国際会議参加報告

第38回国際軍事史学会大会の概要

岡田　志津枝

2012（平成24）年度の軍事史国際会議は8月27日（月）から8月31日（金）にかけて、ブルガリア共和国ソフィア市内のケンピンスキー・ホテル・ゾグラフスキを会場として開催され、36カ国から約170名が参加した。参加者は主に各国軍の軍事史研究機関に所属する研究者や、大学・民間研究機関に所属する軍事史研究者などで、日本からは小官のほか、高橋久志・上智大学教授（国際軍事史学会理事、前日本軍事史学会会長）と稲葉千晴・名城大学教授が参加した。アジアからは、中国から任海泉中将・人民解放軍軍事科学院副院長ほか5名、韓国から金上源・国防部軍史編纂研究所戦争史部長ほか2名、インドネシアから2名が参加した（参加人数順）。また今年度より新たにセルビア、マケドニア旧ユーゴスラビア共和国の2国が参加を果たした。

本会議の共通テーマは「技術と戦争」であり、「石斧から核の時代まで」と題したポメリン博士（ドイツ）の基調講演に始まり、12の作業部会、6のラウンド・テーブルなどにおいて計59本の論文が提出・発表された。参加者の発表内容も、古代ローマから現代・近未来まで、盾と矛から無人機まで、幅広い時代と技術の推移を網羅したものとなった。このほか、今大会での注目すべきプログラムとして、「兵器と軍事史に関する博物館・所蔵品国際学会（ICOMAN）」との共同によるパネル・ディスカッション「博物館における戦争と技術に関する展示」があげられる。このプログラムはICOMANと国際軍事史学会の絆を深めるための話し合いが行われている中で、初めて実現した具体的な成果である。

本会議は、国防副大臣を議長、ブルガリア軍事史学会会長を事務局長として、ブルガリア共和国軍（特に今年度創設100周年を迎えたナショナル・ディフェンス・アカデミー）の全面的な支援のもとに開催された。会議はもとより、軍事史博物館や国立歴史博物館の閉館後の特別見学、リラの僧院への現地研修など、随所に国防省・ブルガリア共和国軍の軍事史研究に対する支持と熱意がうかがえた。

来年（2013年）の第39回軍事史国際会議は国際軍事史学会創設75周年の記念大会にあたり、イタリア共和国トレノ市で開催の予定である。共通テーマは「戦争における統連合作戦（Joint and Combined Operation in Warfare）」である。

（防衛研究所戦史研究センター安全保障政策史研究室所員）

The Three Falcons
– The Succession of Prewar Aviation Technology in Japan after World War II–

岡田　志津枝

【要約】
本稿は、第２次世界大戦中の陸海軍研究所において育まれた知識や技術が戦後日本の社会や科学技術に及ぼした影響について、鉄道産業の事例などをもとに考察するとともに、戦後の航空機産業の復活について述べたものである。また、このような役割を担った陸海軍の技術者を紹介するとともに、陸軍戦闘機、新幹線、小惑星探査機に共通する挿話などを交えて論を進めた。

1. Introduction

At the end of the war on August 15th, 1945, followed by the occupation of Japan by the Allied Forces, all aircraft of the Imperial Japanese Army and Navy (IJA and IJN) were demolished or handed over to the occupying forces. Therefore any kind of aircraft production, research and development, or even flying, was prohibited in Japan for seven years until the peace treaty was formed in 1952. During that time, the engineers of the Japanese military applied for new professions in private enterprise, public office, and universities and therefore dispersed. In this report, I will study how the aviation technology which had developed in the war had a great influence on postwar Japanese society and its technology, especially in the case of the railway industry. I will also examine the reconstruction of the postwar aviation industry.

2. The development of aviation technology in the IJA and IJN (1910-1945)

In 1910, 35 years before the end of WWII, the first airplane flight in Japan had been a success. The IJA dispatched their officers to France and Germany and ordered them to purchase airplanes and study how to fly them. The first flight was attempted and succeeded at Yoyogi drill field in Tokyo in December, 1910. During the 1920s, after WWI, there were two large-scale disarmaments in Japan, which was also true of other great powers in the world. However, the air forces were preserved or strengthened under the policy of modernization of weapons[1].

Especially the period between the outbreak of the Sino-Japanese War (in July, 1937) and the end of the Pacific War (in August, 1945), the IJA and IJN advanced the development and the production of a variety of aircraft. Some of them were state-of-the-art, such as the first Japanese jet plane "Kikka," which had a successful experimental flight toward the end of the war but was too late to be of operational use.

The development of a jet engine for "*Kikka*" (Ne 20) was an interesting and curious case. The IJN formally started the research and development of the jet engine in January, 1942. Thereafter, during two and a half years, the research group had developed the theoretical principles for jet propulsion and successfully conducted preliminary experiments. However, the high-ranking air officers of the IJN didn't adequately understand or evaluate the accomplishment at that time[2]. It was in 1944 that the IJN obtained the information that the research on jet engines in Germany had continued to develop, which led to a growing tendency to develop the jet engine by the leaders of the IJN. At around the same time, Germany provided Japan with the plans, rocket-fuel manuals and materials for the rocket-powered fighter aircraft Messerschmitt Me 163 and the jet-powered fighter aircraft Messerschmitt Me 262 and stowed them into two submarines. One of the two submarines was a Japanese submarine (I-29) and another one was a German submarine which was handed over to Japan (Japanese name, Ro-501). On their way home, however, the German submarine (Ro-501) was attacked and sunk in the Atlantic Ocean, and the Japanese submarine (I-29) arrived at Singapore and then was sunk in Bashi Channel (south of Taiwan) by Allied Forces. One of the occupants of the Japanese submarine, Eiichi Iwaya, who was a Japanese technical commander, disembarked in Singapore. He flew to Japan with very little data on the Messerschmitt Me 163 and Me 262. At the end of July, in 1944, the jet engine research group in the IJN only managed to obtain a single cabinet photo (Four by Six Photo) of a general design view of the German BMW-003A jet engine. However, when the leader of jet engine research group, Tokiyasu Tanegashima (1902-1987), saw this cabinet photo, he thought "the German jet-engine was quite similar to ours in principle," and it opened the way for resolving the technical problems which had been preventing the implementation of the Japanese jet engine. In June of the following year, that group brought their jet

1 The IJA especially implemented the large-scale disarmament and reduced 90,000 officers and men by the two disarmaments, "Yamanashi Gunshuku (disarmament)" in 1922 and "Ugaki Gunshuku" in 1925. However, the air unit was independent as an arm and fostering the aviation industry was encouraged as a modernization of the IJA.

2 Tokiyasu Tanegashima, "Wagakuni ni okeru jetto engin kaihatsu no keika (1)," *Science of Machine*, 21(11) (November 1969), pp. 46-49.

engine to completion (Ne20: "Ne" means Nensho, or combustion) and subsequently succeeded with the experimental flight of the first Japanese jet plane "Kikka" on August 6th, 1945, just before the end of the war[3].

Until the end of the war, the aviation industry in Japan employed approximately 1,000,000 workers and produced 25,000 aircraft per year at its peak, and the cumulative numbers of production was 100,000 aircraft by 1945. However, most of the aircraft developed and produced in Japan were warplanes and there were very few commercial planes[4].

3. The dispersion of the ex-military engineers and civilian use of aviation technologies

Japan was occupied by the Allied Forces after the surrender on September 2nd, 1945, and shortly afterward, the disarmament of the IJA and IJN and the dissolution of "zaibatsu" (the financial combine groups; some of them were parents of aircraft manufacturing companies) were carried out. All aircraft which belonged to Japan were forbidden to fly above Japanese territorial air and all air bases and their facilities were handed over to the Allied Forces. The sweeping destruction of military and civilian aircraft followed. The prohibition that followed continued for seven years.

It was not only aircraft that were prohibited but also the production, research and development of weapons. It wasn't only the machines and facilities relating to these plants that were demolished and burned, but also the research centers and their documents. Consequently, the ex-military engineers and civilian engineers working in the military field dispersed, seeking out new professions. This was especially true in reference to the Railway Technology Research Laboratory (RTRL: currently the Railway Technical Research Institute), which was an institute of the Japanese National Railways (JNR), as they had accepted many of these engineers. The number of engineers in RTRL was 400 by the end of the war; and it increased to 1,500 soon after the war. Some of them had been purged from public office later and the number diminished to 500 again in 1951. However many ex-military engineers continued in RTRL and conducted research on railway technology, such as cars, and signal systems[5].

The most famous engineers among them, for example Tadanao Miki (1909-2005) and Tadashi

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3 Tokiyasu Tanegashima, "Wagakuni ni okeru jetto engin kaihatsu no keika (2)," *Science of Machine*, 21(12) (December 1969), pp. 46-48.

4 Nihon Koku Utyu Kogyokai, *Nihon no Koku Utyu Kogyo 50nen no Ayumi*, (Nihon Koku Utyu Kogyokai, 2003) p. 3, 7.

5 Tetsudo Gijutsu Kenkyusyo 50nenshi Kanko Henshu Iinkai, *Nihon Kokuyu Tetsudo Tetsudo Gijutsu Kenkyusyo 50nenshi*, (Kenyusha, 1957), pp. 41-43.

Matsudaira (1910-2000), had been at the former Naval Institute of Aeronautical Technology (NIAT: "Kaigun Koku Gijutsusho" [later called "Kaigun Kugisho"] in Japanese). Matsudaira was one of the development project engineers of the well-known navy carrier fighter plane, the "Zero," which was developed just before the Pacific War. Later the "Zero" became one of the most prominent airplanes in the Navy; however, it had experienced two midair disintegration accidents during the test flights. At that time, Matsudaira resolved this problem by practical methods, such as ground vibration tests, wind-tunnel tests and model tests[6]. Later this study played a great role when JNR struggled to find the cause of the passenger cars' derailing accident in 1947. Until then, it had been speculated that this kind of accident was due to the strain of rails. However, Matsudaira proved that the cause of these accidents was the vibrations of the train itself and this idea came from his experience when he had developed the "Zero."[7]

Tadanao Miki was also an ex-engineer at the former NIAT and well-known for his work on the designs for the land-based bomber "Ginga" and the suicide rocket plane "Ohka". At RTRL, he took an active role as a train engineer making full use of his aeronautical technology and knowledge obtained at NIAT. He contributed to the lightness of a railway car by implementing a design that followed the Monocoque (French for "single shell") structure of airplanes, for example[8]. Before he designed the "Shinkansen" (also known as the "Bullet Train"), he had already designed a new type of railway car called the "Super Express" for a private railway company in1957. Thus his works greatly influenced the design of postwar high-speed railway cars. When Japanese air forces began to rebuild around 1954, he was asked to be a chief of the technology division. However, he never undertook this position. It is said that main cause of his refusal was his role during the war; he had designed the suicide rocket plane "Ohka," which had been a manned bomb, and it kept him away from military matters after the war[9]. Another example of how ex-military technology had been applied to railway cars was "7075 aluminum alloy (so-called extra-super duralumin)." This material contributed to the lightness of railway cars, such as the "Shinkansen." This material was originally developed by the Japanese company "Sumitomo Material Industry" in 1936, which was ordered by NIAT. This is also another example of how the technologies and materials which had been

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6 Jiro Horikoshi, Masatake Okumiya, *Zerosen-Nihonkaigun Koku Shoshi*, (Nihon Shuppan Kyodo Kabushikigaisya, 1953) pp. 123-127, 142-147.
7 Naoki Kodachi, *Zerosen Saigo no Shogen*, (Koujinsha, 1999) pp. 262-263.
8 After 1950s, Monocoque structure was frequently adapted to Japanese motor vehicles as the unemployed aeronautical engineers had got jobs with automobile industry.
9 Yoshiro Ikari, *Chokosoku ni Idomu -Shinkansen ni Kaketa Otokotachi*, (Bungeishunju, 1993) pp. 104-107.

developed and used for Japanese military airplanes, including the "Zero," during the war, was utilized for civilian products in the postwar era.

In May, 1957, RTRL reported in the lecture meeting commemorating the 50th anniversary of the laboratory that it would be possible to operate a super-express train which would shorten the time between Tokyo and Osaka (550km) from seven and a half hours to three[10]. There were four engineers as the representatives of JNR on the stage, including Matsudaira (in charge of "railway cars") and Miki (in charge of "riding quality and safety"), and another representative Hajime Kawanabe (in charge of "signals") , who was also an ex-military engineer. He had researched electrical signals at the Army Scientific Institute during the war. Later he developed ATC (which stands for "Automatic Train Control," however, its concept is "Automatic Traffic Control" in English) and established the safety operation of high-speed railway cars. The scheme for building a new high-speed railway line and super-express railway cars for it, which was called "Shinkansen," was approved in October, 1958 and its service commenced on October 1st, 1964, in time for the Tokyo Olympics in Japan.

However, the ex-military engineers brought to JNR not only the technologies that they had acquired in the military institutes but also the new technological cultures. During the war, the research and development was not permitted a moment's delay. An example is the previously mentioned case of flutter (a self-feeding and potentially destructive vibration of the Navy's airplanes.) The engineers had to mobilize every kind of theoretical and tentative method to resolve the problem in a short time. The succession of practical and creative technological cultures which had been fostered in the IJA and IJN institutes during the war was another side of the succession of technology[11]. During the Pacific War there were about 7,400 engineer officers who played an active part in the IJN with 5,940 positions occupied by students of science and technology[12]. Many of them were still in their 20s and 30s when the war ended and had experience and executive ability which they would never get during peace time. As the Japanese military was disarmed and the engineer officers dispersed to other fields, it had a great effect on the development on postwar industry in Japan. When RTRL accepted them, the acting president at the time made a resolute decision and stated that it would inflict a loss on our state if we dispersed the competent ex-military

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10 Asahi Shinbun (May 26th, 1957).

11 Yasushi Sato, "Dainiji Sekaitaisen Zengo no Kokutetsu Gijutsu Bunka-Tetsudosyaryoyodaisya Shindokenkyushi no Saikento wo Tsujite-," *Journal of History of Science, Japan*, Vol. 46 (No. 244) (Winter 2007) p. 215.

12 Yasuzo Nakagawa, *Kagaku Gijutsu Kenkyusyo*, (Nihon Keizai Shinbunsya, 1987) p. 17.

engineers and that, therefore, we would receive them. If viewed from the military side, it was a fortune that there was someone who met the expectation of the president of RTRL. The Chief of Naval Technical Department responded by calling for the young and truly competent engineers. Consequently their vision played a great role for the succession of ex-military technologies[13].

After approximately a half century passed, in March, 2011, the newest Shinkansen “HAYABUSA” (in English “falcon”) began its service connecting the distance of 700km between Tokyo and Shin–Aomori (the northeastern region of the mainland in Japan) in about 3 hours. It was just one week before the devastating earthquake and tsunami on March 11th, 2011. During the disaster, all 27 bullet train “Shinkansen” which were operating in that area, stopped their service through the use of earthquake detection systems and brought their passengers to their destinations safely. However, there are only a few people today who know that ex-military technologies and its experience were utilized for the aerodynamic characteristics and seismic control systems, etc. when the first “Shinkansen” was manufactured. It is also an irony of history that ex-military aeronautical engineers opened the new era of super high speed railway with their technologies and the spirit of challenge when automobiles and airplanes were taking the place of rail transport in the 1960s.

4. The seven lost years of the aviation industry and its restoration

During the war, many of the major manufacturers of aircraft were part of the financial cliques known as “zaibatsu “ and they were dismantled by the order of General Headquarters of the Allied Powers (GHQ) after the war. The aviation division of “Mitsubishi Heavy Industries” (“Mitsubishi Juko” in Japanese) that had manufactured the navy carrier fighter plane “Zero,” for example, were divided into three companies and “Nakajima Aircraft” that had manufactured the first Japanese jet plane “Kikka” was divided into twelve companies likewise. The aeronautical engineers in those companies also lost their jobs and dispersed, and the divided companies produced and sold whatever they could. For example, bodies and parts for vehicles, agricultural machines and implements, and other items like scooters and fire-extinguishers[14]. However, the ex-military engineers who gained the highest level technologies scattered through the private enterprise and as a result, it delivered the ripple effect on the creation of major products that would become the pillars of the Japanese export industry, which was not only the railway industry previously mentioned, but

13 Yoshiro Ikari, *Chokosoku ni Idomu*, p. 130, pp. 137-138.
14 Nihon Koku Utyu Kogyokai, *Nihon no Koku Utyu Kogyo Sengoshi*, (Nihon Koku Utyu Kogyokai, 1987) pp. 15-17.

also precision machinery industry (electronic microscope, camera, watch, radio, etc.) or compact car industry.

On the other hand, the occasion of the restoration of the aviation industry was the Korean War in June, 1950; and the conclusion of the San Francisco Peace Treaty and Japan's recovery of its independence in 1952. According to the peace treaty which came into effect, it became possible to produce, research and develop aircraft and fly aircraft under the Japanese flag. The former manufacturers of aircraft, which had survived by producing consumer products, took orders of overhauls and the maintenance of US military aircraft by war-time special procurement. Therefore, they were introduced to the latest aviation technologies which had made rapid strides during the seven lost years in Japan. The research and development of aircraft by its own effort had begun; however, the large step of the resumption and the development of the aviation industry was made by advancing the license production for the Japan Air Self Defense Force (JASDF; Japanese Air force) when it was built in 1954. Even though the experimental flight of the first Japanese jet plane "Kikka" had succeeded before the end of the war, the Japanese aviation industry was left behind the global progress in that field. Therefore the introduction of aviation technologies from the United States and the raising of the nationalization index were the golden opportunities to learn new technologies[15].

If we examine the characteristic point of the resumption of the Japanese aviation industry at that time, we will see that all aviation manufacturers, along with the government, united and established a new company to cope with the redevelopment of the aviation industry. For the development of jet engines, four (later five) aviation manufacturers invested together and established "Nihon Jet Engine" (NJE; 1953-1974). To create the demand for civilian airplanes, publicly and privately funded "Nihon Aircraft Manufacturing Corporation (NAMC; 1959-1982) was established likewise. The former developed the jet engine "J3" which was used for the first Japanese practical jet airplane "T-1B" for JASDF (T-1B had succeeded in its test flight as T1F1 in 1960). The latter researched and developed a medium-sized transport airplane YS-11 in 1962 which was the first Japanese passenger plane after the war and it was expected that there would be a demand from various fields – domestic and foreign airlines as well as reborn Japanese military. The predecessor of NAMC was "Carrier Airplane Design and Research Association" ("Yusoki Sekkei Kenkyu Kyokai" in Japanese; 1957-1959) established by six airframe manufactures and other

15 The number of the JASDF jet airplanes manufactured by joint development between Japan and the United States was 300 F-86Fs and 210 T-33As. The domestic production rate was over 60% ultimately (Ibid., pp. 23-24).

associated parts suppliers[16]. Many of the engineers who played key roles in this association were ex-military engineers, including Jiro Horikoshi, who was famous as a chief engineer of the navy carrier fighter plane “Zero.”

5. Conclusion

Despite the title of this paper, “The Three Falcons,” you may have noticed that only one falcon (“HAYABUSA” in Japanese) was mentioned. It appeared as the name of the newest bullet train “Shinkansen.” Therefore, I will make two other falcons appear on the stage as a closing part of this paper.

In June, 2010, sixty-five years after the end of the war, one steel falcon landed on the Australian desert region, Woomera. It was the asteroid explorer “HAYABUSA” (the original code name was MUSES-C) which returned to the Earth after a lonely seven year voyage to an asteroid. It landed on the asteroid, acquired the samples on its surface and returned them to the Earth. The asteroid which “HAYABUSA” headed for is the near-Earth asteroid 251143 Itokawa (1998 SF36), which was named after the Japanese rocket engineer, Hideo Itokawa (1912-1999) who was called “the father of Japanese rocketry.” Itokawa was an ex-military engineer of the IJA in his youth and was coincidently one of the engineers of the fighter plane “HAYABUSA” (Ki-43, which the Allies code named the “Oscar”) that was the most largely manufactured IJA plane during the Pacific War. After the war, he urged the research and development of rocket systems at the University of Tokyo. He had been involved in the development of sounding rockets (K (Kappa) rocket, L (Lambda) rocket), launch vehicle to launch satellites (M (Mu)), and the first Japanese satellite “OHSUMI.” His emphasis was on the development of rockets and satellite systems for civilian use rather than military use.

Aside from the merit and demerits of warfare, there are astounding technological innovations too numerous to mention which have been developed through warfare. However, the postwar experiences in Japan, which span nearly seventy years, suggests that it is not impossible to build and sustain the technologies which develop our society and improve our lives. Despite the technological advancements brought by warfare, the current use of these technologies has no connection with warfare.

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16 Ibid., pp. 21-26.