergency measure to rapidly improve the conditions of the Imperial Army at the armaments reshaping in 1925, namely the armaments that had been in the condition of “disqualified to compete with major powers at all.” The Ogata mission shouldered the responsibility to materialize Ugaki’s expectation to execute the emergency measure.

The European major powers and the United States after WWI were under the conditions of despite being unhealed from injuries of the War and under continued financial difficulties, throwing in huge amounts of money for researches in preparation for the next war. As the weapon technologies made revolutionary progress, the concept of the “quality” was added to armaments, and the weapons market in Europe and the United States had considerably differed from that before WWI. The weapon research by the Imperial Army was in the process of conversion from “ingenuity to skillfully produce weapons” to creation of a system to manufacture own weapons with own researches through the improvement of military science research facilities at armaments reshaping in 1925. This chapter shall discuss Ugaki’s policies on modernization of armaments in his technological strategy from the viewpoints of the weapons market in Europe and the United States and the technological capability of the Imperial Army.

A. Response of the weapons market in Europe and the United States for weapon import

Ogata said that the weapons his mission had purchased were “not for employment but for mere reference” in his recollections, but actually he had attempted a massive order of about 40 tanks required for the two tank companies to be newly established by the armaments reshaping in 1925. He sounded out the purchase of new Christie amphibious tanks in the US, but since they had still been in the designing stage and lacked manufacturing facility to meet massive orders, he only obtained the designing charts. Next he tried to start negotiation with

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92 Ibid., p.12.
Bickers in Great Britain as they had completed high-speed tanks that could travel at the speed of over 25km/hour. It was refused with the reason that even the British Army had not employed them yet. After negotiation with France at last, Schneider Cte. entered into negotiation as they could receive a massive order for Renault tanks of the world-war model although they were not conducting development of new model tanks that the Imperial Army required.94

The Ogata mission bought new machineguns, light machineguns, automatic rifles and various other pieces of equipment as references in addition, and requested new manufacturing of field guns and railway artillery. His purchase did not include antiaircraft guns and aircraft that would be required at establishment of an antiaircraft gun corps and completion of the aviation troop in the new establishment stipulated in the armaments reshaping in 1925.95

Ogata realized that the actual conditions of weapon researches in Europe and the US varied according to the national characteristics, resources in possession, degrees of science and technology capabilities and especially the financial conditions, and observed the characteristics for each nation as follows. The United States started construction of modern continental military since their participation in WWI. Their military industry was relatively underdeveloped compared to the remarkable progress in the general industrial technologies. They were encouraging domestic inventions and innovations with abundant financial power, actively introducing foreign innovations and proceeding with researches for new weapons.

Great Britain was not sparing research expenses for national defense despite financial difficulties, and buying inventions and innovations from both domestic and international sources as practiced in the US. They adopted the policy of exclusive preference on mechanical power, such as aircraft, tanks and automobiles. The British Army adopted the tactics of break-through of frontlines with tanks and rapid movement/development of the force by automobile transportation, and conducting weapon researches for that.

France maintained the world-war models in armaments due to extreme financial difficulties, but was making Schneider Cte. control all military industries in France and conduct weapon researches, and making profit from exporting weapons. They had the system to complete the wartime industrial mobilization simply by mobilizing Schneider. Germany was prohibited from conducting researches on new weapons by the Armistice Treaty but continuing the researches with own technologies and capitals outside the country.96

The Imperial Army also recognized the situations in Ogata’s observation, and the "Teikoku oyobi Rekkyo no Rikugun" (Armies of the Imperial Japan and Major Powers) in 1926 described as follows. Great Britain was promoting scientific researches without sparing expenses, adopting the effects in the military directly and improving the battle equipment, and

making extreme efforts in utilization of mechanical power, devoted especially to poison gases, aircraft and tanks, planning completion of defense power to meet the trend of the time and executing the plans one after another. For the United States, the Imperial Army picked up their poison gas researches in particular, and described that they had recognized that chemical wars mainly fought with poison gases would be the most economical and effective means in the future, the government and the civilian companies were cooperating in utilization, researches and investigations, and had made large scale preparation for training facilities and industrial mobilization of them at peacetime.⁹⁷

According to Ogata's observation and the Imperial Army's understanding on the armaments and weapon researches after WWI, Europe and the US were encouraging inventions and innovations in science and technologies with considerable expenses, endeavoring development and completion of aircraft, tanks, poison gases and other new weapons, and aiming for the "qualitative" supremacy of own armaments. The First World War urged development of science and technologies and caused revolutionary progress in weapons. It enlarged the importance of the "quality" of armaments, and the European major powers and the US were engaged in severe competition in the "quality". In other words, while the supremacy of armaments had been judged by the "quantity" before WWI, the relative significance of the "quality" increased after WWI, and the emphasis in the armaments competition had shifted to supremacy of the "quality".

Ogata mentioned at the officers conference concerning the weapons purchase that we would have to sufficiently respect the patents or manufacturing rights in the future.⁹⁸ Respect for the patents and manufacturing rights meant that it could be a bargaining power that influences the "quality" of armaments. Ogata sensed that the target of the weapon researches in Europe and the US had shifted to acquisition and maintenance of "qualitative" supremacy of armaments. Indication of Ugaki's apprehension that it would be "difficult to emerge from subordination to the major powers and being always behind" meant that Ugaki also knew that the innovation of the weapon technologies after WWI had shifted its direction to more emphasis on the "quality" from the traditional "quantitative" armaments. His decision to set the policy for modernization of armaments to "import and employ the completed articles as much as we like," however, contained contradiction in a sense that the weapons market in Europe and the US would not easily allow massive orders or transfer of the latest weapons.

B. Contradiction in efforts for "indigenous weapon development" and weapon import

The Army was making efforts, though slim, to investigate and master the weapon technologies for the new weapons after WWI through the Technology Headquarters, Aviation Headquarters, Scientific Research Laboratory and Committees. For research and

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Investigation of tanks, the Army established the Military Vehicle Testing Group in the Military Vehicle Investigation Committee in 1915, purchased tanks from Great Britain and France as reference material, and researched the performance and handling methods. When the purchase plan for Renault’s tanks emerged, the Technology Headquarters was in charge and the vehicle group was conducting repeated researches on the designing technologies.

At the purchase plan of tanks, the vehicle group evaluated the Renault tanks as “scrap from a museum”, and held a sense of apprehension in employing it at the new tank battalions. The Technology Headquarters quickly acquired Minister of War Ugaki’s approval and started to produce a prototype of domestic tanks. They started designing in June 1925, and completed a prototype in March 1927. This was the No. 1 prototype tank, which only took 1 year and 9 months to complete. It was proven that domestic production of tanks was technologically feasible, and the import of Renault tanks was to be limited to the minimum.99

The Army Ordnance Depot and a civilian manufacturer obtained a license from France to manufacture aircraft in 1919, and started production in Japan. The technologies for engines, however, were inferior and they had to depend on import. Yet by 1924, manufacturing by civilian companies surpassed the production by the Ordnance Depot and imports in volume for both bodies and engines.100

The Army declared that they determined to concentrate on the capability to manufacture aircraft domestically as much as possible and have everyone aware of that policy in accordance with the grand policy of indigenous weapon developments upon conducting researches and evaluations at the beginning of the "Policy for Evaluation of Equipment Under Control of the Aviation Division" drawn in April 1924, and making efforts to emerge from copying foreign models, to produce aircraft and equipment domestically, and to accomplish "indigenous weapon developments".101 The Army executed the policy of "indigenous weapon development" at the designing and production of the model 88 surveillance aircraft, which was the first competition prototype of the Army in 1925. The bill approved in September 1925 titled "to have civilians design aircraft" stated the reason for purely domestic production of the successor surveillance aircraft that the technologies for designing and manufacturing have significantly developed, and today we have finally reached to the point that we can manufacture everything in Japan, and since the term for the manufacturing license for the surveillance aircraft would expire, they decided to have civilian companies conduct manufacturing "in order to determine entire domestic production system at this time and at the same time to support the civilian factories.102

102 “Min bu No I Ote Hikohki Sekkai o Nasashimuru Ken” (Ministry of war,” Showa 4 Nen Mitsu-dainikki Dai- san-satsu,” possession of the War History Division, Defense Research Institute).
The model 88 surveillance aircraft employed as the official model after the competitive prototype production was actually designed by a foreign engineer invited by a civilian manufacturer and its engine was a foreign model produced in Japan. It did, however, achieve materialization of the “indigenous weapon development” concept in view of designing and producing a prototype inside Japan. Other domestically produced prototypes around those days include model 87 heavy bomber and model 87 light bomber.

Ogata said he “avoided observation of aircraft for a certain reason” in his mission to Europe and the U.S.\textsuperscript{103} This “certain reason” might have been the fact that the designing and manufacturing of aircraft in Japan had reached to the level of prototype production and the Army Aviation Headquarters had come to evade import of aircraft.

The Technology Headquarters and the Aviation Headquarters took leadership in weapon research in the Army and it had developed from the early stage of imitation and mastering through introduction of foreign weapons and technologies to the level where designing, prototype production and manufacturing in Japan became possible by this time. The Army slowly but steadily advanced the technologies, and the level had reached to the point that they could oppose to introduction of the latest weapons that Ugaki had tried to adopt as an emergency measure for modernization of armaments, as seen in the episode of the production of No. 1 prototype tank to replace the imports.

Although Ugaki was trying to emerge from subordination to Europe and the U.S and achieve the true meaning of the “indigenous weapon development” that had been the goal since the foundation of the Army in his technological strategy, he tried to employ import of weapons at the point of time when the efforts to attain the goal was about to bear fruit, granted that it was an emergency measure for modernization of armaments. He did not try to utilize the results of the weapon researches that had been built up so far, aside from aircraft, as he was in such haste for modernization of armaments.

The technological strategy must identify the problem of coordination between the acquisition and maintenance of “qualitative” supremacy of the armaments and the demand to ensure the “quality” for the time being, namely the problem of whether to import or domestically produce weapons. It must also be in accordance with the improvement of the weapon technologies in own country. Ugaki’s technological strategy lacked consideration on those problems. Development of science and technologies or improvement of productivity proceeds by steady steps, and raising higher level targets could not achieve faster progress. The Army at this time faced the problem of how to accelerate the speed of progress to reach the level of Europe and the U.S in the first place.

(2) Ensuring “qualitative” supremacy in armaments and direction of weapon research

Ugaki set the target for the weapon research in his technological strategy as “the point that

\textsuperscript{103} Ogata, “Oubei Gunji Shisatsu Dan,” p.11.
is above the technological levels of Europe and the United States. What measures did he have in mind to achieve this target? What kind of weapon researches did he lay emphasis on for the future warfare?

Ugaki recognized that it was important to conduct researches on military application of mental science and physical science for the future warfare with close cooperation between the military and civilians. He thought it important to establish a major research institute by joint efforts of the military and civilians, promote basic researches with the essence of the intelligence of the entire nation, prepare the weapon administration system that can link the fruit of the researches with practical researches for weapons and complete the armaments. He also held the opinion on the subjects for the weapon research that the Imperial Army that particularly prefers short war and quick decision requires adequate studies on improvement and operations of tractors, automobiles and transport vehicles in view of the difficulty in the traffic of the assumed battlefields. In addition, application of gas and electricity in the battlefields requires a wide range, thorough researches.

His concept derived from the recognition that the weapons to conduct researches in preparation for the future warfare were extremely dependent on the development of automobiles, poison gases and electricity, in other words the automobile industry, chemical industry, electric communication industry and other general industries' technologies for both military and civilians, and it is necessary that the military and civilians cooperate in nurturing and improving the technologies and industrial foundation. It was around 1921 when he indicated this concept, which is an evidence that he had recognition that more exhaustive reformation was required than the armaments reshaping of 1922.

He did not reveal all his intentions in the chairman's instruction to the System Investigation Committee, but at the armaments reshaping in 1925 he specifically indicated the subjects for weapon researches. Those that fell into the category among the new establishment items were "incorporation of the vehicle corps into the vehicle school" to provide thorough research and training on automobiles, "standardization of training and research of all military communications" by established a communications school, and "establishment of the chemical weapon research facility and expansion of the Scientific Research Laboratory" by improving the military scientific research facilities. The researches at training institutes, however, tended to concentrate on traditional weapon operations and training as evidenced by the separation of the research division of Tokorozawa Aviation School to establish the Technology Division that was to devote to promotion of aviation technologies at the armaments reshaping in 1925. Reorganization and establishment of a vehicle school or communications school were not necessarily the policy to emphasize

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104 Ugaki, Ugaki Kazunari Nikki I, p.345.
105 Ibid.
weapon research. Therefore, as far as the new establishment indicated, the priority in the
weapon research that was to “proceed with the target to surpass the levels” was the research on
chemical weapons.

The ban on chemical weapons, i.e. poison gases started at the declaration in the
International Peace Talks in the Hague, and after the Convention for the League of Nations in
Brussels immediately after WWI, Washington Convention in 1922 and Disarmament
Conference in Geneva in 1925, it was ultimately adopted as an international covenant. This
covenant, however, merely banned the use of poison gases and did not cover the research,
production and storage, and lacked the audit system and punitive measures. Its effectiveness
was doubtful as major powers retained ratification. The Europeans and Americans were
steadily preparing themselves for chemical warfare.107

At the armaments reshaping in 1925, it was decided to promote the chemical weapon
group in the second section of the Scientific Research Laboratory into the third section to
devote to chemical weapons and to establish additional facilities that would conduct full-
fledged researches on chemical weapons including studies on the characteristics and
effectiveness of poison gases, effectiveness and offensive and defensive materials in the
chemical warfare. The major reason for the Army to emphasize on the chemical weapon
research was the impact of the preparation of chemical warfare in the US108, but it was also
due to large expectation that chemical weapons might provide particularly superior surprise
attack effect when it was incorporated in the technological strategy and it might bring on the
power comparable to the air strength.109

The chemical weapon research started with the plan that they would first complete
offensive and defensive weapons with the performance equivalent or superior to those of the
end-of-WWI models to a certain degree, complete the protective equipment promptly, improve
them and gradually shift the focus on the search for new poisons and study on new offensive
and defensive weapons. The research facilities continued to be expanded and reinforced. By
1929, production and research on major poison gases had made substantial progress, and the
studies on new poison composition started. By 1933, most major offensive and defensive
materials had been systemized, the characteristics and effectiveness of major poison gases had
been identified, and the outline of the usage of poison gases and protective measures against

Rikugun Gijutsu Kenkyusho Ni Okeru Kagaku Heiki Kenkyu Keika No Gaio (Dai-ichii An)” (History
Material Office, Evacuees’ Support Bureau, Ministry of Welfare, possession of the War History Division,
Defense Research Institute).
109 Akio Tagami, “Kyō Nippon Rikugun No Kagaku-sen Junbi No Jitsai Ni Tsuite (Sono 2 - Kan)” (op.cit.,
Gijutsu Kenkyusho Ni Okeru Kagaku Heiki Kenkyu Keika No Gaio (Dai-ichi An)” mentioned that there
might have been overestimation on the gases at the early stage of the research, but it must specifically mean the
indication of Tagami.
As the research progressed, however, difficulties in storage, restriction by international laws and problems in operation also became evident. As a result, it was recognized that although chemical weapons were powerful battle measures, it could not accomplish overwhelming offense to the enemies with superior equipment.111

The research expense amounted to 300,000 to 400,000 yen a year around 1929, and although it was exceptionally high compared to 50,000 yen for the second section, there was a world of difference between the United States with the spending of 1.3 million yen a year or the Great Britain with 1.5 million yen.112

The Army proceeded with the chemical weapon research with the expectation to achieve the "quality that will enable exertion of tactics to bring on superiority at the goal" which Ugaki hoped to provide. The Army, however, merely followed suit of Europe and the United States in fear of their brisk researches as apparent in Ogata's statement at the officers conference that unlike machineguns or artillery they "could not simply purchase them from abroad to meet the needs." Even when the target of weapon researches was set at the "superior point" to the technological levels of Europe and the United States, the Army lacked the concept of how to utilize it in the future warfare and the target and scale of chemical weapon research were insufficient to materialize "qualitative" superiority of armaments. Chemical weapon researches also drifted off from the technological strategy concept of Ugaki after all.

(3) Relationship between Ugaki's technological strategy and nurturing of industrial foundation

The Imperial Army learned from WWI that it was indispensable to make industrial mobilization to secure the huge amount of munitions at total warfare, but since it was impossible to create new production power at wartime, all nations had been expanding the productivity by converting the industrial capability at peacetime. Thus, the Army took leadership in setting the "Munitions Industry Mobilization Law" and had it approved in 1918. This law mainly concerned with how to secure munitions at wartime, but it also covered nurturing of domestic industrial foundation.

110 Akiyama, “Rikugun Kagaku Kenkyusho Oyobi Dai-roku Rikugun Gijutsu Kenkyusho Ni Okeru Heiki Kenkyu Keika No Gaiyo (Dai-ichi An).”
112 The Research budget for the Imperial Army was obtained from Akiyama, “Rikugun Kagaku Kenkyusho Oyobi Dai-roku Rikugun Gijutsu Kenkyusho Ni Okeru Kagaku Heiki Kenkyu Keika No Gaiyo (Dai-ichi An),” and for the American and British Armies, from “Seichou Shiryo Dai-14-Gou Beikou Kagaku Senbu Heiji Hensei Hyo” (Ministry of War, “Taisho 13 Nen Sangatsu Seido Chosa Ni Kansuru Shorui Sono 5 Sono 2, possession of the War History Division, Defense Research Institute”).
The domestic industrial foundation, however, remained vulnerable even 7 years after the enactment of the Munitions Industry Mobilization Law. Ogata lamented at the condition that the civilian technological strength and weapons manufacturing capabilities were low and the Imperial Army had to provide traction power from researches to manufacturing of weapons during his mission in Europe and the United States. Despite such situation, the armaments reshaping in 1925 lacked policies for it, not to mention establishment of "a major research institute with joint efforts of the military and civilians" in Ugaki's concept. The only effort was seen in the attempt to nurture domestic aircraft manufacturers with the assumption of wartime demands by completion of the air division. The statement of Ugaki's technological strategy also omitted the view to nurture the domestic industrial foundation. It, however, did not necessarily mean that Ugaki neglected that.

Ugaki viewed the relations between armaments and industrial strength as armament was an indispensable tool for maintenance, expansion and development of the national power; in other words the industrial strength and the industrial strength was the major factor in maintenance, fostering and expansion of the armament, in other words the war capability. He went on to say, "the relations between the two was like two wheels of a car. It should not be appropriate to separate them in consideration." He correctly recognized the role and importance of industrial strength at total warfare, and was thoroughly aware that fostering it was an important issue for completion of armaments. It was around 1921 when he expressed this opinion, and he added with permeating disappointment that "the industries are beginning to voice limitation or reduction of armaments. When you think of the reason and the characteristics of the industries, you may easily imagine the rest."

It was due to this very fact that the industries, or one party that should make efforts to cooperate in fostering armaments and industrial strength, had to advocate disarmament under the particular domestic circumstances that made Ugaki feel the necessity to enlighten the people even more sharply. This feeling led to adopt the background reason for the "reduction of 4 divisions" as to warn the people and lead the way to integrated defense in cooperation between the military and civilians. Then, why did Ugaki's technological strategy or the armaments reshaping in 1925 omit the fostering of the domestic industrial foundation? The Munitions Industry Mobilization Law that included fostering of industrial foundation covered a wide range of fields over all ministries. The Agency of Munitions was established as the organization to execute the policy, which was expanded into the State Authority. At the administrative reorganization in 1922, however, the State Authority was abolished and the Ministry of Agriculture and Commerce succeeded the businesses of encouragement of munitions industries. The Munitions Industry Mobilization Law lost the central execution organization, and fostering of the industrial foundation miscarried.

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Abolition of the State Authority was caused by oppositions of other ministries because it had expanded its authorities too far on resource regulation and industrial mobilization and even intervened the major duties of other ministries. It was an incident that told of the difficulties of making all non-military ministries and relevant civilians agree with the military and cooperate in execution of this significant duty against the trend of disarmament and tight finances due to the depression after WWI.116 Ugaki's lamentation that, industries was beginning to voice disarmament had come true.

Ugaki, on the other hand did not agree with the "national economy based on industry" policy advocated by Tsuyoshi Inukai who was the president of the National Party in 1921. In the national economy based on industry policy, it was defined as an urgent duty in national defense to make every possible effort to develop industries at peacetime and foster the capability so that Japan would be able to counter with the entire national power at wartime, since the industrial condition of Japan was too vulnerable to fight total warfare. This principle was close to Ugaki's, but it was based on reduction of military spending. Even Ugaki who had recognized the importance of industrial strength at total warfare could not step into reduction of the Army budget.117 Ugaki must have thought that if fostering of the domestic industrial foundation had not been a problem for the Army alone but required disarmament as advocated in Inukai's "national economy based on industry" policy, modernization of armaments would be almost hopeless.

The System Investigation Committee discussed the service processing guideline for the Army as a measure for total warfare in relation to the Munitions Industry Mobilization Law, but they never reviewed it with the viewpoint of fostering of the industrial foundation. It was not adopted even at the armaments reshaping in 1925.

The first investigation report omitted the issue of fostering the industrial foundation as the "item that is related to other ministries and not appropriate for execution by the Imperial Army alone" in the policy. It would have been natural to place priority on the "execution of completion of the Imperial Army" if modernization had meant "self-sustaining" capability. If, however, the domestic industrial foundation had been vulnerable and its fostering had been the national issue, it must have required to formulate technological strategy to foster the industrial foundation with the viewpoint of indigenous weapon development when the latest weapon technologies were to be introduced.

5 Significance of technological strategy in Ugaki Disarmament in the international politics

The Imperial Army had raised the slogan of "indigenous weapon development" since its foundation, and proceeded to prepare the weapon research system to achieve it. It was,
however, focused on mastering the "ingenuity to skillfully produce weapons" until the WWI as described earlier, and the weapons market in Europe and the United States had readily met the demands by the Imperial Army in the weapon export and technology transfers partly due to their focus on pursuit for economic profits. No nations had needed the concept of technological strategy with the "quality" of armaments as the priority, and the superiority of armaments had been evaluated simply by the "quantity".

The First World War brought on the new concept of warfare, namely total national warfare. Dramatic progress on the weapon technologies at that time caused the concept of the "quality" to be added into the traditional recognition of the "quantity" in comparison of war capabilities of the armies. The armament competition among the major powers shifted to concentrating on the relations between the "quantity" and the "quality". In such a revolutionary period, the major issue was what kind of "quality" to create and how to coordinate the "quantity" and the "quality" in accordance with the security environment, technological capabilities and economic strength of each nation, which created the necessity for technological strategies. In the innovation after WWI, as the progress of weapons was so drastic that first, it did not stop at mere modernization of the obsolete weapons but changed the entire weapon system, and second, with the necessity to secure the "qualitative" superiority of the armaments, the weapons and relevant technologies became potent options in the diplomatic and defense policies as bargaining power.

In such a revolutionary period for weapon technology, the Imperial Army attempted to emerge from the complete subordination to Europe and the United States in the weapon research caused by the traditional focus laid on the "ingenuity to skillfully produce weapons." This was the objective of Ugaki's technological strategy, which was apparently intended to coordinate the "quality" and the "quantity" of the armaments in spite of the limitation in the national finance. It was conceived with the utmost mission of prompt recovery in the delay in modernization of armaments, and provided suggestions to the issues of bargaining with the weapons market, selection between import or domestic production of weapons, the future concept of weapon researches and fostering of the domestic industrial foundation together with the improvement of the military technologies of Japan with inferior weapon technologies.

Conclusion

The Imperial Army finally started to ride with the drift of revolution at the armaments reshaping in 1925, 7 years after the end of WWI. The reform dared to reduce the number of strategic units and compensate for the loss of the war capability with enhanced "quality" since increase of the defense budget was not to be expected. This intention was apparently an adoption of the concepts of the "quantity" and the "quality" of armaments, which was remarkable in the armaments concepts of the Imperial Army.

It was Ugaki's strategic concept for modernization of the weapons and the style of weapon researches that lay under the innovation, and it could be highly evaluated as the first armament reformation that the Imperial Army proceeded with by means of a technological
strategy. The strategy was based on the “application and promotion of science and technologies” and “breakaway from subordination to Europe and the United States.”

The modern weapons intended to be introduced at this time were aircraft, tanks and antiaircraft guns, aimed for mechanization of weapons and preparation of commands and communications. Addition of new battle capabilities by these new weapons necessitated change of the weapon system to be based on clear future visions for the Army that had traditionally been heavily dependent on firepower. The reform, however, did not generate the awareness to change the weapon system perhaps because the obsession to “bring on budding of modernization” created by tight national finance was too strong. The researches on chemical weapons, that had been intended to surpass the levels of Europe and the United States as a means to “break away from subordination to Europe and the United States”, did not after all achieve creation of the “quality” that could supplement the “quantitative” inferiority in the armaments, not to mention changing the weapon system as aircraft or tanks did.

The Imperial Army failed to realize that the weapon export was beginning to attach strategic values as bargaining power while realizing the significance of the “qualitative” superiority in armament because they were in too much of a hurry for modernization. They also ignored at the same time that the weapon researches by the Army had already developed to the point of achieving the “indigenous weapon development” in the true sense.

Ugaki’s technological strategy failed to realize that the weapons to be modernized necessitated the change of the system, and the weapons and their technologies began to possess strategic values in diplomacy and national defense when it was reviewed from the trend brought on by the revolution in weapon technologies in the post-WWI period. His technological strategy might be said to have lacked the effectiveness as a strategy after all. If the armaments reshaping in 1925 was targeted at allowing “budding of modernization”, the subsequent reformation would have significant meaning, but when the technological strategy was to indicate how to acquire and maintain superiority in weapons and their technologies as well as how to reflect them in military strategies and security policies as defined at the beginning, it was necessary for Ugaki to define how the “quality” should be in the future armaments instead of stopping at solving the temporary issues.

Today, will the information technology revolution promote drastic progress? How should the technological strategy be at this time? The most important point to be considered in technological strategy must be the judgment on whether weapons technology revolution can make conversion of the weapons system which Ugaki had overlooked and lead to discovery of new bargaining power.