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DEPARTMENT OF STATE
INTERIM RESEARCH AND INTELLIGENCE SERVICE
Research and Analysis Branch

R & A No. 2558.2

JAPANESE WAR PRODUCTION INDUSTRIES. Part II.

The Aircraft Industry

Description

Discussion of the Japanese aircraft industry; corporate structure and the history of governmental control receive the major emphasis. The capacity, technological aspects of this industry are also discussed.

31 October 1945

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ERRATA

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Table of Contents: Add to Appendix II "IIIh Note on Mitsui Control of Nakajima Aircraft". This Appendix is attached to this errata sheet.

p. 108 line 24: delete "both"

p. 109 line 3: delete "from the American point of view"

p. 112 third sentence should read: "During the years 1917-18, two private companies, Nakajima and Mitsubishi, and the Naval Arsenal at Hiro, built the first aircraft plants."

P. 112 line 10: change "were" to "was"

P. 114 line 2: delete "28"

p. 118-124: should be bound in the following order:

p 122

p 123

p 118

p 124

Present pages 119, 120, and 121 should be deleted

p. 123 last line: delete whole last line

p. 124 line 8: change "Kiyeshi" to "Kiyoshi"

P. 128 line 12: change "Kanaka" to "Tanaka"

p. 128 last sentence should read: "In 1941, International General Electric was the largest stockholder in Tokyo Shibaura Denki; Mitsui, the second largest."

p. 132 line 13: change "were/or" to "were for"

p. 141 line 17: change "¥200,000" to "¥200,000,000"

p. 144 line 16: insert "This" at end of line

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II. THE AIRCRAFT INDUSTRY

A. Aircraft Production: Physical and Technical Aspects

Aircraft commanded top priority in the Japanese war production program. After 1941, strenuous efforts were made to increase plant output by the construction and equipment of new manufacturing facilities, by conversion of plant capacity less essential to the war program, and by diversion of labor and material resources to the aircraft program. Under this stimulus, aircraft production in Japan increased rapidly, but output was always small in comparison with U.S. production, which reached upwards of 8,000 planes a month by the end of 1944.

Table 3. OFFICIAL JAPANESE REPORT AND AMERICAN JOINT TARGET GROUP ESTIMATES OF JAPANESE AIRCRAFT PRODUCTION TRENDS

<u>--Domei</u>		<u>W.D.M.I.S.</u>
<u>(4 September 1945; all types)</u>		<u>(30 August 1945; (aircraft: combat only)</u>
<u>Low</u>	Dec. 1941 - <u>550</u>	428
	Dec. 1942 - 1,054	803
	Dec. 1943 - 2,096	1,448
<u>Peak</u>	June 1944 - <u>2,857</u>	2,034
	Dec. 1944 - 2,204	2,450
	July 1945 - 1,003	1,850

Note: If Trainer and Reconnaissance types are assigned a value of roughly 25 percent of total aircraft production, American estimates and Japanese official reports are comparable until December 1944 when the Japanese figures are considered to be far too low, by contrast with the best American estimates.

In order to achieve her 1944 level of aircraft production, it is believed that Japan was employing over 750,000 workers. Of this number, it has been estimated that about one-eighth were women. (See R & A 2271, Industrial Distribution of The Population of Japan.)

Distribution of Population in Japan.)

1. Structure of the Industry. Prior to 1945,¹ Japan's aircraft industry drew on many hundreds of plants for its supply of components, but the major fabricating processes involved in airframe and engine production and assembly, were largely concentrated in ten to fifteen major plants. These plants accounted for over 80 percent of airframes and about 90 percent of engine production. (See Appendix II a.) New plants and dispersed sites in 1945 were reducing this concentration materially ^{which would} ~~---a fact/~~ alter considerably the list given in Appendix IIa.

2. Major Fabrication Plants. Major fabrication plants include those plants engaged in (1) engine manufacture (defined as ^{the} ~~fabrication~~ ^{of} the major engine components and the assembly and testing of the engine complete with ^{and} accessories); (2) airframe assembly (defined as the forming and machining of parts, the fabrication of the major airframe components ~~s~~ -- wings, fuselage, etc. -- and the final assembly and testing of the completed aircraft).

3. Principal Components Plants. Besides ~~the~~ 10-15 major plants already referred to, there were many others which produced most of the aircraft components for leading aircraft types.

Airframe components were made in many plants, the principal ones known being listed in Appendix IIb. Six large plants and several small ones held the field in the manufacture of landing gears. As far as can be estimated, almost all starters were manufactured in one plant, while total magneto production was accounted for by ^{three} plants, one of which was reported to make as high as three-quarters of the total output. Propellers

1. Bombing and significant dispersal of the industry began in December 1944.

were made principally in 5 or 6 plants, while the manufacture of propeller governors appeared to take place in 4 plants. The production of anti-friction bearings seemed to be concentrated for the most part in 7 plants accounting for nearly 75/^{percent} of the total produced. (See Appendix II b for a list of these selected component plants and their locations.)

4. Regional Concentration. Aircraft plants were scattered over a large part of Japan proper, and there were some in Manchuria and Korea. The most important concentrations of aircraft manufacture, however, were in the industrial districts of Nagoya, Osaka and Kobe in Southwest Japan, and the districts around Tokyo, Ota, and Koizumi (Gunma Prefecture) in North - Central Honshu.

Although, in general, aircraft component manufacture was not highly concentrated in location, important clusters of component producers were to be found. (See Map I of the aircraft industry.)

5. Installations and Equipment. In the aircraft industry, machines and machine tools fall into two very general categories: (1) the few machines peculiar to aircraft manufacture, such as hydraulic presses, spar-cap milling machines and other multiple drill and boring machines (such as the Greenlee), stretchers, Berliner profilers, etc.; and (2) general purpose tools which are extremely varied in their industrial uses, such as lathes, shapers, millers, etc. Normally 80-85/^{percent} or more of the machine tools found in US engine plants were general-purpose.¹ In Japan the proportion was undoubtedly higher, but some special purpose tools were probably in use.

1. Almost all machine tools in airframe plants are general-purpose.

6. Time Required to Restore Aircraft Manufacture.

a. Airframe Assembly.

At the major assembly stage, neither the buildings nor the facilities are of such a complex nature that they could not be replaced in a relatively short time. Restoration of an average plant would probably mean a total loss of production for six months, with a gradual recovery of the normal rate of output in about nine months or even less under stepped-up wartime conditions. Two and a half years represent the most optimistic figures of German, British, and American plans for the time required from the day blueprints of a new aircraft type are initiated until peak production is obtained. ^{however,} Assuming that the Allied authorities attended to the dismantling and scrapping of the plants themselves, the accompanying hangars, jigs, presses, assembly lines, and other facilities which go to make up a final assembly plant, the removal or distribution of research laboratories, testing stations and drafting facilities, and the breaking-up of industrial organizations having the necessary "know-how" and trained labor force, the re-creation of an entire industry would ^{take} a far longer period. It is certain that, in general, Japanese standards are not up to the level of the three nations mentioned above.

b. Engines.

In the event that Japanese plants producing aircraft engines were dismantled, destroyed or otherwise disposed of by the Allied authorities, several years would necessarily elapse before manufacture at the peak 1944 rate could be again attained, even assuming that all other facilities and raw materials were freely at hand. Manufacture of modern

aircraft engines on a mass production basis involves the use of great aggregates of machine tools, together with a mass of specialized equipment including jigs, fixtures, gauges, etc. It is believed that if the machine tool industry were called upon to re-equip the two largest engine plants in Japan under wartime conditions, 4 to 8 months would elapse. Obviously, after a disarmament period, an estimate of three to four years is more reasonable.

7. Principal Raw Materials. According to a Japanese source, 71%^{percent} of the material in/^{Japanese} their planes was light metal, of which 67 or 68%^{percent} was aluminum; magnesium accounted for 3 to 4%^{percent}; the remainder was composed mostly of special steels and various alloys.

a. Aluminum.

Until very recently, about two-thirds of the raw materials required to fill Japan's aluminum needs were imported in the form of bauxite from Bintan and Malaya. Substitutes from Manchuria, Korea, North China, and Japan proper, in the form of aluminous shales, were the main source of the remaining raw materials employed, growing in importance as Allied armies moved into the South and Japanese supply was restricted by submarine action. By the beginning of 1945 less than 20 percent of total alumina production (424,000 metric tons) was derived from the Bayer process, using bauxite from the south as raw material. Non-Bayer plants accounted for 80 percent of total alumina production, operating with various Inner Zone substitutes. Further expansion of non-Bayer plants could readily release Japan's industry altogether from dependence on NEI bauxite supplies. The largest 10 plants included about 75 percent of total alumina capacity; the largest 14

plants 90 percent; but much of this represented unused capacity in Bayer plants. The 5 largest non-Bayer plants are believed to have accounted for about 65 percent of total output (February 1945).

Annual aluminum reduction capacity in Japanese controlled areas was estimated at 232,000 metric tons, and output at 208,000 metric tons (February 1945). Production was equivalent to requirements, of which more than 80 percent (of primary aluminum) went into aircraft production. Japan has a total of 20 aluminum reduction plants. Fourteen of these contain 92 percent of capacity; the largest 10 plants include slightly over 75 percent of capacity.

While it has been estimated that in 1944 there was considerable excess capacity for primary ingot production, it is believed that rolling capacity might have been a bottleneck for Japanese aircraft production unless the known end-of-1941 capacity of about 45,000 metric tons was greatly increased. In any event, 70-80 percent of all rolled products were probably used for aircraft. (See Map I of the aluminum and alumina industry and Appendix II c/alumina and aluminum in Japan and the Inner Zone)

(i) Alternative Domestic Process.

Given a highly subsidized industry, it is clear that Japan's requirements for alumina could be derived from the lime-sinter-soda-leach process or a similar one using various types of domestic shales, clays, or limestone as a raw material. The same facilities (rotary kilns) used in producing cement ^{also} are used to make alumina. There were no inherent technical or material obstacles to prevent Japan from developing substitute domestic raw material sources for the production of aluminum. As recent wartime

intelligence has indicated, domestic materials were in use and new processes were developed and ready to go into production as soon as bauxite stocks were judged to be critically low. It is possible, moreover, that magnesium, wood, plastics, or steel may in time also satisfactorily substitute for aluminum in the production of aircraft.

(ii) Stock piles.

In 1943 it was estimated that Japan had on hand about a year's supply of aluminum, most of which was in the form of bauxite. There is reason to believe that, with increasing threats to her shipping lines from the south, Japan must have made every effort to maintain her stocks in 1944. Available estimates, however, assume that Japan had negligible stocks (35,000 metric tons) of bauxite during the last year of war and that she operated on her current supply of aluminous shales and/or other domestic substitutes.

(iii) Power Requirements.

Adding together the estimated power requirements for the 1944 production of alumina and aluminum in the Japanese Inner Zone, a rough figure of approximately seven billion kilowatt hours is arrived at. These processes ranked third and first, respectively, in energy consumption for 1944. The proportion of this total which was consumed in the production of the primary aluminum going into aircraft production would be about **six billion** kilowatt hours annually, which amounts to over 13 percent of the total estimated energy consumption of Japan proper for 1944. The significance of this figure for peacetime economy may be gathered from the fact that this amount of energy is roughly two-and-a-half times that con-

sumed by the entire textile industry of Japan in 1937. In that year, textiles still represented by far the most important industry.

(iv) Adaptability and Convertibility.

Aluminum capacity is not very adaptable, since its rolling mills and ingot facilities differ from those used in the production and fabricating of steel. Insofar as aluminum ingot production and strip mills represent smaller-scale industries, with more hand labor and less automatic machinery, they are more adaptable to a variety of needs than steel plants. The aluminum and aluminum fabrications industries could eventually be converted to the production of such items as railroad cars, trucks, farm equipment, housing and furnishings, etc. Under any circumstances, however, much of this capacity would have to be held as stand-by until a market was available for such products, since well over four-fifths of Japanese controlled aluminum production was destined for aircraft and other direct military and naval war uses.

(v) Economic Considerations.

The elimination of the aluminum industry would not constitute a serious disturbance in the normal economic life of Japan. As is well known, this industry is only a few years old (1934-35), having been called into existence chiefly with war ends in view. The economic disadvantages which ^{would} accrue from a very large post-war aluminum industry in Japan are obvious. To begin with, the bulk of the high-grade raw materials required have to be imported. Secondly, the domestic process for the production of aluminum from ceramic clays is both in an early stage of development and is ^{fore} ~~there~~ extremely costly. (^{Since} the autumn of 1939 there

has been a provision for subsidies to be paid to companies using domestic raw materials. It has also been stated that the sum of ¥1,000,000 was set aside for such subsidies in the fiscal year 1940-41.) Finally, the implications of a Japanese monopoly on the production of aluminum in the Orient should be considered both from the point of view of ^{American} military security and the viewpoint of China and other friendly nations.

(vi) Long and Short-Run Considerations.

In the long run, an analysis based on costs or industry locations alone is not valid. For, given a peaceful, democratic Japan, a good argument could be made for a domestic aluminum industry, retaining a certain percentage of the present capacity to serve the needs of an integrated Japanese economy and perhaps the surrounding areas. This is even more cogent in view of Japan's relatively abundant hydroelectric power resources and her shortage of many non-ferrous metals, including copper. Keeping in sight the short-run goal of military security, however, the importance of the Japanese aluminum industry in the production of military aircraft emerges as the dominant consideration.

b. Magnesium.

^{percent}
Some 54/ of the total magnesium obtained by Japan in 1943 (7,200 tons of 13,200 tons) was produced in Japan proper, largely from imported magnesite and similar earths. Manchuria and Korea, which have some of the richest magnesite deposits in the world, accounted for the balance. The production of aircraft disposed of about 20/^{percent} of this total, and in general, there was excess capacity. (See Appendix IIId for details on the source of raw materials for the magnesium industry and dispersion of production.)

The role of magnesium in the production of aircraft in the future merits careful consideration. Recent intelligence has pointed to the use of brine as a raw material for a considerable proportion of magnesium produced. The limitations upon this process lie in the very high electric power consumption in the production of magnesium by the electrolysis of sea bitters. Thus, 50,000 kilowatt hours are required to produce a metric ton of magnesium by this process as opposed to 20,000-25,000 kilowatt hours required when magnesite is used as a raw material. The great power consumption and the very extensive plant and facilities which are required for the electrolysis method are a decisively limiting factor at present, as are certain structural defects, referred to as "stress corrosion". Future research and refinements may change this picture appreciably. On the positive side, magnesium has the advantages of being considerably lighter than aluminum, of being the most easily machined of all metals, and of not being subject to corrosion by alkalis or sea water. Moreover, it compares very favorably in price with aluminum. Thus, it is not unlikely that magnesium may at some future time substitute for aluminum in aircraft production. At present, the ratio of magnesium to aluminum use in a plane is at most not more than a few percent and its use is restricted mostly to portions of the engine. In the past, the neglect of magnesium has been due largely to industrial competition as opposed to purely technical considerations.

(i) Reserves.

Japan had little domestic raw material in the form of magnesite or other earths, but virtually unlimited resources of raw material for

the production of magnesium were available to Japan from Manchuria and Korea, in the form of magnesite and dolomite. Magnesite reserves in Manchuria alone are estimated at five billion tons.

(ii) Potential Peacetime Production of Magnesium.

The magnesium industry in Japan is another "war baby" having been developed only recently (1934-35) as an adjunct of the armaments industry. In wartime upwards of three-quarters of Japan's total magnesium requirements were allocated for directly/military use. The adaptability and convertibility of the magnesium industry is similar to that of aluminum. As in the case of aluminum, Japan is as well or better suited to produce this light metal than any other country in the Far East, from the point of view of electric power and industrial installations. Plentiful magnesite is also available from Manchuria and Korea, as well as in sea water. The continued existence of the magnesium industry in Japan, however, should probably not be decided on a purely cost or technical basis, but according to considerations of American security and world peace.

B. Organization of the Aircraft Industry.1. Brief History.

The origin of the Japanese aircraft industry coincides with World War I. Shortly before the war, Japan sent army and navy officers to France to study European developments in aerial warfare. During the years 1917-18, two private companies, Nakajima and Mitsubishi, built the first aircraft plants and the Naval Arsenal at Hiro. Because of Japanese technical backwardness, these were based on foreign models. This dependence on copies or adaptations of foreign designs--British, French, German, and American,--and the employment of foreign engineers and producers, were to continue to a decreasing but still dominant degree until the eve of World War II. By the end of 1937, the Japanese had succeeded in creating two or three types of airplanes of their own design.

The first intensive period of Japanese aircraft production was related to her war preparations in 1929-31. New companies were organized and the existing ones, Mitsubishi, Nakajima, and Kawasaki were enlarged. With the conquest of Manchuria, Japan worked hard to create her own models, culminating in the successes of 1937. It was during the latter part of this period, too, that the aluminum and magnesium industries were first developed (1934-35).

The years 1936-37, which featured preparations for the war with China and the outbreak of hostilities, marked a further period of unusual activity. The Ministry of War tended to encourage a shift of production from the arsenal to the private company.

The leading companies doubled or tripled their capital and new companies were again organized. According to the Japanese Ministry of the Navy, in 1938-39, private industry composed 70-75 percent of the entire Japanese aircraft industry. The relatively satisfactory types produced at this time, formed the nucleus of the Japanese air force at the beginning of the war.

As is now well known, the years 1940-41 were years of immediate preparation for war. In these preparations aircraft production ranked second to none. Most companies again doubled or tripled their capitalization and received huge government subsidies in addition. Government aircraft plants and arsenals were enlarged; and new ones were built, and assumed an increased proportion of total production and much activity of a research and experimental nature.

During the entire war, aircraft production continued to have first priority. Efforts to increase production included conversion of other industries, led by textiles, to aircraft manufacturing.

2. Leading Manufacturing Companies.

The aircraft industry was not an independent development in Japan. As stated, several established manufacturing companies added aircraft production to their other activities. The largest of these were: Mitsubishi Jukogyo (Mitsubishi Heavy Industries), the Mitsui-backed Nakajima Hikoki (Nakajima Aircraft), Sumitomo Kinzoku Kogyo (Sumitomo Metal Industry), Kawasaki Kokuki (Kawasaki Aircraft), Aichi Tokai Denki (Aichi Clock and Electric), and Watanabe Tekkosho, (Watanabe Iron Works). Other aircraft units were set up as semi-independent subsid-

aries of established companies. Even the newly organized manufacturers were financed by older banking and business interests. The 28 investments of Mitsubishi, Mitsui and Sumitomo are especially notable.

3. Government Encouragement: Aircraft Manufacturing Industry Law.

The government's constant interest in the aircraft industry has increased in recent years. The war of aggression in China in particular gave a great impetus to the already increasing demands for military and, to a lesser extent, civil aircraft. As a result, aircraft manufacturers of "doubtful competency and background" began to spring up all over Japan. Realizing the importance of the industry to the military program and the necessity for its control, the Government in 1938 passed the Aircraft Manufacturing Industry Law, requiring government license of all firms engaged in the manufacture of airframes weighing over 350 kilograms, or of engines of stroke volume capacity over 3,500 c.c. Licenses were granted only to companies having a minimum capitalization of ¥ 3,000,000 and an annual capacity of 100 tons of airframes, or 300 engines or propellers. In return for government authority over production, licensed companies were in a position to receive substantial monetary grants, tax exemptions, and import privileges. The salient features of the Law are as follows:

Government Control.

(i) The Government may determine specifications; control prices, terms, and the supply of planes and parts; merge or dissolve companies; and transfer, discontinue, or suspend manufacture of all or part of their products.

(ii) Under a military clause, the Government may issue instructions regarding plant expansion, manufacturing research, training of technicians; cooperation with other plants; storage of raw materials; drafting of plants, employees, or equipment; guards and counterespionage.

(iii) Land may be appropriated for plants or fields.

Manufacturers' Benefits:

(i) The Government compensates the manufacturers for losses. Subsidies are granted for airplane parts and materials not previously produced in Japan.

(ii) Under certain conditions manufacturers are exempt from income tax, business profit tax, and local taxes for six years. Import duties for tools for the industry were ^{to be} abolished for five years.

(iii) Capital may be increased for plant expansion and bonds may be sold in excess of the legal limits for the purchase of equipment.

Miscellaneous Data.

(i) Licenses are issued separately for aircraft manufacture and assembly.

(ii) The Aircraft Technical Commission was ^{to be} organized with 20 members under the Minister of Communications (Tsushin-sho). Its primary function is the standardization of aircraft. Any violation of the government regulations subjects the firm to fines varying from ¥500 to ¥2,000 Yen. (See Appendix IIe for text of the above-mentioned Law).

4. Concentration of Production.

Whatever the reasons advanced for these measures, the manufacture of all military airplanes and of the relatively insignificant number of airplanes for the civil airlines was then concentrated in the hands of 14 licensed firms. (See Appendix II f for details concerning the 14 originally licensed companies.) These companies were licensed for the production of complete airframes, engines, and propellers; the subcontracting of component parts to other producers was encouraged.

5. Government Arsenals. In addition to the production by the licensed civil companies, the naval aircraft factories at Hiro, Yokosuka, and Sasebo had at least a small production capacity. Recently they are believed to have confined their activities principally to research, experiment, and testing, and to the manufacture of models for later development of private mass production.¹ Sasebo produced a single-engine float type fighter plane; Omura was equipped to manufacture engines and assemble planes. Mention should also be made of the Tachikawa Army Air Arsenal in Tokyo prefecture, which was assigned a small percentage of total aircraft manufacture and did considerable research on new models.

6. Nature of the Licensed Companies. The licensed companies were of two types. Some were "integrated" companies--that is, they produced in their own plants a large portion of the principal components going into the aircraft they manufactured. Others specialized in particular aircraft components. The most important "integrated" companies were Mitsubishi Jukogyo, Nakajima Hikoki, Kawasaki Kokuki, and Aichi Tokei Donki. Mitsubishi and Nakajima were the two names most often associated with Japanese aircraft, and the greatest proportion of planes had their final imprint, although they contained parts from many other sources. Companies such as these generally embraced several manufacturing plants. Other licensed companies, by contrast, are known to have been highly specialized. Sumitomo Kinzoku and Nippon Gakki Seizo (Japan Musical Instrument) produced propellers for

1. But they also engaged in mass production of privately developed aircraft and engines. Thus the "Judy" bomber and the new Nakajima Homano engine were made at Hiro.

several different plane types. Ishikawajima Koku Kogyo (Ishikawajima Aircraft) and Hitachi Kokuki (Hitachi Aircraft) manufactured engines on a smaller scale, the latter making trainer engines mainly. Watanabe Tekkosho made components and probably assembled planes. Showa Hikoki Kogyo (Showa Aircraft Industry) manufactured a transport plane copied from the US D.C.-3 (C-47).

7. Research and Development. Realizing that Japanese aviation products would continue to be several years behind foreign material unless adequate provision were made for research, design, and testing, ^{the Government set up} an Aeronautical Research Institute under direction of Tokyo Imperial University in 1918. Experimental laboratories were similarly instituted by the Army and Navy Air Services. The larger civil producers had their own departments for research and design which worked for either the Army or Navy, or, in a few cases, for both. ^{and Navy} The Army/made heavy demands upon the aircraft companies for the experimentation and development of new military aircraft and endeavored to allocate their orders to compensate for experimentation undertaken. In theory, all these agencies were to work in close harmony for the advancement of Japanese aviation. Actually, there appears to have been a lack of coordination, and to remedy this the Government in the 1938-39 budget provided an original sum of ¥500,000 for the establishment of a Central Institute of Aeronautical Research under the Aviation Bureau (Koku-Kyoku) of the Communications Ministry, (Tsushin-sho). The object, in addition to providing newer and better equipment, was undoubtedly to provide a central controlling head for the coordination of all research having to do with aviation. The cost of the entire project was to be ¥130,000,000.

The Ministry **having** been inaugurated to carry out this policy with particular emphasis on aircraft, an Aviation Ordnance Bureau (Koku Heiki-kyoku) was created within the Ministry to take over from the War and Navy Ministries all their former administrative functions concerning aircraft and related industries. This transfer, which became effective on 15 January 1944, appeared to represent a coordination rather than a shifting of responsibility, because the Bureau was to be staffed principally by officers of the Army and Navy. Lt. Gen. Saburo Endo was designated as Chief of the Bureau.

(ii) Aviation Industrial Association (Koku Kogyo Kai); Semi-official Cartel. When the new Ministry assumed its duties, an Aviation Industrial Association was formed on 16 January 1944 to coordinate the production of aviation supplies. Formation of this Association indicated that the Japanese Government was hoping to expand production of aircraft by unifying direction and centralizing the priority system. The detailed powers of this Association and similar ones in other industries were derived from the National General Mobilization Law of 1938 and, in particular, from the Major Industries Association Ordinance of 1 September 1941.

The division of functions between the Munitions Ministry and the semiofficial Aviation Industrial Association was as follows: the Aviation Ordnance Bureau of the Ministry drafted general production schedules to be assigned to the Association; the Association was then responsible within its field for control of production, the supply of funds, material, and labor required, and the allocation of schedules among its member enterprises. Despite its semiofficial title and cast, the Association was effectively dominated by the industrial leaders in the field and was essentially a business organ. The nature of this domination is

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Scheduled to be completed in 1944, the Institute was supposed to have the following departments:

(i) Aero and Hydro Dynamics. (To have six wind tunnels of various sizes -- the largest of which was to be eighteen meters in diameter -- and a water tank 500 meters in length.)

(ii) Engine Testing.

(iii) Structural Test.

(iv) Testing of Materials.

(v) Testing of Instruments.

(vi) Flight Testing.

(vii) General Affairs. (Which was to include physiology and a library section for the handling of air patents.)

When completed, the Institute was to compare favorably with the best similar foreign establishments.

a. Institutions Operating in 1941.

(i) The Aeronautical Research Institute. The Aeronautical Research Institute, which is located at Komaba, a suburb in the western part of Tokyo one mile west of the Shibuya station on the Yamanote line, has confined its work primarily to pure scientific research and secondarily to the practical application of its discoveries to actual airplane design. There are twelve sections devoted to physics, chemistry, metallurgy, materials, wind tunnel work, engines, airframes, instruments, physiology, construction, diesel engines, and propellers. Equipment, while considered modern in 1939, has long been outstripped by that used abroad.

Some of the Institute's important work has been in the field of diesel engines, the designs of which were turned over to Mitsubishi for building and incorporated in the design for the long distance "Kamikaze" which flew from Tokyo to London in 1937.

(ii) The Army Air Technical Experimental Laboratory. The Army Air Technical Experimental Laboratory, located at Tachikawa, was formerly under the technical section of the Office of the Chief of the Air Corps, but in 1935 was made directly responsible to the Chief of the Air Corps. Its primary function appears to have been the testing of airplanes and engines of new design, but it also produced a few reconnaissance planes and some engines.

(iii) The Naval Experimental Laboratory. The Naval Experimental Laboratory, which is located at Yokosuka, is a fairly complete unit for research in materials, aero-dynamics, and associated subjects. The policy here, as at the Army Laboratory at Tachikawa, is to carry on activities of a practical nature, leaving to the Tokyo University Aeronautical Research Institute the fundamental and theoretical work. In addition there are the 11th and 21st Air Arsenals at Hiro and Sasebo respectively.

b. Administration.

(i) Munitions Ministry. (Gunju-sho) Prior to November 1943 aircraft production proceeded under the close supervision of the War and Navy Ministries in plants which manufactured exclusively for one or the other. Government integration of the aircraft industry was affected through the Munitions Ministry, which was established in November 1943 and the functions of which have already been described in an earlier section of this report.

Scheduled to be completed in 1944, it is supposed to have the following departments:

(i) Aero and Hydro Dynamics.

To have six wind tunnels of various sizes, the largest of which is to be eighteen meters in diameter, and a water tank 500 meters in length.

(ii) Engine Testing.

(iii) Structural Test.

(iv) Testing of Materials.

(v) Testing of Instruments.

(vi) Flight Testing.

(vii) General Affairs.

Which includes physiology and a library section for the handling of air patents.

When completed, the Institute was to compare favorably with the similar foreign establishments.

(a) Institutions Operating in 1941.

(i) The Aeronautical Research Institute. Located at Komaba, a suburb in the western part of Tokyo, one mile west of the Shibuya station on the Yamanote line. It has confined its work primarily to pure scientific research and secondarily to the practical application of its discoveries to actual airplane design. There are twelve sections devoted to physics, Chemistry, metallurgy, materials, wind tunnel work, engines, airframes, instruments, physiology, construction, diesel engines and propellers. Equipment, while considered modern in 1939, has long been outstripped by

that used abroad. Some of the Institute's important work has been in the field of diesel engines, the designs of which were turned over to Mitsubishi for building and into the design for the long distance "Kamikaze" which flew from Tokyo to London in 1937.

(ii) The Army Air Technical Experimental Laboratory. Located at Tachikawa, it was formerly under the technical section of the Office of the Chief of the Air Corps but in 1935 was made directly responsible to the Chief of the Air Corps. Its primary function appears to be the testing of airplanes and engines of new design, but it also produced a few reconnaissance planes and some engines.

(iii) The Naval Experimental Laboratory. Located at Yokosuka, the plant is a fairly complete unit for research in materials, aero-dynamics and associated subjects. The policy here, as at the Army laboratory at Tachikawa, is to carry on activities of a practical nature, leaving to the Tokyo University Aeronautical Research Institute the fundamental and theoretical work. In addition there are the 11th and 21st Air Arsenals at Hiro and Sasebo, respectively.

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(a) Aviation Ordnance Bureau. (Koku Heiki-kyoku) The

revealed in the history of the Association and an analysis of its personnel.

The new Association supplanted the Army and Navy Industrial Associations. In the former, which in 1942 included all firms manufacturing aircraft, engines, and components for the Army (209 companies were registered), the President of Mitsubishi Jukogyo was elected President. A similar pattern is evident in the new Association. Shortly after its formation, early in 1944, GOKO Kiyeshi, the Managing Director of Mitsubishi Jukogyo, was appointed Vice-President of the Association. Other officials were Lt. Gen. ENDO Saburo, Chief of the Aviation Ordnance Bureau, President; and Vice-Admiral Katagari, former Chief of Navy Airforce Headquarters (Kaigun Koku-hombu), Vice-President. (See Chart I, The Dual Administration of War Production in Japan.)

(a) Industrial Associations under its Jurisdiction.

The duties of the Association, as officially described, were to cooperate with the Aviation Ordnance Bureau and act as a liaison agent to coordinate the production and supply of raw materials, transportation facilities, and electric power; and to sponsor research and training programs for the improvement of techniques. To this end, 14 industrial associations were to be placed under its jurisdiction--machine bodies, motors, electricity, munitions, accounts, lighting instruments, iron, steel, alloy-mixing machinery, charcoal, fuel, and three chemical associations.

(b) Offices. The offices of the Association were located in Tokyo, Nagoya, Osaka, Hakata, Sapporo, Niigata, Hiroshima, and Matsuyama; that is, one city for each of the administrative blocs into which Japan was divided in July 1943.

C. Ownership and Corporate Structure

The seven principal companies which assembled Japanese combat aircraft and, (in the case of the first four), manufactured engines, in order of importance, are the following:¹

Nakajima Hikoki (Nakajima Airplane)

Mitsubishi Jukogyo (Mitsubishi Heavy Industries)

Kawasaki Kokuki Kogyo (Kawasaki Aircraft Industry)

Aichi Tokei Denki (Aichi Clock & Electric)

Tachikawa Kokuki (Tachikawa Aircraft)

Kawanishi Kokuki (Kawanishi Aircraft)

Watanabe Tekkosho (Watanabe Ironworks)

1. Concentration of Major Aircraft Companies. The first four of the above companies accounted for 80-85 percent of total airframe manufacture and assembly while the three most important of these accounted for almost 90 percent of all engines used in Japanese combat planes. (See Appendix IIIa for list of these companies, their plants, and capitalization.)

From the point of view of outright production, Nakajima could be said to have been the largest of these companies, for it manufactured percent about 40/ of the total airframes for combat planes and accounted for nearly percent 40/ of the estimated requirements for combat engines.

On the same level with Nakajima was Mitsubishi, which manufactured the airframes for about one-fourth of Japan's output of combat planes; it was credited with about 40 percent of the total national output of combat plane engines. Its engine plant at Nagoya was the largest single second to in production engine plant in Japan. Mitsubishi's position as/ Nakajima/ was not considered

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1 As of first half of 1945.

fixed, since ~~Mitsubishi~~ had considerable facilities not yet in full operation in the spring of 1945 which could eventually handle a larger production of airframes and engines.

The next in order of output was Kawasaki, which assembled about 15 percent of the total Japanese output of combat planes. In the engine field it was credited with 11 percent of the total.

Finally, there was Aichi Tokei Denki, which assembled about 8 percent of Japan's combat planes and about 5 percent of combat engines.

The remaining airframe and engine manufacture for combat planes was carried on by Tachikawa, Kawanishi, Watanabe, Hitachi, Ishikawajima, and a number of other small companies. Various army and navy air arsenals should also be mentioned in this connection (see Appendix IIb) as well as the Manshu Hikoki Seizo (Manchuria Aircraft Mfg.) in Mukden and Showa Kokuki (Showa Airplane) at Heijo, Korea.

2. Component Producing Companies. As in the case of assembly and production, engine/ the production of certain critical aircraft components and accessories was also concentrated in a few companies (1944-45). (See Chart 3 and Appendix IIb.)

listed

(a) Airframe Parts. Besides the companies/in the immediately the following were preceding paragraphs, producing airframe parts for leading aircraft types: Kumagaya Koku Kogyo (Kumagaya Aircraft Industry), a company controlled by Nakajima; Nippon Kentetsu Kogyo (Japan Iron Construction Industry), a Mitsubishi subsidiary; Nippon Hikoki (Japan Aircraft), in which Sumitomo, Mitsui, and Mitsubishi are large stockholders; Sumitomo Kinzoku Kogyo (Sumitomo Metals); Fuji Hikoki (Fuji Aircraft), a Mori enterprise; and

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Senju Aircraft.

(b) Landing Gear: Oleo Shock Struts. Three companies which produced the bulk of oleo shock struts were: Kayaba Seisakusho (Kayaba Works), which is related to both Mitsui and Mitsubishi, (the former probably retaining control); Okamoto Kogyo (Okamoto Industry), affiliated with both Mitsubishi and Sumitomo; and Mitsubishi (Nagoya Kokuki plant).

(c) Starters. It appears that starter production was almost wholly concentrated in one company, Tokyo Keiki Seisakusho (Tokyo Instrument Mfg.), in which Mitsubishi subsidiaries hold about 10 percent of the stock. This ^{company} is also related to Mitsubishi through the latter's Nippon Kogaku Kogyo (Japan Optical Industry).

(d) Magnetos. Three-quarters of the production of magnetos was produced by one company, Kokusan Denki (Kokusan Electric), which is dominated by Mitsubishi and Sumitomo; 20 percent was accounted for by Yokogawa Denki (Yokogawa Electric); and an additional 5 percent by Mitsubishi Denki.

(e) Propellers. The two organizations which produced the bulk of propellers are Sumitomo Kinzoku Kogyo and Nippon Gakki Seizo. Sumitomo Kinzoku Kogyo is one of the two principal stockholders in Nippon Gakki Seizo. Nippon Kokusai (Japan International Aircraft), a Mitsui subsidiary, is the only other producer.

(f) Anti-friction Bearings. In order of importance, the two companies producing nearly 75 ^{percent} of all bearings used in Japanese planes are the Toyo Bearing Seizo (Oriental Bearing), in which Mitsubishi and Sumitomo both have capital holdings, and Nippon Seiko (Japan Steel Manufacturing), a Mitsui-controlled corporation.

(g) Aircraft Instruments. The production of indicating instruments was concentrated principally in eight companies: Nippon Kogaku Kogyo (Japan Optical Industry), and Tokyo Kiki Seisakusho (Tokyo Machine Tool Works) ^{both} directly controlled by Mitsubishi Jukogyo; Hitachi Seisakusho (Hitachi Engineering Works), controlled by the Mangyo (Manchuria Industrial Development Corporation), "whose industrial ramifications bring it close to Mitsubishi, Mitsui and Sumitomo"¹; Tokyo Kiki Kogyo (Tokyo Machine Tool Industry); Tokyo Koku Keiki (Tokyo Aviation Instruments), which is related to Mitsubishi; Nippon Denki (Japan Electric), in which both Mitsubishi and Sumitomo capital is present; Fuji Koku Keiki (Fuji Aircraft Instrument), which is dominated by Mitsubishi; and finally Tanaka Keiki Seisakusho (Kanaka Instrument Works).

(h) Radio and Radar. Two companies, Nippon Denki and Tokyo Shibaura Denki (Tokyo Shibaura Electric), were held to account for over 70/ ^{percen} of all electronic tubes manufactured in Japan. The principal stockholder in Nippon Denki is Sumitomo Honsha. International General Electric, Mitsui is the largest stockholder in Tokyo Shibaura Denki, Mitsui, the second-largest.

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3. The Role of the Great Family Combines

As may be observed from the foregoing paragraphs and Chart 3, there are three large industrial aggregations--Mitsui, Mitsubishi, and Sumitomo--which, through a variety of control devices, encompass the key producing companies in the aircraft field. Of these Mitsubishi is by far the most prominent.

a. Mitsubishi.

The aircraft branch of the family enterprise, Mitsubishi Sha, is the Mitsubishi Jukogyo, which was formally incorporated in June 1934 through the merger of Mitsubishi Zosen Kaisha (Mitsubishi Shipbuilding and Engineering), established in 1880, with Mitsubishi Kokuki (Mitsubishi Aircraft), which was established in 1920. The latter in turn had absorbed the Mitsubishi Hatsudoki (Mitsubishi Internal Combustion Engine Company) which had been organized in 1914.

In 1937 the authorized capital of Mitsubishi Jukogyo was ¥120,000,000, half of which was assigned to the aircraft section. The company doubled its capitalization in 1941 and again in 1942.

Under the National General Mobilization Law of 1938, increases in capital were not permitted without government consent. Mitsubishi owed its ability to double its capital repeatedly to the fact that from its origin it had maintained the closest relations with the military and had become a specialist in military requirements. A comparison of Mitsubishi's capital with that of other companies indicates

that the Government evidently approved fully the company's dominant position in the industry.

A feature of the expansion of the Japanese aircraft industry was the way in which Mitsubishi collaborated with other companies. The record shows that experts from "rival" Japanese companies travelled together with Mitsubishi personnel and inspected American plants and production methods, and that those missions used Mitsubishi trading facilities in America to purchase machines and tools. The collaboration did not stop there but continued in the production and development fields in Japan.

Once more, against the background of the National General Mobilization Law of 1938 which gave the Government control of human and material resources, Mitsubishi's industrial prominence increased. There was a basic arrangement between Mitsubishi, the leader of heavy industry among the Zaibatsu, and the Government for empire-wide rationalization, expansion, and dispersal of war industries.

The Japanese Government acknowledged Mitsubishi's leadership of the aircraft industry in 1942, when the President of Mitsubishi Jukogyo was elected President of the Army Aviation Industrial Association.

With the creation of the new Aviation Industrial Association in January 1944, GOKO Kiyoshi, Managing Director of Mitsubishi Jukogyo, became Vice-President. This new organization took the place of both the Army and Navy Industrial Associations and included all

companies producing aircraft and components. Its functions have already been analyzed in the section on administration of the industry.

Taking advantage of its standing with the Government, Mitsubishi consolidated its domination of the aircraft field by obtaining interlocking relationships with six of the major aircraft companies.

The six principal companies thus affiliated are: Nakajima Hikoki, Kawasaki Kokuki, Aichi Tokai Denki, Kawanishi Kokuki, Okamoto Kogyo, and Manshu Koku Seizo (Manchuria Aircraft). The last-mentioned is a direct subsidiary of Mitsubishi established in 1932 with a capital of ¥ 130,000,000, with one plant in Mukden, Manchuria. These relationships took the following forms.

(i) Production Agreements.

of production agreements

Examples can be found in the close production interrelationships

which existed between the major aircraft producers. Thus, the Type 1 1050 h. p. engine developed by Mitsubishi was used in the twin-engined "Nick" which was manufactured and assembled by Kawasaki; the Mitsubishi Kinsei "Four" Series engine was also used by Watanabe in its "Jake" and by Aichi in its "Val Mark I"; the Mitsubishi Kinsei "Five" Series was used in Nakajima "Nell" and "Mark II". There are numerous other instances of the same type, in which Mitsubishi manufactured a plane which used an engine developed by one of the other major producers. This was also true of components.

(ii) Supply.

Supply includes Mitsubishi designs, licenses, processed raw materials, fabricated parts, special machinery, and other items. Chart 4 illustrates how Mitsubishi was in a position to supply other producers with raw materials, components and intermediate parts of all kinds--from aluminum, magnesium, special steels, alloys, and copper to indicating instruments and bullet retardants--through her affiliation with some 40 enterprises producing all manner of aircraft products in perhaps a couple of hundred plants.

Mitsubishi's prominence was also originally enhanced by the fact that it held by far the largest number of foreign licenses in the aircraft field for the production of aircraft engines and airframes. The more important of these licenses were/or:

- Junkers engines and planes
- Curtiss fighters
- Hispano-Suiza engines
- Blackburn reconnaissance planes
- Armstrong-Siddeley engines
- Henriot training planes
- Claudel carburetors
- Handley-Page slotted wings
- Farman reduction gears
- Pratt & Whitney engines
- Reed-Levasseur metal propellers
- Herzmark and Letembe engine starters

(iii) Financial and political pressure.

Financial and political pressures sprang from Mitsubishi's leadership in various cartels and associations which dominated key industries and controlled credit machinery. Instances to illustrate this may be multiplied, but one example is the key position of a leading Mitsubishi industrialist GOKO Kiyoshi, the Managing Director of Mitsubishi Jukogyo, as President of the Aviation Industrial Association. (See above pages 119-121 inclusive).

b. Mitsui.

Mitsui's principal interests in the aircraft field lie in the military airframe and aero-engine field, in the production of transport planes, in indicating instruments, and finally in radio and radar:

(i) Nakajima Hikoki K. K.

Hokoki K. K.,
Nakajima, which represents the single largest production unit in the Japanese aircraft manufacturing industry (assembled about 40 percent of combat planes and manufactured about 40 percent of combat engines -- early 1945), was established in 1917 with the help of Mitsui-backed Toyoda Shiki Orihata (Toyoda Textile Machinery). It was reorganized in 1922 and 1931. By 1937 its capital was ¥20,000,000. After the Government placed the aircraft industry on a war footing, Nakajima's capital was once more increased. By 1939 it had a capitalization of ¥50,000,000, making it second in importance in regard to capital to Mitsubishi Jukogyo's aircraft section.

1. Owing to the secrecy connected with Nakajima's development, it has been difficult to state the precise nature of Mitsui control of Nakajima. All available sources, however, English and Japanese, trade and published, attest to that relationship. (See Appendix IIh.)

Nakajima's most important industrial investment and association is its partnership with Mitsui and Mitsubishi in Toyowa Jukogyo (Toyowa Heavy Industry), which was developed from Showa Jukogyo (Showa Heavy Industry). Showa was established in 1934 with ¥3,000,000 by the Mitsui-backed Toyoda Shiki Orihata interests (a ¥15,000,000 company which also made aircraft parts, arms, and machine tools) and which earlier had financed the rise of Nakajima Hikoki). The main stockholders in Showa were Mitsui-Toyoda, Nakajima Hikoki, and Mitsubishi Jukogyo. It specialized in the production of aircraft parts, arms, and machine tools in a plant at Shirkowa, outside of Nagoya. Showa Jukogyo was said to be a contributor to Nakajima production. By 1939 its capital had been increased to ¥8,000,000. . . In September 1940, owing to the increasing importance of the company in the war production program, Showa was permitted to merge formally with Toyoda Shiki Orihata to form Toyowa Jukogyo with a capital of ¥15,000,000. . .

Nakajima's importance in the industry was based on:

(a) Multiplicity of Plants. Nakajima embraced a series of modern, aircraft plants and contributory companies and had the necessary military and political affiliations to increase capitalization for plant expansions. The seven principal Nakajima plants listed in Appendix IIIa represent one of the two largest aggregations in the Japanese aircraft industry. These plants are also serviced by numerous small subsidiaries, at Tanashi, Izazaki, Miyabashi, Kumagaya, and other places.

(b). Association with Mitsubishi and Mitsui. Nakajima is affiliated with the two most influential members of the Zaibatsu in the rapidly expanded Toyowa Jukogyo, referred to above, and before the war made its purchases of parts and machinery in the United States through Mitsubishi.

(c) Technical Collaboration with Mitsubishi. In 1940, NAKAJIMA Yutaka, and KITO Shuzo of the Nagoya plant of Mitsubishi's aircraft section, together with SEKINE Ryuichiro, Chief Engineer of the Tokyo plant of the Nakajima Hikoki, were honored by the Government for designing and manufacturing a new type of military aircraft engine. There are many other evidences of technical collaboration between Nakajima and Mitsubishi which might be cited. Nakajima and Mitsubishi both produce among others the type "O" Fighter "Zeke", and in general their production interrelationships are many and complex. In the past Nakajima has also been known to manufacture the Mitsubishi T-96, T-97 (Army), T-97 (Navy), etc. Again, Nakajima is licensed in common with Mitsubishi for the Pratt & Whitney and Hispano-Suizo engines.¹

(d) Close Association with the Government and Long Experience with Army and Navy Production Requirements. The President of Nakajima Hikoki, NAKAJIMA Chikuhei, was graduate of the Naval Engineering School,

1. Nakajima, is also licensed to construct Vought, Douglas, Fokker, Nieuport-Delage, Broguet, Closter and Airspeed Envoy planes; Wright, Lorraine-Dietrich, Bristol Jupiter, and Lorraine engines; and Hamilton Standard (American) propellers.

served the Army as a lieutenant in the Engineers, and was sent to Europe and America to study aircraft. In 1917, he resigned from the Army service and founded the Nakajima Hikoki. Subsequently he was parliamentary Vice-Minister of Commerce and Industry. (Jikan Sho Kogyo), three times member of the House of Representatives. (Shugi-in), and Railroad Minister (Tetsudo Daijin) of the Konoye Cabinet, 1937-39. He was also a director of the Seijukai Party and, most recently, a counselor of IRAPS (Yokusan Seiji-Kai). Throughout this entire period his firm maintained close relations with the services and supplied them with the principal types of military aircraft which they required. It therefore enjoyed special financial support of the Army and Navy, assignment of enterprises for conversion, and priorities for the supply of raw material.

(ii) Showa Hikoki Kogyo (Showa Aircraft Industry).

Showa Hikoki Kogyo, capitalized at ¥ 30,000,000, was established in 1937. Among the foremost industrialists of Japan who sponsored Showa, the Mitsui interests dominated the financial arrangements and acquired 20,000 shares of the stock of the new company. MAKITA Tamaki, formerly President of Mitsui Kozan (Mitsui Mining), was made Director of Showa. It was arranged that Showa was to use materials supplied by Sumitomo Kinzoku (Sumitomo Metals) and Furukawa Denki (Furukawa Electric).

In 1942 a report indicated that the Mitsui Kozan (Mitsui Mining) on behalf of Mitsui interest, had purchased the Heijo aircraft works in Korea from Showa Hikoki Kogyo with the intention of developing large-scale manufacturing. This purchase gave Mitsui its first outright ownership of an aircraft plant.

A very important contribution to Showa's development as an aircraft producer was made by American aircraft companies and specialized machines and tools producers, notably the Douglas Aircraft Company. It was from Douglas that Showa obtained the manufacturing rights to the DC-3 and machines for milling certain sections. Douglas experts went to Japan and helped Showa get into production or fabrication of Douglas types. One Douglas employee was consultant engineer with Showa from August 1938 to March 1940. When the American experts left Showa early in 1940, their places were reported to have been taken by German and other Axis experts.

Of Showa's two original plants, scheduled for completion by the spring of 1939, one is located 40 miles east of Tokyo (Tachikawa) and the other in Heijo, Korea. There have been numerous reports, both before and after the establishment of Showa, which describe the potentialities and accomplishments of the new company in exaggerated terms. Two new factories (probably manufacturing parts) were established at Kamato and Shinagawa in Tokyo prefecture. There is much evidence to indicate, however, that Showa was greatly

retarded in getting into production of combat planes and by the end of the war had not succeeded in making any contribution in this field worthy of mention. Accordingly, it may be concluded that Showa Hikoki's main contribution was in the form of a transport plane based on the Douglas DC-3 license.

Subsequent reports in June 1945, stressed Mitsui's great expansion plans in connection with Showa. These were clearly too late to affect the total production picture. But the Tachikawa plant was rated (January 1945) with capacity for at least 60 transport planes a month. An unstated production of fighter planes for the Navy was also attributed to Showa.

(iii) Ishikawajima Koku Kogyo (Ishikawajima Aviation Industry)
and Tachikawa Kokuki (Tachikawa Aircraft).

Mitsui capital dominates Ishikawajima Koku's parent company, Tokyo Ishikawajima Zosensho (Tokyo Ishikawajima Shipbuilding) which was established in 1889.¹ In 1934 the capitalization of the shipbuilding or parent company was only ¥2,000,000. By 1936 the company's production of aero-engines showed such promise that the engine section was capitalized at ¥16,000,000 and two of its plants were expanded. The Yokohama plant now produces some complete engines as well as

1. A 1942 account (Toyo Keizai, 24 October 1942) indicated that Mitsui, which was second-largest shareholder with 45,000 shares, was planning to buy up further shares until she had control. At that time, Oya Yoneta was largest shareholder with 47,000 shares.

important engine components for other manufacturers. Besides this, Ishikawajima Zosensho had become dominant in an aircraft company, Tachikawa Kokuki, which is generally referred to as an Ishikawajima subsidiary. Sumitomo and Okura also held substantial investments in this organization.

Tachikawa is several times larger and vastly more important as a producer than Ishikawajima. As may be observed from Appendix IIa, it assembles about 8 percent of total combat planes produced in Japan.

(iv) Hitachi Kokuki (Hitachi Aircraft).

According to a reputable Japanese source, Mitsui assumed control "of the home companies of the Manchuria Industrial Development Corporation" some time in 1942. If true, this would give Mitsui control of additional companies operating in the aircraft field, principally, Hitachi Seisakusho, which is the parent concern of Hitachi Kokuki (an important producer of engines -- principally trainer -- with some airframe production), and Nissan Jidosha, which is credited with production of important aircraft components, particularly for engines.

(v) Other Companies.

Besides a number of affiliations which Mitsui has in the production of aircraft components, as may be observed above and from Chart 3, its industrial array includes such leading companies as Tokyo Shibaura Denki (Tokyo Shibaura Electric), which has been credited with as much as 60 percent of the total electronic tube production (radio and radar), Nippon Seikosho (Japan Steel Works), and Denki Kagaku Kogyo

(Electro-Chemical Industry). These also have important subsidiaries which contributed directly to the aircraft industry.

(vi) Mitsui Chief as Minister of Munitions.

From the foregoing analysis of the administration of the aircraft industry, the strategic position of the Munitions Ministry and the Aviation Industrial Association is apparent. Mitsubishi, having secured a dominant position in the latter organ, Mitsui, in keeping with its own continued close association with war production and military requirements and its powerful political position, had one of its foremost industrialists FUJIWARA, ¹Ginjirō as Minister of Munitions (Gunjo-Daijin) in the Koiso Cabinet (summer of 1944). The position of Munitions Minister was created by Tojo for himself as a means of securing supreme power over the Japanese economy. Fujiwara is the chairman of Mitsui's Oji Seishi (Oji Paper Manufacturing) and directs many other enterprises of the same organization. Fujiwara was also Minister of Commerce and Industry in the Yonai Cabinet, January to July 1940, and a member of the Cabinet Advisory Council in Tojo's Cabinet (appointed March 1943). In November 1943 he was appointed a Minister without Portfolio by Tojo. He has been a member of the House of Peers (Kizoku-in) since 1929.

1. Replaced by YOSHIDA, Shigersu, 19 December 1944.

c. Sumitomo.

Until the war in the Pacific, Sumitomo had no participation of importance in the major aircraft fabrication plants. Its most important industrial investment, is in Sumitomo Kinzoku Kogyo, which dominates the propeller and propeller governor field as well as being a heavy investor in a number of companies producing light metals, alloys, etc. It is also, a large stockholder in Kokusan Denki (Kokusan Electric), the largest magneto producer in Japan; it has capital investment in Toyo Bearing Seizo, the largest bearing plant in Japan; it is likewise affiliated with several aircraft instrument companies such as Hitachi Seisakusho (Hitachi Engineering) and Nippon Denki. The latter, an important instrument producer, was credited with over 10 percent of all electronic tubes (radio and radar) and was the most important maker of radar tubes, including cathode tubes, manufactured in Japan.

(i) Sumitomo Kinzoku Kogyo

Sumitomo Kinzoku Kogyo, of which Sumitomo Honsha is the principal stockholder, has a capital of ¥ 200,000 (second only to Mitsubishi Jukogyo), having doubled its capital since 1939 in order to expand its plants and build new ones. This represents a jump from a capital of ¥- 35,000,000 in 1935 to ¥75,000,000 in 1938 and ¥ 100,000,000 in 1939. In the aircraft field it works closely with Mitsubishi, producing, for example, Hamilton propellers (American) which Mitsubishi

uses. Like Mitsubishi Jukogyo, Sumitomo Kinzoku did not devote all of its huge capital to aircraft / production. Yet, the already wide Sumitomo interests were further extended under government encouragement and pressure into the heavy industry field so that it became one of the three major participants in aircraft production.

Sumitomo Kinzoku clearly dominates the manufacture of propellers and propeller governors, and is perhaps the most important producer of rough forgings for crankshafts, and aluminum and duralumin sheeting for aircraft in Japan. It is the principal stockholder in Osaka Kinzoku Kogyo, the largest producer of propeller governors, and controls directly Sumitomo Kinzoku Kogyo. These are two of four companies which have been referred to as the sole producers of this item. Sumitomo Kinzoku Kogyo and Nippon Gakki Seizo (the former holds one-third of the stock of the latter) are also the two dominant companies (with a total of four plants) which specialize in the manufacture of propellers. As concerns metals, two of Sumitomo Kinzoku's plants, one at Osaka and one at Kuwana in Mie-ken, together account for an estimated (1941) 50^{percent} of the aluminum rolling mill capacity of Japan proper. In addition, Sumitomo Honsha owns outright such companies as Sumitomo Kogyo (Sumitomo Mining), Sumitomo Aruminium (Sumitomo Aluminum), Sumitomo Arumi Seiren (Sumitomo Aluminum Manufacturing and Refining), and Hanshu Sumitomo Kinzoku (Manchuria Sumitomo Metals).

The position of Sumitomo in the heavy industry and aircraft field is further strengthened by ownership of such companies as Sumitomo Denki Kogyo (Sumitomo Electric Industry), Fujikura Densen (Fujikura and Electric Wire), Sumitomo Kikai Seisaku (Sumitomo Machine Manufacturing); such large capital holdings in other companies/as Sumitomo Kagaku (Sumitomo Chemical).

(ii) Kawasaki Jukogyo (Kawasaki Heavy Industry)

Early in 1943, it was recorded that Sumitomo ^{had} acquired a controlling interest in Kawasaki Jukogyo, a leading engineering concern, one of the largest merchant shipbuilders in Japan and third in production of combat aircraft (15 percent of airframes and 11 percent of aero-engines - February 1945). Together with her other products, as propellers light metal sheeting, etc., this new interest places Sumitomo well up in front in the military aircraft field.

(iii) Watanabe Tekkosho (Watanabe Iron and Steel Works) .

Watanabe Tekkosho, a machine-building company which entered the aircraft production field in 1930, was backed heavily by Sumitomo after 1941. Thereafter it expanded rapidly and by 1944 it was considered a medium aircraft production company with a capital of ¥ 30,000,000. In January 1945 it was assigned a production of 40 reconnaissance planes monthly.

In partnership with Watanabe Tekkosho, Sumitomo also shared control and aided the expansion of Tachirai Seisakusho, a company reported to be producing twin float torpedo bombers and reconnaissance

planes.

In all, the intimacy of the relationship of the two companies, Sumitomo and Watanabe, strongly suggests control of the latter by the former and vastly stronger organization.

(iv) Nippon Hikoki (Nippon Aircraft).

Nippon Hikoki is a comparatively new company. Although not very large, it is one of the most important airframe parts manufacturers in Japan, with plants in Yokohama and Yamagata. The Sumitomo concern, as the largest stockholder, plays an important part in the affairs of this company.

(v) Light Metals Control Society (Keikinzoku Toseikai).

Sumitomo, ^{like} Mitsubishi has cemented its control of its particular field by domination of the semi-official cartel in the field; the Light Metals Control Society. Thus, Atsushi Oya, Director of Sumitomo Honsha, Managing Director of Sumitomo Kagaku and Director of Sumitomo Kogyo, is also President of the above Society. organ, which was established in 1942, has functions in its field analogous to those of the Aviation Industrial Association. Briefly, it supervises the production and sale of aluminum, alumina, magnesium, creolite, aluminum fluoride, and also the sale of aluminum scrap, magnesium scrap, bauxite, and alumina rock for all Japan, including Korea and Formosa.

APPENDIX IIa

PRINCIPAL AIRFRAME AND AEROENGINE PLANTS

PRINCIPAL AIRFRAME PLANTS

Company	Capitalization (¥ 1,000) (1941 or later)	Location	% Production (as of 7 February 1945)	Personnel (1941)
Nakajima Hikoki KK	50,000	(1) Ota, Gumma- ken	14)	Pres.: NAKAJIMA Kiyochi; Vice- Pres. NAKAJIMA Kimihei; Direc- tors SASAKI Kakuji, NAKAJIMA Yushi, SAKUMA Ichiro, KURIHARA Jinkichi, KINURA Gonshiro, NEGISHI Yoshio; Inspectors NUMAZU Takeshi, NAKAJIMA Honkichi, HAMADA Takeo.
		(2) Koizumi, Gumma-ken	22)	
		(3) Handa, Aichi- ken	3)	
		(4) Utsunomiya, Tochigi-ken	3)	
Mitsubishi Jukogyo KK	480,000	(1) Nagoya, Aichi- ken	18	Chairman: SHIBA Koshiro; Manag- ing Directors: GOKO Kiyoshi, MOTARI Shintaro; Directors: TAMAI Kiosuke, IWASAKI Koyata, IWASAKI Hikoyata, MIYOSHI Shigemichi, OTANI Noboru, ITO Tatsuz IJIUIN Kiyohiko, SASAHOTO Kikutaro, MATSUI Koshiro, USHIMARU Fukusaku, WATANABE Naota; Inspectors: KAWAI Genhachi, TATO Takeo, YAMA- MURO Sobun, MUTO Matsuji.
		(2) Mishima Plants Tsurushima, Okayama-ken		
		(3) Kumamoto, Kuma- moto-ken		

Company	Capitalization (¥ 1,000) (1941 or later)	Location	% production (as of 7 February 1945)	Personnel
Kawasaki Kokuki Kogyo KK (Kawasaki Aircraft Industry)	50,000	(1) Kagamiga- hara, Nagoya ken (2) Akashi, Hyogo- ken))) 15))	Pres., ITANI Masa- suke (cf Mitsub- ishi); Managing Directors: KAWASA- KI Yoshikuma (cf Mitsubishi), YOSHI- OKA Yasusada; Di- rectors: IWAKURA Michitomo and MIWA Kojuro.
Aichi Tokei Denki KK (Aichi Clock and Electric Company)	30,000	(1) Chitose Funa- gata plant, Nagoya Aichi- ken (2) Eitoku, Aichi- ken))) 8))	See Aero-engines
Watanabe Tekkosho KK (Watanabe Iron Works)	30,000	(1) Fukuoka Fukuoka-ken (2) Zassinakuma)))	Pres., WATANABE Fukuo; Managing Directors: HAYASHI Ryokichi, NANRI Toshihide, TAGUCHI Ukichi; Directors: WATANABE Tokichi, FUJI Kazuo, SASAKI Shoji; Inspectors: WATANABE Yoshiina, MESHIMA Fujita, NAKAGAWAJI Sadaji
Kawanishi Kokuki KK (Kawanishi Aircraft)	30,000	(1) Naruo, Kobe Area, Hyogo- ken (2) Fukae, Hyogo-ken))) 5)	Pres. and Engi- neering Director, KAWANISHI Ryuzo; Directors: KAWANI- SHI Seiji, TAKAO Shigezo, SHIMIZU Sakuro, OZU Kei- chiro; IWATA Shirichi; Inspector, NODO Katsumoto.
Tachikawa Kokuki KK (Tachikawa Aircraft Company)		(1) Tachikawa (Tokyo-to))) 8	Pres., KADENO Jukuro Managing Director, YOKOYAMA Torasaburo; Directors: SHIBUYA Kiyoshi, ASAKAWA Masune, GOTO Yukizo HARA Kunizo; Cons. Div.: SHIBUSAWA Takenosuke

APPENDIX II a continued

Note: Mention should be made of Hitachi Kokuki, capitalization, 30,000,000, which is the newly formed aircraft subsidiary of Hitachi Seisakusho, which is a leading manufacturer of machine tools, autos, electrical machine appliances, aircraft parts, etc. It is believed that Hitachi objectives are aircraft engines and fuselages, parts, accessories, and cast metals. It is conceivable however that Hitachi is producing aircraft on a through process basis. Hitachi Kokuki has six plants producing directly for it: Tokyo (4), Totsuka, Kawasaki.

APPENDIX IIa continued

PRINCIPAL AERO-ENGINE PLANTS

Company	Capitalization (¥ 1,000)	Location	% Production	Personnel
Nakajima Hikoki KK (Nakajima Aircraft)	50,000	Tokyo-to (1) Musashina- Tama (2) Okigubo, (3) Omiya,	38	Pres: NAKAJIMA Kiyochi, etc., see list under Airframe Plants
Mitsubishi Jukogyo KK (Mitsubishi Heavy Indus- try)	480,000	(1) Nagoya Hatsudoki (2) Shizuoka, Shizuoka- ken (3) Kyoto, Kyoto-ken	} 39	See personnel list under Air- frame Plants
Kawasaki Kokuki Kogyo KK (Kawasaki Aircraft Industry)	50,000	Akashi Hyogo-ken	11	See personnel list under Air- frame Plants
Aichi Tokei Denki KK (Aichi Clock and Electric Company)	30,000	Chitose Funa- gata plant, Nagoya	5	Pres.; AOKI Kamataro; Manag- ing Directors: MASUKI Toshiza- buro; KOKURI Nobuichi, KANDA Junichi; Direct- ors: OKADANI Sosuke, SUZUKI Soichiro, ITO Jiriaemon, RESTRICTED

APPENDIX IIa continued

FUKUDA Tokutaro,
HIRANO Tsuneki;
Inspectors:
YONEZAWA Kozo,
WATANABE Yoshiro,
KONO Kinnosuke,
SOMA Hanji.

Note: Mention should be made here of Hitachi Kokuki KK (see under Airframe Plants); as an important and producer of aero-engines for trainer aircraft at Tachikawa in Tokyo prefecture; the Eleventh Air Arsenal at Hiro, Hiroshima prefecture; the Omura Air Arsenal, Omura, Nagasaki prefecture; the Tachikawa Army Air Arsenal at Tachikawa in Tokyo prefecture; and of the two aircraft subsidiaries of Tokyo Ishikawajima Zosenjo KK, namely, Tachikawa Hikoki KK and the Ishikawajima Koku Kogyo KK, with plants in Yokohama, and Tokyo).

RESTRICTED

APPENDIX IIb

PRINCIPAL MANUFACTURERS OF CRITICAL AIRCRAFT COMPONENTS

Company	Capitalization (¥ 1,000)	Location	Products	Personnel or % of Production
<u>Airframe Parts</u>				
Kumagaya Koku Kogyo KK	unknown	Kumagaya, Gumma-ken	-?-	Managing Directors AMADA Ryoze, KOBAY SHI Junzo, SUGI- YAMA Takeo; Direc- tors: TERADA Yasoji, ARIWA Shinnosuke; In- spectors: MATSU- MOTO Shinpei, SUGIYAMA Akira.
Nippon Kentetsu Kogyo KK (Japan Steel Construction)	2,000	Funabashi	Mitsubishi airframe components	Managing Director; NAKI Atira; Di- rectors: TAKAZUMA Toshihide, HAYA- KAWA Tanezo, HAZ- AMA Shiro, MIYA- KI Komakichi, HATTORI Ichiro; Inspectors: UCHIDA Koichi; UENO Fukusaburo.
Sumitomo Kinzoku Kogyo (Sumitomo Metals)		Shimizu	Plywood and alumi- num air- craft parts	

RESTRICTED

RESTRICTED

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APPENDIX IIb continued

Company Capitalization
(¥ 1,000)

Location

Products
or % of
Production
Various
airframe
parts

Personnel

Kawanishi
Kokuki

Takaratzuka

Nakajima Hikoki

Ogima
Kunagaya

Nippon Hikoki KK 15,000
(Japan Air-
craft Co.)

Yokohama

Pres., HORI Teikichi
Directors: NISHIM
Keinosuke, HIGINO
Mototaro, KAGA
Takanori, MURATA
Yoshimaro, MATSUURA
Matsuni, HASEGARA
Heigoro, INAGAKI
Hbitaro, NAKAMURA
Kuzamon, GOTO
Keiichi.

Fuji Hikoki KK

Ofuna

Various parts

Senju a/c Parts
Plants

Tokyo

Various parts

Propellers

(Estimated 6 April 1945)

Sumitomo
Kinzoku KK
(Sumitomo
Metals) 400,000

Osaka
(2 plants)
Shizuoka

60-70%

Nippon Gakki
Seizo KK
(Japan Musi-
cal Instru-
ment Mfg.Co.) 17,500

Hamanatsu

20

Pres., KAWAKAMI
Kaichi; Managing
Director: HAYASHI
Keikichi; Directors
NAKAMURA Enichiro,
NAKAMURA Tokichi,
KATANAHARA Shiro,
NAKASHIMA Matazo,
SENDANI Torao;
Inspectors: KOTAKE
Rokunosuke, YAMABA
Yoshio

Hiratsuka,
Kanagawa

Less
than
20%

RESTRICTED

Japan Inter-
national
Aircraft

APPENDIX IIb continued

Company	Capitalization (¥ 1,000)	Location	% Production	Personnel
<u>Starters</u>				
Tokyo Keiki Seisakusho KK (Tokyo Gauge Manufacturing Company)	5,000	Tokyo (possibly several plants)	Credited with 100	Pres., WADA Yoshihi; Managing Director, ARIMA Junji, FUJII Tadashi; Directors: ABE Hasajiro, WADA Tetsuo, WADA Shigeo, MIZUNO Ichiro, KONDO Kadoji, ASADA Nikosuke.
<u>Magnetos</u>				
Kokusan Denki KK (Kokusan Electric Company)	5,400	Tokyo, Mishima plant	75 (approx)	Pres., IWAI Toyoji; Managing Director, ABE Ichiro; Direc- tors: TOKUGAWA Manoru, SATO Keisu- ke, KATO Masatoshi, SHIBUYA Toru, OKAMURA Matasaburo; In- spectors: YAMAMOTO Yosh, NOMURA Sei- zuke.
Yokogawa Denki KK (Yokogawa Electric)	3,000	Tokyo	20 (also manu- factured a variety of electrical equipment)	
Mitsubishi Denki KK (Mitsubishi Electric)	30,000	Nagoya	5 (approx)	Pres., KAWAI Gen- hachi; Managing Directors: MIYAZAKI Kōmakichi, HAZAMA Shiro; Directors, IWASAKI Koyata, IWASAKI Hikoyata, SHIBA Koshiro, FUNADA Kazuo, KAWA- TE Suteji, NASAKI Ryoichi, HONMA Kanaekichi. SEKI- ZAWA Fujatoyo; Inspectors: NAGA- HARA Nobuo, YAMA- MURA Sobun, MUTO Matsuji.

APPENDIX IIb continued

Company	Capitalization (¥ 1,000)	Location	% Production	Personnel
<u>Landing Gear</u> (Oleo struts)				
Mitsubishi Jukogyo KK	480,000	Nagoya Kokuki plant	Small pro- portion of total prod.	For personnel see list under Airframe Plants
Kayaba Seisakusho KK (Kayaba Engi- neering Co.)	5,000	Shiba-ku Tokyo	Largest producer of landing gear	
Okamoto Kogyo KK (Okamoto Indus- try)	13,000	Nagoya (2 plants) Gifu (2 plants)	Second largest producer	
<u>Anti-friction bearings</u>				
Toyo Bearing Seizo KK (Toyo Bearing Manufacturing Company)	25,000	Nagoya (2 plants) Muko-gun Hyogo-ken	These 2 firms, with 7 plants, are be- lieved to produce 75% of total	Pres.: TANBA Noboru; Managing Directors MIZUKI Zenshiro, NISHIZONO Jiro, MORI Tomikichi; Directors: TERADA Jinkichi, HASEGAWA Kanichi, SATO Ya- suichiro, KINOSHITA Shigeru; Inspectors TAROSABURO, KICHI- GORO, KISHIMOTO Gohe.
Nihon Seiko KK (Japan Pre- cision Indus- try)	50,000	Tokyo (4 plants)		Pres: TAKAHASHI Koreyoshi; Managin Directors: TAKO Hidezo, YASUMATSU Toshio; Directors YAMAGUCHI Takehiko KONDO Shizuro, MIYAJI Kenji, MIYA- HARA Isao, ENDO Jyuichi; Inspector MOCHIZUKI Otsu-hik YASUI Yuzo.

PRINCIPAL MANUFACTURERS OF CRITICAL AIRCRAFT COMPONENTS

Company	Capitalization (¥ 1,000)	Location	% Production (est. 13 Jan. 1945)
<u>Radio and Radar Tubes</u>			
Tokyo Shibaura Denki	174,000	Kanagawa-ken Kawasaki-shi	50
Horikawa plant		Horikawa-cho 72	
Yanagi plant		Yanagi-cho 1284	10
Komukai plant		Kawasaki-shi	?
Nippon Denki Tama plant	30,000	Kawasaki-shi Shimonumabe-cho Tanagawa Mukai 1753	10
Mita plant		Tokyo-shi Shiba-ku, Mita Shikoku-machi 2	?
Kawanishi Kikai Seisakusho	15,000	Kyogo-ken Kobe-shi Hayashida-ku, Wadayamadori, 1-chome 5	10
Miyata Seisakusho		Tokyo-shi Omori-ku, Omori-cho, 3-chome 55	4
Nippon Musen (formerly Nippon Musen Denshin Denwa)		Shinagawa-ku, Higashi Ozaki) Meguro-ku Senkoku 1327) Tokyo-fu Kita Tama-gun Mitaka-machi) Komae-mura)	8 (4 plants)
Riken Shinkukan Kogyo		Tokyo-shi Omori-ku, Omori-cho Chiba-ken Chosei-gun Mobara-machi Ichikawa-cho, Gyotoku-machi Isumi-gun, Odaki-machi	6 (4 plants)

APPENDIX IIc
JAPANESE ALUMINUM AND ALUMINA PLANTS; ALUMINUM ROLLING MILLS

A. ESTIMATED ANNUAL CAPACITY OF JAPANESE ALUMINUM AND ALUMINA
 PLANTS AS OF JANUARY 1945
 In Metric Tons

Company	Location	Aluminum Capacity	Percent of Total	Alumina Capacity	Percent of Total
Japan Light Metals Aluminum Plant	Kanbara (Shizuoka-ken)	40,000	17.24	---	---
Nippon Aluminum Co.	Takao, Formosa-)	20,000	8.62	B- 40,000	7.01
Japan Aluminum Co.	Karenko, Formosa	20,000	8.62	---	---
Manchuria Light Metals (Aluminum) Mfr.	Fushun, Manchuria	18,000	7.76	48,000	8.41
Japan Light Metals Co.	Niigata(Niigata-ken)	18,000	7.76	---	---
*Manchuria Light Metals Co.	Antung, Manchuria	18,000	7.76	24,000	4.20
*Oriental Light Met- als Co.	Yoshi, Korea (Shingi- shu or Gishu)	18,000	7.76	21,000	3.68
Showa Denko Aluminum, Omachi	Omachi (Nagano-ken)	12,000	5.17	B- 8,000	1.40
Chosen Nitrogen Fertilizer Co.	Konan, Korea	12,000	5.17	24,000	4.20
Sumitomo Aluminum Reduction Plant	Niihama (Ehime-ken)	10,000	4.31	---	---

* - The exact locations of these plants are not known

B - Bayer process plants

RESTRICTED

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APPENDIX IIb continued

PRINCIPAL MANUFACTURERS OF CRITICAL AIRCRAFT COMPONENTS

Company	Capitalization (¥ 1,000) 1940	Location
<u>Indicating instruments</u>		
Nippon Kogaku Kogyo	25,000	Kanagawa-ken Yokohama Kawasaki
Hitachi Seisakusho	358,000	Yokohama
Tokyo Kiki Kogyo	5,000	Kawasaki
Tokyo Koku Keiki	3,000	Kawasaki
Yokogawa Denki Seisakusho	3,000	Tokyo-to Tokyo
Tokyo Keiki Seisakusho	120 (1937)	Tokyo

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APPENDIX IIc continued

Company	Location	Aluminum Capacity	Percent of Total	Alumina Capacity	Percent of Total
Nichiman Aluminum Co.	Higashi Iwase (Toyama-ken)	8,000	3.45	20,000	3.50
Nippon Soda Co., Aluminum Plant	Takaoka (Toyama-ken)	8,000	3.45	B- 14,000	2.45
Kokusan Light Metals Co., Sasazu Plant	Sasazu (Toyama-ken)	6,000	2.59	---	---
*Ibigawa Electro-Chemical Co., Kido Plant	Ogaki (Gifu-ken)	6,000	2.59	---	---
Chosen Riken Metals Co.	Chinnampo, Korea	5,000	2.16	20,000	3.50
Nitto Chemical Co. Northeast Aluminum Plant (Nichiman Aluminum Co.)	Hachinohe (Aomori-ken) Koriyama (Fukushima-ken)	4,000 4,000	1.72 1.72	B- 10,000 ---	1.75 ---
Osaka Ceramic Industry Cement Co.	Osaka (Osaka-ken)	2,000	0.86	---	---
*Nasu Aluminum Co.	Tokyo (Tokyo-ken)	1,500	0.65	---	---
*Nichiman Aluminum Co.	Genzan, Korea	1,500	0.65	3,000	0.53
Japan Light Metals Alumina Plant	Shimizu (Shizuoka-ken)	---	---	B- 100,000	17.51
Onoda Cement Co.	Onoda (Yamaguchi-ken)	---	---	70,000	12.26

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APPENDIX IIc continued

Company	Location	Aluminum Capacity	Percent of Total	Alumina Capacity	Percent of Total
Asano Cement Co.	Itozaki (Hiroshima)	---	---	50,000	8.76
Toyo Aluminum Co.	Omuta (Fukuoka-ken)	---	---	36,000	6.30
Japan Aluminum Co.	Kurosaki (Fukuoka-ken)	---	---	24,000	4.20
Sumitomo Alumina Plant	Niihama (Ehime-ken)	---	---	20,000	3.50
Kukusan Light Metals	Kurosawajiri (Iwate-ken)	---	---	20,000	3.50
Showa Electro-Chemical Co.	Yokohama (Kanagawa-ken)	---	---	16,000	2.80
Asada Alumina Plants	Shikama (Hyogo-ken)	---	---	3,000	0.53
Totals		232,000	100.01	571,000	99.99
Percentage of total capacity of ten largest plants			80.17		76.53
Percentage of total capacity of fourteen largest plants			92.25		90.53
From auxite in Bayer Plants				232,000	40.6
From bauxite and other low grade aluminous raw materials				339,000	59.4

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APPENDIX IIc continued

B. PRINCIPAL JAPANESE ALUMINUM ROLLING MILLS, CAPACITY ESTIMATED, 1941

Company	Location	Capacity (000,000 lb.)
Kobe Seikosho KK	Yamaguchi-ken, Shimonoseki Fukuoka-ken, Moji	
Nippon Aruminium KK	Osaka-fu, Osaka	20
Osaka Zoheisho KK	Osaka-fu, Osaka	
Sumitomo Kinzoku KK	Osaka-fu, Osaka	35 ¹
Sumitomo Kinzoku KK	Mie-ken, Kuwana	25
Furukawa Denki Kogyo KK	Tochigi-ken, Nikko-machi	20
Furukawa Denki Kogyo KK	Hyogo-ken, Amagasaki-shi	

1. Output of several small plants included in this estimate.

APPENDIX IIId continued

PRINCIPAL JAPANESE MAGNESIUM PLANTS

Company	Location	Reduction Capacity (est. 1943)	% Total	Production (est. 1943)	% Total
Asahi Denka Kogyo	Tokyo	1,500	7.4	1,000	7.5
Nippon Magnesium	Tokyo	650	3.1	--	--
	Toyama-ken Sasazu	650	3.1		
Kanto Denki Kagaku Kogyo	Gumma-ken Shibukawa	500	2.4	350	2.6
Nippon Soda	Toyama-ken Higashi-Iwase	600	2.9	350	2.6
Riken Kinzoku (-Nichiman Magnesium -Ube Chisso)	Yamaguchi-ken Ube	5,000	24.5	5,000	37.9
Shinetsu Kagaku	Niigata-ken Kuroi, Naoetsu	500	2.4	500	3.8
Chosen Riken Kinzoku	Heian Nando Chinnampo	1,000	4.9	500	3.8
Nippon Magnesite Kagaku Kogyo	Kankyo Nando Joshin	350	1.2		
Nippon Magnesium Kinzoku	Konan	5,000	24.5	3,000	22.7
Manshu Keikinzoku	Fengtien Fushun	2,000	9.8	1,500	11.3
Manshu Magnesium Kogyo	Yingkow	2,000	9.8	1,000	7.5
Minami Nippon Engyo	Takao shu Takao	600	2.9		

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APPENDIX IIe

AIRCRAFT MANUFACTURING INDUSTRY LAW

(A Translation of the Full Text Taken from the Official Gazette, March 11, 1938)

Article 1. The aircraft manufacturing industry as mentioned in the present law signifies enterprises of manufacturing the aircraft as specified by ordinance or the fuselages, motors, or propellers of the said aircraft.

The manufacture of parts or accessories of aircraft conducted by persons who are engaged in the enterprises as mentioned in the foregoing paragraph or their manufacture of the materials to be used in their enterprises for manufacturing aircraft or their repair of aircraft shall be regarded as a part of their enterprises.

Article 2. Persons who desire to be engaged in the aircraft manufacturing industry shall obtain the permission of the Government.

Article 3. Those who may obtain the permission as mentioned in the foregoing article shall be limited to the joint stock companies (kabushiki kaisha) which were established in accordance with the provisions of the law and ordinance of the Empire and which have the majority of the shareholders, the majority of the directors, the greater part of the capital funds, and the greater part of the right to vote represented by the subjects of the Empire or the juridical persons which were established in accordance with the provisions of the law and ordinance of the Empire.

The juridical persons as mentioned in the foregoing paragraph shall not have the majority of the staff members, shareholders, or officials executing the business, or the greater part of the capital funds, or the greater part of the right to vote represented by the nationals of foreign countries or the juridical persons of foreign countries.

When persons who have obtained the permission as mentioned in the foregoing article have ceased to be under the provisions of the foregoing two paragraphs, the said permission shall become null and void.

Article 4. The companies which have obtained the permission as mentioned in Article 2 shall commence their enterprises within the periods specified by the Government.

The Government may permit the prolongation of the periods as mentioned in the foregoing paragraph only when it recognizes that there exist good reasons for such prolongation.

When the companies which have obtained the permission as mentioned in Article 2 have failed to commence their enterprises within the periods as

AIRCRAFT MANUFACTURING INDUSTRY LAW

mentioned in the foregoing two paragraphs, the permission as prescribed by Article 2 shall become null and void.

Article 5. The companies which are engaged in the aircraft manufacturing industry (to be referred to as aircraft manufacturing companies hereinafter) shall, in accordance with the provisions of ordinance, determine their plans of enterprises and report to same to the Government. When they desire to change the plans of enterprises, they shall also report the matter to the Government.

The Government may order changes in the plans of enterprises when it deems such measures as necessary.

Article 6. The Government may determine the specifications of the fuselages, motors, propellers, parts, or accessories of the aircraft or materials for manufacturing the aircraft, after referring the matter to the aircraft technical commission.

Aircraft manufacturing companies shall not manufacture or use anything which is subject to the specifications determined in accordance with the provisions of the foregoing paragraph and which does not conform to the specifications. However, an exception is made when the permission of the Government has been obtained (for the manufacture or use of such things).

The regulations concerning the aircraft technical commission shall be determined by Imperial ordinance.

Article 7. When aircraft manufacturing companies desire to transfer, discontinue, or suspend the whole or a part of their enterprises, they shall obtain the permission of the Government in accordance with the provisions of ordinance.

Resolutions for the merger or dissolution of aircraft manufacturing companies shall not take effect unless the approval of the Government has been obtained for them in accordance with the provisions of ordinance.

Article 8. The aircraft manufacturing industry shall be regarded as an industry which may expropriate or use the land as mentioned in Article 2 of the land expropriation law and as such shall be subject to the application of the said law.

Article 9. Aircraft manufacturing companies shall, in accordance with the provisions of Imperial ordinance, be exempted from the income tax and the

AIRCRAFT MANUFACTURING INDUSTRY LAW

business profit tax in regard to their enterprises for the year during which the permission as mentioned in Article 2 was obtained and the following 5 years.

Article 10. The Hokkaido, prefectures, cities, towns, and villages and similar bodies shall not impose taxes upon the aircraft manufacturing companies which have obtained exemption from the income tax and the business profit tax in accordance with the provisions of the foregoing article, against their enterprises which have been exempted from the taxes. However, an exception is made when the permission of the Government has been granted in consideration of special circumstances for the imposition of such taxes.

Article 11. When aircraft manufacturing companies import tools, machinery, or materials necessary to their enterprises with the permission of the Government, an exemption from the import duty shall be made for 5 years from the day of the enforcement of the present law under the provisions of ordinance.

Article 12. The Government may grant, under the provisions of ordinance, encouragement money to aircraft manufacturing companies when they are engaged in the manufacture of such kinds of aircraft, fuselages, motors, or propellers which have never been manufactured in this country, within the limits of the budget. Encouragement money may also be granted for the manufacture of such kinds of parts or accessories of aircraft or materials for manufacturing aircraft as have never been manufactured in this country.

Article 13. Aircraft manufacturing companies may, when expanding their enterprises, effect an increase in their capital in order to obtain funds to meet the expenses for establishing facilities belonging to their enterprises, subject to the permission of the Government, even before their capital is fully paid up.

Article 14. Aircraft manufacturing companies may, with the permission of the Government, issue debentures beyond the limits as stipulated by the Commercial Law, when obtaining funds to meet the expenses required for establishing facilities belonging to their enterprises. However, the total amount of debentures shall not exceed 200 per cent of the amount of paid stock shares.

The provisions of the foregoing paragraph shall not be applied when the property stated in the last balance sheet to be in the possession of the companies fails to reach the amount of paid stock shares.

Mortgages on the belongings of the enterprises of the companies in accordance with the provisions of the factory mortgage law shall be required for issuing debentures according to the provisions of the first paragraph. However, an exception is made when there exist special circumstances and when the Government recognizes that there is no need for such mortgages.

AIRCRAFT MANUFACTURING INDUSTRY LAW

Article 15. The Government may cause the aircraft manufacturing companies to file reports in regard to the conditions of their business and property.

The Government may issue orders or make disposition, such as are deemed necessary from the standpoint of control, in regard to the business and accounting of aircraft manufacturing companies.

The Government may, when such measures are deemed necessary from the standpoint of control, cause the government officials concerned to inspect the offices of aircraft manufacturing companies, their places of business, factories, warehouses, and other places and examine the conditions of their business or property or documents or books or other articles. In such a case, the government officials concerned shall be caused to carry with them certificates showing their identities.

Article 16. The Government may, when such measures are deemed necessary from the standpoint of public interests, order the aircraft manufacturing companies to change sale prices or sale terms of aircraft, fuselages, motors, or propellers and issue orders with reference to matters required in regard to the supply of these products.

Article 17. The Government may, when such measures are deemed necessary from the military point of view, issue orders to the aircraft manufacturing companies in regard to matters enumerated in the clauses given below. The Government also may issue similar orders in regard to matters enumerated in Clauses 1 to 5 when such measures are deemed necessary from the standpoint of public interests.

1. Expansion or improvement of facilities.
2. Manufacture of the aircraft specified by the Government or the fuselages, motors, or propellers of the aircraft.
3. Researches in regard to special matters concerning aircraft and/or establishment or special facilities concerning aircraft.
4. Training of technicians for the manufacture of aircraft or the fuselages, motors, or propellers of aircraft.
5. Joint use of facilities for manufacturing aircraft or the fuselages, motors, or propellers of aircraft and/or cooperations with other aircraft manufacturing companies.
6. Preservation of materials for the manufacture of aircraft.
7. Offering of employees or factories and other facilities to be used by the Government.
8. Establishment of special plans of enterprises and/or necessary drill in regard to such plans.
9. Guard of factories and/or establishment of facilities required for preventing espionage.
10. Presentation of reference material in regard to aircraft.

AIRCRAFT MANUFACTURING INDUSTRY LAW

11. Matters which are not enumerated in the foregoing clauses and which are considered necessary under special circumstances.

The Government shall, in accordance with the provisions of Imperial ordinance, compensate for the losses incurred owing to the orders issued in regard to Clauses 1 to 4 or Clauses 6 to 11 of the foregoing paragraph.

The orders to be issued concerning the compensation as mentioned in the foregoing paragraph shall be issued within the limits of the total amount of compensation which has been approved by the Imperial Diet as required by such orders.

When the parties concerned have failed to reach an agreement between themselves in regard to their shares of expenses required in the case of Clause 5 of Paragraph 1, the Government shall decide the matter. In case of dissatisfaction with the decision of the Government, an appeal may be made to the ordinary law court within three months following receipt of a notice about the decision.

Article 18. When the Government is about to issue orders in accordance with the provisions of Article 16 or Clause 1 of Paragraph 1 of the foregoing article, or decide the amount of the compensation as mentioned in Paragraph 2 of the foregoing article, it shall refer the matter to the commission on the aircraft manufacturing industry, except in the cases which are otherwise stipulated by Imperial ordinance.

Regulations concerning the commission on the aircraft manufacturing commission shall be determined by Imperial Ordinance.

Article 19. When aircraft manufacturing companies have violated the present law or orders issued in accordance with the provisions of the present law or disposition made on the basis of the present law, the Government may suspend or restrict their business, cancel the permission granted to them in accordance with the provisions of Article 2 and/or discharge the directors or auditors performing the duties of directors.

Article 20. The present law shall be applied mutatis mutandis according to the provisions of Imperial ordinance in regard to enterprises of manufacturing parts or accessories of aircraft or materials for the manufacture of aircraft, which do not belong to the aircraft manufacturing industry as mentioned in Article I.

Article 21. Persons who have violated the provisions of Article 2 by engaging themselves in the aircraft manufacturing industry without obtaining the necessary permission of the Government shall be punished with a fine not exceeding ¥ 5,000.

AIRCRAFT MANUFACTURING INDUSTRY LAW

Article 22. Persons who fall under one of the clauses given hereunder shall be punished with a fine not exceeding ¥ 2,000:

1. Persons who have failed to report their plans of enterprises or execute the plans of enterprises in violation of the provisions of Paragraph 1 of Article 5.

2. Persons who have executed their plans of enterprises in violation of the orders for changes in the plans of enterprises issued in accordance with the provisions of Paragraph 2 of Article 5.

3. Persons who have transferred, discontinued, or suspended their enterprises in violation of the provisions of Paragraph 1 of Article 7.

4. Persons who have violated the orders issued in accordance with the provisions of Article 16 or Paragraph 1 of Article 17.

of

Article 23. Persons who fall under one/the clauses given hereunder shall be punished with a fine not exceeding ¥ 500:

1. Persons who have failed to file the report as stipulated in Paragraph 1 of Article 15 or filed false reports.

2. Persons who have violated the orders issued, or the disposition made, in accordance with the provisions of Paragraph 2 of Article 15.

3. Persons who have refused, obstructed, or evaded the inspection and/or examination by the government officials concerned as stipulated in Paragraph 3 of Article 15, or refused to answer the questions asked by the government officials concerned, or made false statements in reply to their questions.

Article 24. Aircraft manufacturing companies shall not be immune from punishment for the violation of the present law or orders issued in accordance with the provisions of the present law or disposition made on the basis of the present law in regard to their business by their representatives, employees, or other workers, on the ground that the violation was not conducted under their instructions.

Article 25. The penal regulations to be applied on the basis of the present law or orders issued on the basis of the present law shall be applied, in the case of juridical persons, to the directors (riji), directors (torishimariyaku), or other officials executing the business of the juridical persons and in the case of minors or incompetent persons, to their legal representatives. However, an exception is made in regard to the minors who have the same capability as adults concerning their business.

APPENDIX IIe continued

Supplementary Rules

The date for the enforcement of the present law shall be determined by Imperial ordinance.

Persons who are actually engaged in the aircraft manufacturing industry or who have succeeded to the aircraft manufacturing enterprises of some other persons, at the time of the enforcement of the present law, may be engaged in the industry, in spite of the provisions of Article 2, for only one year from the day of the enforcement of the present law.

When persons who fall under the foregoing paragraph have applied for the permission as mentioned in Article 2 within the period as specified in the foregoing paragraph, they may continue engaging in the industry pending a decision on the issuance or non-issuance of the permission applied for.

When persons who fall under the second paragraph have obtained the permission in accordance with the provisions of Article 2, they shall be regarded as having obtained the permission from the year of the commencement of their enterprises and accordingly the provisions of Article 9 shall be applied to them only in regard to that portion which follows the day of the granting of the permission.

The provisions of Article 11 shall not be applied in regard to the imports made by persons who fall under Paragraph 2 before they obtain the permission in accordance with the provisions of Article 2.

APPENDIX IIf

LICENSED AIRCRAFT MANUFACTURERS

The following list shows the aircraft firms licensed under the Aircraft Industry Manufacturing Law of 1936, their capitalization, location of factories, activity for which licensed (1 - Complete airplanes; 2 - Assembly of planes; 3 - Airframes; 4 - Engines; 5 - Propellers) and their production for the year ending 30 June 1940.

Mitsubishi Jukogyo (Mitsubishi Heavy Industries Co.) Yen 120,000,000. (Not exclusively an aircraft firm) Factories at Nagoya. Licensed for 2, 3, and 4. Production 475 airframes, 1380 engines, chiefly for the Navy.

Nakajima Hikoki (Nakajima Aircraft Co.) Yen 50,000,000. Airframe factory at Ota, Gumma Pref. Engine factory at Tokyo. Licensed for 2, 3, and 4. Production 545 airframes, 1380 engines. Next to Mitsubishi in size and importance.

Kawasaki Kokuki Kogyo (Kawasaki Aircraft Engineering Co.) Yen 50,000,000. Factories at Kobe (airframes and engines) and at Kamigahara (engines). Licensed for 2, 3, and 4. Production 185 airframes, 135 engines.

Aichi Tokai Denki (Aichi Clock and Electric Engineering Co.) Yen 30,000,000. (Not exclusively aircraft.) Factory at Nagoya. Licensed for 1. Production 90 airframes, 230 engines.

Tachikawa Hikoki KK (Tachikawa Aircraft Co.) Yen 25,000,000. Factories at Tachikawa, Tokyo Pref. Licensed for 2 and 3. Production 210 airframes, 90 engines.

Tokyo Gasu Denki Kogyo KK (Tokyo Gas and Electric Engineering Co.) Yen 36,000,000. (Not exclusively aviation.) Main factory at Omori, Tokyo Pref. Branch factory at Haneda (Tokyo). Licensed for 2, 3, and 4. Production 35 airframes, 380 engines.

Kawanishi Kokuki KK (Kawanishi Aircraft Co.) Yen 15,000,000. Factory at Naruo (Kobe). Licensed for 2, 3, 4, and 5. Production 60 airframes, 250 engines.

Watanabe Tekkosho (Watanabe Iron Works.) Yen 15,000,000. Factory at Fukuoka. (Not exclusively aircraft.) Licensed for 2 and 3. Production 95 airframes. Probably also casts engine blocks for engine manufacturers.

Nippon Kokuki (Japan Aircraft Co.) Yen 5,000,000. Factory at Yokohama. Licensed for 2 and 3. Production 25 airframes.

LICENSED AIRCRAFT MANUFACTURERS

Sumitomo Kinzoku Kogyo KK (Sumitomo Metal Industry Co.) Yen 100,000,000. (Not exclusively aircraft.) Factory at Osaka. Licensed for 5. Production not known, but the plant probably became one of the principal suppliers of propellers.

Nippon Gakki Seizo KK (Japan Musical Instrument Manufacturing Co.) Yen 8,750,000. (Not exclusively aircraft.) Main factory at Hamamatsu. Branch factory at Yokohama. Licensed for 5. Definite production figures lacking. The plant is the oldest propeller factory in Japan, and probably divided with Sumitomo the bulk of the production.

Showa Hikoki Kogyo KK (Showa Aircraft Engineering Co.) Yen 30,000,000 (7,500,000 p.u.) Factories at Tokyo and Heijo. Licensed for 2, 3, and 4. Production 10 airframes (organized in 1938 -- had difficulty getting initial equipment from abroad).

Nippon Koku Seisakusho KK (Japan Aviation Engineering Co.) Yen 3,000,000. Factory at Hiratsuka, Southwest of Yokohama. Licensed for 2, 3, and 5. (Organized in 1937 primarily as a propeller factory).

Tokyo Ishikawajima Zosenjo (Tokyo Ishikawajima Dockyard Co.) Yen 16,000,000 (Not exclusively aircraft.) Factories at Tokyo and Yokohama. Licensed for 4. Production estimated at 300 engines -- association with and contiguity to Japan Aircraft Co., increases its strength as a potential producer).

Source: M/A Tokyo #9749. March 27, 1937 - RS 2085-680; Annual Aviation Intelligence Report 1940, 9505.
BFDC Japan: File 15720

APPENDIX IIg

PRINCIPAL JAPANESE AIR ARSENALS

Arsenal	Location	Product (est. 4 Nov. 1944)
Tachikawa Army Air Arsenal (Rikugun Koka Kosho)	Tokyo-to 1/2 mile NW of Tachikawa (24 miles west of Tokyo)	50 S. E. Fighters) 20 S. E. Recce.) per mo. Large enough plant to sustain a much greater production. However, cur- rent intelligence indi- cates this plant also used to produce original models of new type planes and engines. If this is true, production of 70 planes not out of line. Apparently no mass pro- duction of engines.
2nd Naval Air Arsenal (the management of this arsenal is not definitely known, but it is believed to op- erate under the 21st (Sasebo) Naval Air Arsenal, possibly under Mitsubishi supervision.	Nagasaki-ken Omura	15 S. E. Bombers (together with Aichi, Nagoya). An un- confirmed PW report refers to assembly of 9 S. E. fighters per day during May 1942 -- excessingly high. Some engine manu- facturing. Extensive repair work.
11th Naval Air Arsenal	Hiroshima-ken Hiro (E. of Kure)	20 S. E. Bombers. Major repair and maintenance depot for land and float- planes; produces a small number of planes and engines and manufactures some components. About 100 high powered engines per month.
21st Naval Air Arsenal	Nagasaki-ken Sasebo	Small airframe plant Engines (?)
61st Naval Air Arsenal	Formosa Okayama	Engines, assembly. Believ- ed to be one of the prin- cipal aircraft repair, maintenance, modification plants outside of Japan proper.

APPENDIX IIh

NOTE ON MITSUI CONTROL OF NAKAJIMA AIRCRAFT

In 1930, Mitsui Bussan and the Fokker Aircraft Company of America reached an agreement under which Fokker licensed its aircraft engine to Mitsui for exclusive manufacture and sale in the Japanese Empire. The key statement indicating a close Mitsui-Nakajima relationship was:

"Mitsui shall not divulge or entrust to any person not directly connected with its own subsidiary, Nakajima Aircraft Works, and/or other subsidiary technical staff and responsible sales or manufacturing personnel the drawings, specifications or other data provided to Nakajima".

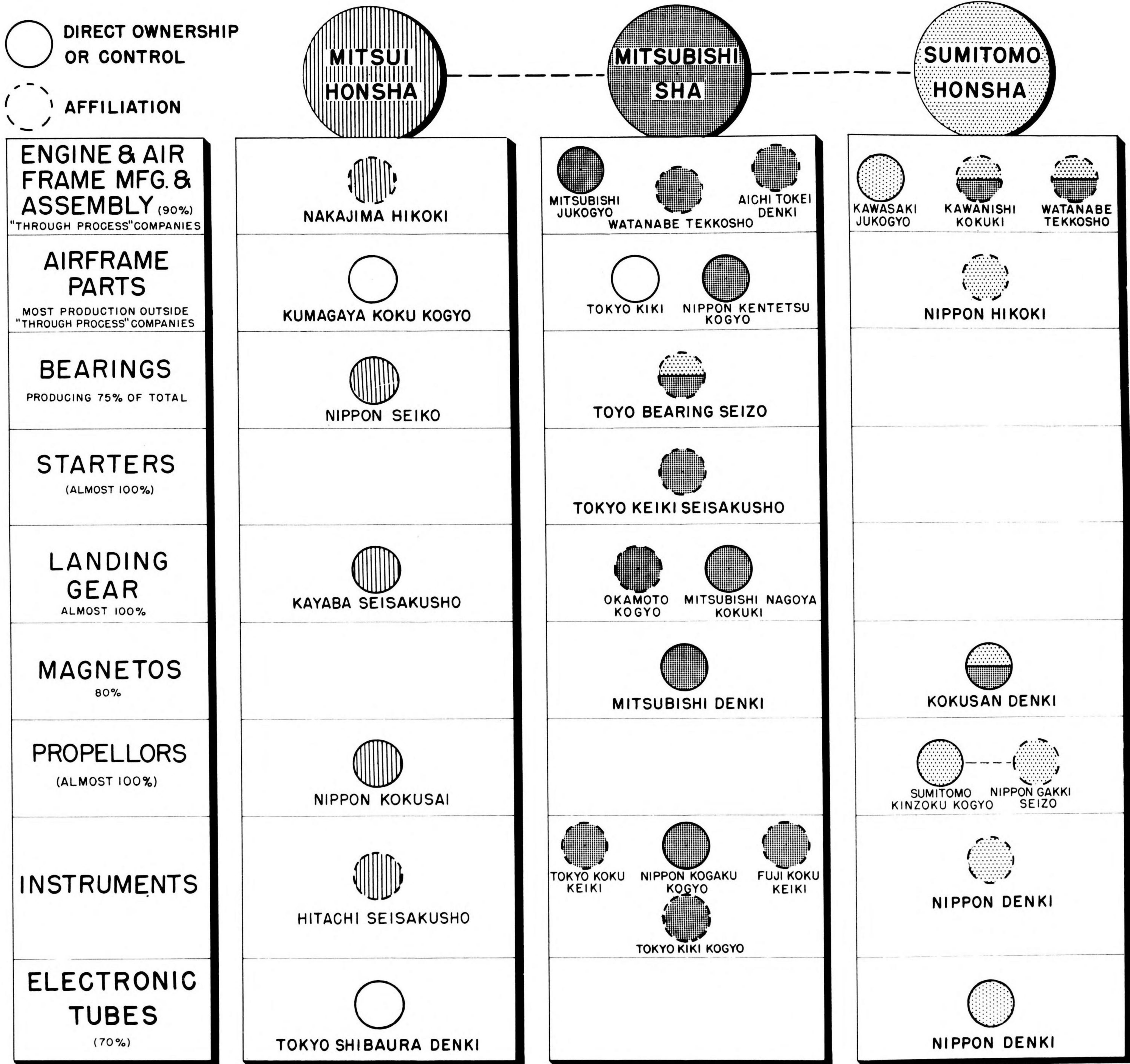
AFFILIATIONS OF THREE FAMILY ENTERPRISES IN MILITARY AIRCRAFT FIELD

RESTRICTED CONFIDENTIAL

EARLY 1944

○ DIRECT OWNERSHIP
OR CONTROL

○ AFFILIATION



OSS PRESENTATION

CHART 4

ROLE OF MITSUBISHI CONCERN IN AIRCRAFT PRODUCTION EARLY 1944

ALUMINUM, MAGNESIUM, DURALUMIN

Nippon Aruminium K. K.
Nippon Keikinzoku K. K.
Nippon Soda
Tohoku Kogyo
Riken Kinzoku
Furakawa Denki Kogyo K. K.
Nippon Chisso K. K.
Nippon Aruminium Seisakusho
Tohoku Shinko Arumi
Mitsubishi Kogyo

Two companies credited with 45.6 Empire Alumina; Three Companies credited with 51.3 Empire Aluminum.

SPECIAL STEELS, ALLOYS & COPPER

Rasa Kogyo
Nippon Seiren
Nippon Kokan
Amagasaki Selkoshu
Nippon Seitetsu K. K.

OPTICAL & PLASTIC EQUIPMENT

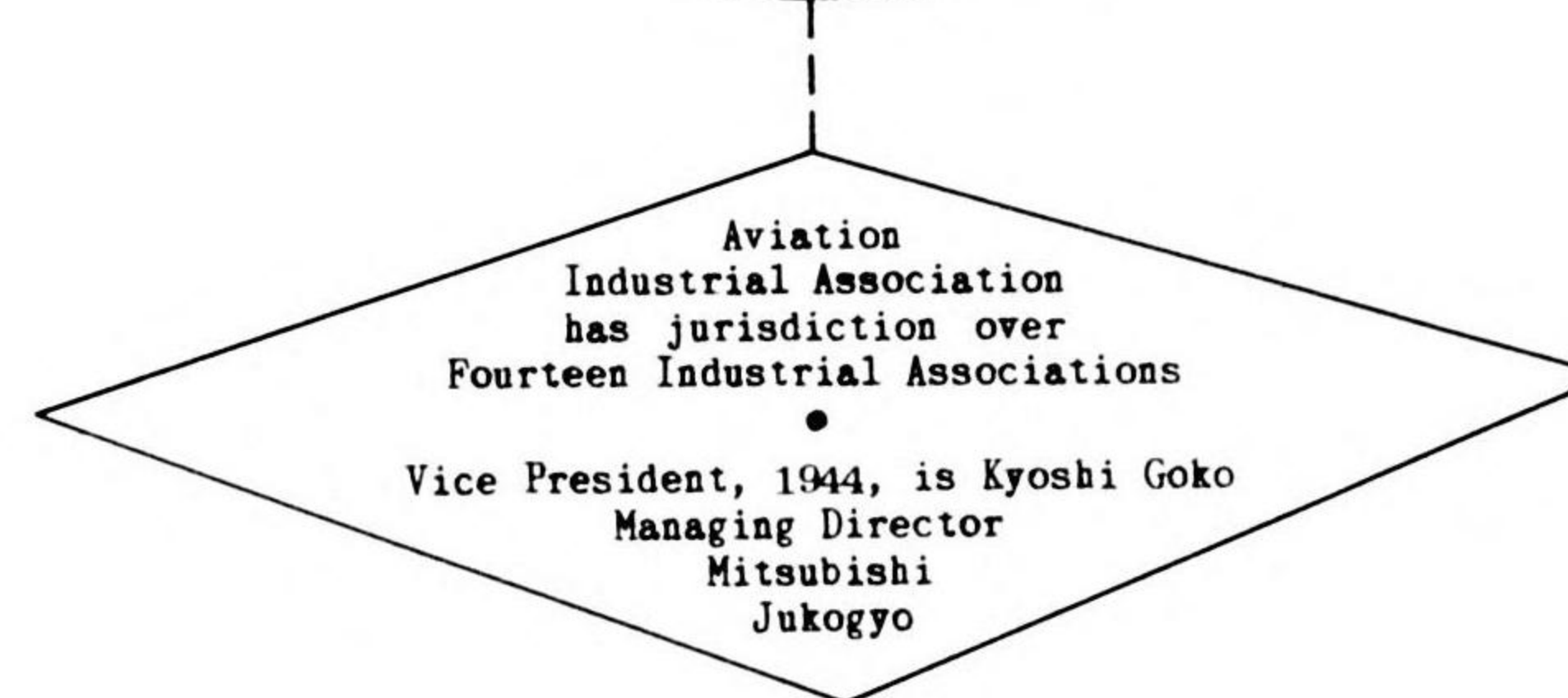
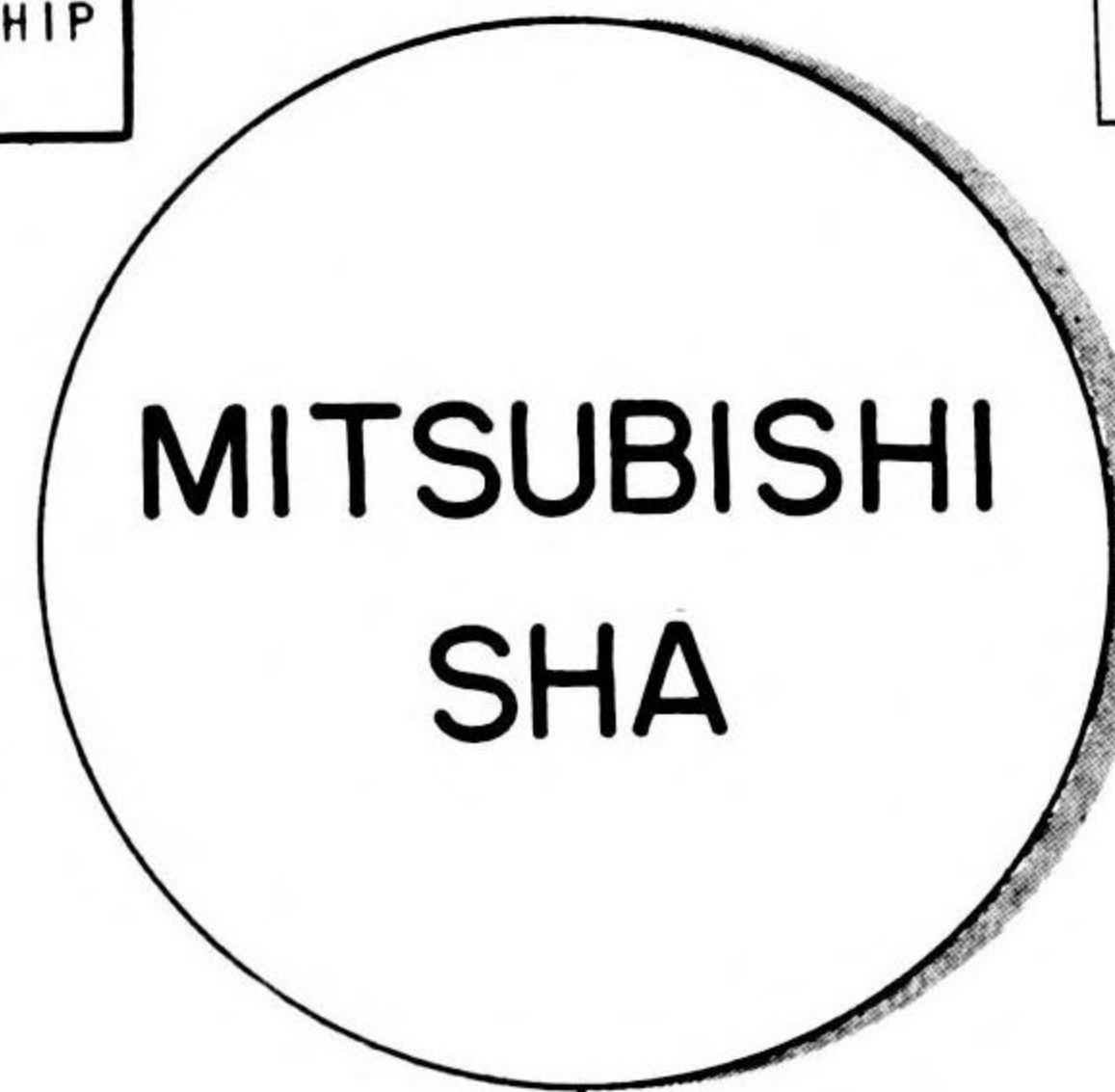
Nippon Kogaku Kogyo K. K.
Asahi Garasu

ELECTRICAL EQUIPMENT

Fujikura Densen
Nippon Denchi
Nippon Musen Denshin Denwa
Nippon Denshin Denya Koju
Nippon Denki

DIRECT OWNERSHIP
OR CONTROL

AFFILIATION



MACHINERY & MACHINE TOOLS

Mitsubishi Kikai
Mitsubishi Denki
Teikoku Seibyō
Nippon Kinzoku Kogyo
Hokoku Kikai Kogyo
Tanaka Kikai Seisaku

INSTRUMENTS

Nippon Denki
Kazura Seisakusho
Fuji Koku Keiki
Tokyo Kiki Kogyo
Hitachi Seisakusho
Tokyo Koku Keiki
Nippon Kogaku Kogyo

Assemble over 90% of airframes and engines

AIRFRAME, ENGINE MFG. & ASSEMBLY

Mitsubishi Jukogyo
Nakajima Hokoki
Kawasaki Kokuki Kogyo
Aichi Tokei Denki
Kawanishi Kokuki K. K.
Watanabe Tekkoshu

Two of four main airframe part producers

AIRCRAFT PARTS

Nippon Kentetsu Kogyo
Tokyo Kiki Seisakusho
Toyowa Jukogyo
Miyata Seisakusho
Toyo Kogyo
Shimazu Seisaku
Tokyo Ishi
Kayaba Seisakusho
Okamoto Kogyo
Mitsubishi Nagoya Kokuki

Three of four main landing gear companies

ENGINE PARTS

Toyo Bearing Seizo Kaisha
Diesel Kiki K. K.
Nippon Kabon
Nippon Denchi
Nippon Piston Ring K. K.
Kokusen Denki
Mitsubishi Denki
Tokyo Keiki Seisakusho
Fuji Denki Seizo

Produces 80% of magnetos

Produce almost 100% of starters

One of four main producers of propeller governors

J A P A N

PRINCIPAL AIRCRAFT ASSEMBLY AND COMPONENTS PLANTS, ALUMINUM AND ALUMINA PRODUCTION

