GERMANY (PRE-WAR)

CIVIL AVIATION
IN
PRE-WAR GERMANY

The following report on pre-war civil aviation in Germany is condensed from a study specially prepared for this series by the Aeronautics Division of the Library of Congress. The full report covers the subject in very much more detail and includes charts and a complete list of references. It is available to anyone desiring to carry out further research.

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CIVIL AVIATION - PRE-WAR GERMANY

A. CIVIL AIR POLICIES

1. German civil aviation was an instrument of national aggrandizement, created by a totalitarian state to forward its ideology, and completely dominated by that state in policy and procedures. Air commerce, air sport and the aircraft industry existed to feed each other and the Luftwaffe. "Today's air power is not contained only in the air forces of a nation; it includes — and this is the meaning of Goring's proclamation of a 'nation of flyers' — the air force, industry, and civil aviation. Civil aviation has a front line soldier's position equally with the Air Force, for it defends the position of a nation in the air through its technique, transport, sport, and research functions".

   Adolf Bäumker, Managing Director of the German Academy of Aeronautical Research in 1943, indicated the German approach to the study of air power as early as five years after the Treaty of Versailles: "We must in investigating the bases (of air power) distinguish three factors: the aircraft industry, air transportation, and air sport, in addition to military aviation". Bäumker's analysis on Deutsche Lufthansa, the aircraft industry and air sport, forces the conclusion that each of the three components of German civil aviation was an instrument of national and party policy in exactly the sense of the Luftwaffe.

2. (a) & (b) The first German government following World War I had centralized all internal scheduled and unscheduled air transport into the hands of one company; the second government extended that company around the world as a weapon in its geopolitical warfare. The identification of government and airline was so complete that one man Erhard Milch, was from 1933 to 1945 both State Secretary of Aviation and Executive Director of Deutsch Lufthansa. Government control came about through capital ownership and was implemented by subsidies.

   After the Nazi advent to power, Lufthansa placed principal emphasis on the international field, inter-European and inter-continental, with particular attention in the latter respect paid to South America. Within Europe, Lufthansa worked out, usually within the framework of the International Air Transport Association, reciprocal agreements with Sweden, Holland, France, England, Switzerland, and Italy, which permitted joint operations between the various countries involved. During the war, Denmark, Hungary, Rumania and Bulgaria were forced to join in this sphere of influence. "It was quite evident that the National Air Ministry, acting through the Lufthansa, was very willing to offer strenuous competition in all phases of commercial air transportation, regardless of expense".

   (c) Because the expense was too much for the ordinary pocketbook, the German authorities made no special efforts to promote private flying or the personal plane. In 1938, for example, there were only 152 private aircraft owners. However, the schools, clubs, and sport organizations encouraged by the government owned approximately 600 planes,

and thousands learned to fly with them. A brief history of government sponsorship of private flying clubs and organizations follows:

Air sport in pre-war Germany had been centralized in the Deutsche Luftrat (German Air Advisory Board) since 1924. This organization worked through the Deutsche Luftfahrt-Verband (German Aviation Union), a private organization founded in 1902, to avoid the provisions of the Treaty of Versailles which banned public support of air sport. The German Aviation Union in 1929 headed 249 clubs, organized into 12 groups. Germany's international representation, particularly with the Federation Aeronautique Internationale, was undertaken by the Aero Club of Germany.

The success of the German Aviation Union was extraordinary, considering that it was granted ostensibly a yearly subsidy of only 250,000 RM, to be devoted to the purchase of gliders. Somewhere contributions were obtained to finance the expansion of membership from 19,300 in 1926 to 45,000 in 1929. The number of planes owned by local clubs increased from 18 in 1926 to 64 in 1929, and the number of gliders from 125 to 643 in the same period. The Union owned about 60 balloons, which probably represented an investment of 600,000 marks. Possibly the source subsidizing this growth was the secret funds of the Reichswehr.

The Union's analysis of the social origins of the 6,400 members it described as "youths" will show how deeply the air sport movement had taken roots in every social class: 25% were said to be from the lowest financial class; 27% from the lower middle class; 39% from the upper middle class, and 9% from the professional class. It is significant of the conservative nature of the Union that the Communists were forced into their own air sport club, the "Storm Bird".

Probably the most striking single feature of the sport movement was the mushroom growth of gliding and soaring. In 1920 about 50 enthusiasts gathered at the Wasserkuppe in the Rhön mountains to begin an annual contest that attracted tens of thousands by 1933. Newspapers offered prizes of from 3 to 5 thousand marks; villages banded together to send their champion to the Wasserkuppe; and several flourishing magazines publicized the exploits of the winners. A society, the Rhön-Rossiten Gesellschaft, was founded by private interests not related to the German Aviation Union to advance the theory of gliding and soaring. The Union maintained, in addition, training schools for gliders at Grunau, Schwarzenberg in Saxony, Doernberg, the Wasserkuppe, Rossiten, and Wangen. The Union's greatest contribution to the later history of aeronautics in Germany was probably this creation of air consciousness in the youth of Germany.

When the Nazis assumed power, the German Aviation Union and the Aero Club were in the process of a voluntary merger. Göring halted this combination. The Aero Club retained its identity, but all other flying clubs in Germany, including Göring's own National Socialist Flying Corps, were incorporated into a new organization, the German Air Sport Union. The Rhön Rossiten society was renamed, and made a state institution.

At the same time, aeronautics was introduced as a subject into the public school curriculum by a decree of the Minister of Education. The decree prescribed such educational devices as "aeronautics in modern languages", "aeronautics in physical education", and "aeronautics in history". The Hitler Youth leader and the Air Sport Union leader partitioned between them the spare time of German youth. "Recruits for the Luftwaffe", said the agreement, were to come only from the Hitler Youth, but they were to be chosen by the Air Sport Union. The 10 to 14-year olders would be tested as potential aeronautical material in the so-called "model plane building work associations". Those selected would spend their 14th to 18th birthdays in the air sport squadrons of the Hitler Youth, but be subject for their purely aeronautical education to the Air Sport Union.

The Hitler Youth in the flight squadron underwent this program from 14 to 18:

Time	Course	Agency
1 afternoon each week	World Outlook	Hitler Youth
1 afternoon each week	Workshop Service	Air Sport Union
2 Saturdays in the month	Physical Training	Hitler Youth
2 Saturdays in the month	Flight or Workshop Service	Air Sport Union
1 Sunday in the month	Small Arms and Terrain Sport	Hitler Youth
1 Sunday in the month	Flight Service	Air Sport Union

It is of this period that the Nazi publicist for air sport was thinking when he wrote in 1942 "everywhere animated activity set in, of which the public knew nothing. It did not lay in the interests of the Reich to publicize openly this air sport." On the November 9th after his 18th birthday, the Hitler Youth graduate would become a member of the Party, and on the Sunday after that a member of the Air Sport Union. By attaining his 18th birthday, the youth also became subject to the six months labor service

requirement, followed by his two years of military service in the Luftwaffe.

The replacement of the Air Sport Union by the National Socialist Flying Corps (usually abbreviated NSFK) in April 17, 1937 was a change of name rather than of function. The NSFK assumed the duties of supplying reinforcements for the Luftwaffe, and developing national air consciousness. The division of labor between the Hitler Youth and the Air Sport Union was carried on by the NSFK. The only difference was that the NSFK, unlike the Air Sport Union, was a recognized party organization, and could walk shoulder to shoulder with the SA and the SS in party parades.

The NSFK was divided into 16 groups, corresponding geographically with the districts ("Gaue") of the Hitler Youth and the Party. Each group was subdivided into regiments ("Standarten") and companies ("Stürme"). The terminology is that of the SS. By 1938 the situation was this: 150,000 11 to 13 year old boys have one afternnon a week and one Sunday a month to devote to model flying. Eighty thousand from 14 to 18 were in the air squadrons of the Hitler Youth, and 60,000 young men were members of the NSFK. The NSFK had the added feature of non-flying, but contributing members (the "Förderer" or sponsor), who numbered 230,000 in 1939, and were allowed to pay a mark a month. The Air Ministry, for example, suggested in 1938 that it would be well for its employees to join the NSFK.

With this sort of financial support, the NSFK in 1938 could boast 23 soaring schools, 5,000 gliders, 7 schools for motor flight, and 600 planes. Major General Christiansen, leader of the NSFK, had ordered 2,000 more planes of the type of the light Siebel "Hummel" for 1940, and was talking in terms of muscular flight. In a total of 125 summer camps, 7,500 Hitler Youth annually underwent flying training at the hands of the NSFK. The NSFK instructors themselves had been indocrinated with the proper political ideology at the Berlin-Dalhelm school of the party's official political philosopher, Alfred Rosenberg. Christiansen could boast that "in close cooperation with the Main Education Office of the Party and the Führer's delegate for the entire spiritual and philosophical education, Rosenberg, the NSFK guarantees the systematic development of the youth in a uniform spiritual and character-moulding education".

Fees for training and instruction were, surprisingly enough, rather high. Christiansen in 1938 established five groups of fees for "everything included" rates for 22 flying lessons of one hour each, which reveal the military influence behind German air sport.

Group A: Members of the NSFK of less than 23 years, fully suitable for flying services, holders of the glider license second stage, who had not yet done any military duty. Cost: RM 200, each additional hour RM 12.

Group B: Similar regulations, but in place of the stage II glider certificate, a service period of at least two years with the NSFK or with the "Flieger-HJ" (Flying Hitler Youth). Cost: RM 400, each additional hour RM 21.
Group C: Members of the NSFK aged up to 35 years with at least two years' activity in the NSFK: the C glider flying certificate was desirable and the instruction had to be undergone in the interest of military service. Cost: RM 600, each additional hour RM 24.
Group D: Members and male sponsors of the NSFK of up to 40 years of age with a membership or sponsoring activity of at least 2 years. Cost: RM 800, each additional hour RM 36.
Group E: All other protagonists of the NSFK, including women. Cost: RM 1,000, each additional hour RM 42.

The whole German air sport movement can be judged on the basis of the failure or success of the NSFK in fulfilling its functions of creating suitable replacements for the Luftwaffe, and generating national interest in aeronautics. For, as Christiansen said, "As the Luftwaffe is the real heart of military aviation, the Lufthansa of commercial aviation, so is the NSFK the real meaning of the entire German air sport movement." The opinion of the expert seems to be that the NSFK failed the Luftwaffe. Asher Lee says:

In spite of Christiansen's best endeavors, the general opinion among the older hands of the Luftwaffe was that pre-training with the National Socialist Flying Corps did not make any real contribution to the breeding of a better race of German Air Force pilots. At the beginning of the training course, at the regular German Air Force flying training schools, the young Hitler embryo pilots held a certain slight advantage over the others in theoretical knowledge of aircraft, but more particularly in political prestige. As the young aspirant pilots reached the later stages of flying training, the effects of the National Socialist Flying Corps training were progressively thinner up to the time the average pilot received his wings. It seems that, on the whole, most very good pilots are born and not made, and that most average pilots have to fly in order to become pilots. A few hours of flying National Socialist gliders was worth little more than training on a bicycle would be for a professional racing motorist. On the whole the National Socialist Flying Corps remained full of budding promise but never blossomed.

(d) Government promotion of aircraft manufacturing and the reasons therefor, are presented in the following sub-study which for purposes of clarity is divided into three sections. Due to the important influence of the war years on the industry, they have been included in the study.

History.

Before 1933, Germany can be said to have had no aircraft industry. Her total output in 1931 was 13 planes, and in the following year it was only three times that number. The companies which constituted the air frame section of the National Union of German Aircraft Industry were Arado, Dornier, Erla, Fieseler, Focke-Wulf, Heinkel, Junkers, Klemm Messerschmitt and Rohrbach. Their products were distinguished for technical excellence, but their plants and equipment were very small and their capital investment comparatively insignificant.

With Hitler's assumption of power, the creation of a sizeable air force became a primary goal. Goring began the expansion of the aircraft industry which was to build the Luftwaffe. He ordered the immediate increase in production of existing planes, and initiated the development of new military types. The purpose of the first action was to provide companies with manufacturing experience, and to have something to fly to impress the German people. The second action involved two basic steps: (1) design and development and (2) the expansion of the manufacturing capacity.

The design and development of high preformance military aircraft were undertaken by engineers in research institutions and in industry along lines laid down by the National Air Ministry. The Messerschmitt 109 and 110, the Junkers 52 and 87, and the Heinkel III are perhaps the most successful results of this research. These planes were combat-tested in the Spanish Civil Air.

The expansion of the industry was accompanied by (1) extension of existing aircraft plants, (2) by bringing concerns engaged in other industries into aircraft manufacturing by converting some of their plants, and (3) by constructing new plants. Some of the concerns from other industries which took on the manufacture of aircraft before the war were:

Company	Location	Engaged in Manufacture of
Allgemeine Transport-enlagen	Leipzig	Cranes, mining and transportation equipment
Blohm & Voss	Hamburg	Shipbuilding
Gothaer Waggonfabrik	Gotha	Railroad cars
Henschel Flugzeugwerke	Berlin	Locomotives
"Weser" Flugzeugbau	Bremen	Shipbuilding

Funds for the expansion were provided principally by the Air Ministry directly through the Bank der deutschen Luftfahrt incorporated in 1938 with a capital of 70 million RM, or through bank credits guaranteed by the Air Ministry. However, the company management, generally speaking, carried on operations with little interference from the government. "The arrangements were liberal enough so that by close cooperation between the government and the aircraft industry it was possible to repay loans quickly and thus to build up the ownership of expanded facilities."

The Air Ministry itself owned Junkers and Arado, and the Saxony State Bank controlled Arla. The Reichsbank voted 50 percent of the shares in the two aero-engine companies, Daimler-Benz and BMW. An estimate of 150 million RM in war loans from the Reichsbank alone to the aircraft industry is probably an understatement, in view of the 20 million RM given to only one relatively small aircraft accessory company. As for private industry, Allgemeine Elektrizitats Gesellschaft controlled Focke-Wulf, Mittel-Deutsche Stahl controlled ATG, and Krupp stood behind Weser. The aircraft, aircraft accessory, and aircraft engine industries were set up in the form of limited liability companies, rather than as corporations, to avoid the necessity of reporting on the volume and nature of output.

Until 1934, the prices paid to the aircraft industry immediately on receipt were "calculated" or estimated sums. Final prices were agreed upon annually after the auditing of the company's books, on the basis of the principle of assuring the industry 6 to 8 percent interest on capital invested. The industry's profits, therefore, did not depend on volume or quality of output, but only on the amount of capital originally invested. This principle was abandoned in 1934, apparently because it proved uneconomic to support marginal firms. Payment before the war was computed on the basis of an estimation of the total value of orders received after examination of the company's books. Prices determined in this way seemed to have guaranteed to the manufacturer his cost price of production plus 6 to 8 percent. The cost price figure included all expenses and all taxes, so that the 6 to 8 percent granted was net profit.

From the first, the keynote of the organization of the German aircraft industry was "rationalization". Competition was discarded as a matter of policy. Patents and designs were pooled. Only a few of the more competent groups were encouraged to carry on engineering development. Several companies were regarded as satellite or "shadow-plants" for concerns with a strong design organization, such as Junkers and Messerschmitt. Henschel entered the aircraft industry of its own accord in 1933 and made a substantial investment of its own funds. Henschel developed several new designs, but its principal contribution was the production of airplanes designed by other companies. By the "licensing"

device, new concerns could be equipped with machines and could acquire experience. Junkers, for example, gave licenses to Mitteldeutsche Motorenwerke and Pommersche Motorenwerke, and Daimler Benz licensed Henschel and Bussing NAG shortly before the war.

The outlines of the peace-time Nazi aircraft industry had been definitely fixed by the middle of 1936. Despite the increase in potential aircraft, production between 1936 and 1938 showed virtually no increase, with the annual output in the latter year at 5,235 planes. Historically, no important step-up in production was to occur until the second part of 1939. The growth of German aircraft production during the pre-war years is shown in the following table, taken from US Strategic Bombing Survey, Overall Report (European War). Washington, 1945, p. 11:

Year	Combat Types	All Other Types	Total
1931	0	13	13
1932	0	36	36
1933	0	368	368
1934	840	1,128	1,968
1935	1,823	1,360	3,183
1936	2,530	2,582	5,112
1937	2,651	2,955	5,606
1938	3,350	1,885	5,235
1939	4,733	3,562	8,295
Total	15,927	13,889	29,816

On the authority of a report prepared for Göring, the characteristics of the aircraft industry in 1936 can be summarized as:

Rapidity of Growth: In 1933, the net production of the aircraft industry was worth 37-1/2 million RM, or 0.2 percent of the total of German production. The automobile industry was seven times as large. In 1936, the aircraft industry ranked fourteenth among the 279 industries studied with a total net production of 527 million RM, or 1.6 percent of German industrial production. While the sum of German production had increased 190 percent, the production of the aircraft industry had increased 1500 percent. Employees of the aircraft industry numbered 124,878 in 1936, those of the automobile industry only 110,148.

Diversity in Size: In 1936, the aircraft industry comprised 74 geographically distinct factories, that is, 53 air frame factories, 16 engine factories, and 5 repair establishments. Eight factories paid out in salaries over 10 million RM each, or 41 percent of the total of salaries in the industry. Fifteen factories paid out over 33 percent of the total, 28 factories 23 percent, and the last 23 factories only 3 percent. Of the 8 largest factories, 5 produced airframes, and 3 produced aero engines. The production of these 5 air frame factories amounted to 39 percent of the whole, and that of the engine factories to 50 percent.

Employment: Two per cent of all German industrial workers were employed in the aircraft industry in 1936.

By 1936, the structure of the German aircraft industry had been planned in terms of its war-time potential. The relationship of the peace and war-time aircraft industries can be expressed in this manner:

The aircraft industry built by Germany in the years immediately preceding the war worked on a single-shift basis to supply military aviation. If undisturbed, Germany's peace-time plant capacity could have produced the peak war time quantities by the single device of introducing the three shift system.

German manufacturers by application of "series" or production line methods and by extensive production tooling, had reached a stage far more advanced than actually needed for 1938 or 1939 operations.

Germany fought the war with the peace-time products of the factories. The Me 109, Mello, Ju 87, and the He 111 were in substantial production before the war, and the Ju 88 and the FW 190 were beginning to come off the lines in 1939 and 1940. The He 177 and the Me 262, projected for 1944, never actually got into the volume production stage.

Government Planning

In his capacity as Air Minister, Göring appointed a Director of Aircraft Supplies, who was charged with the procurement of aircraft. Udet occupied this position until his death by suicide in 1941, and carried on direct negotiations with the industry as to production plans. When Milch took Udet's place in 1941, he set up an organization in the Air Ministry whose sole function it was to plan the aircraft program. The planning work on programs was carried on with the advice of the Main Committees for Airframes, Supplies, and Accessories. These committees were formed by Speer when he became Minister of Armaments and Munitions in 1942, and were outgrowths of the Industry Advisory Council formed by Udet in May 1941. The Main Committees were made up from industry, and represented a definite industry point of view. The function of these committees in the aircraft industry was to advise the Director of Aircraft Procurement and the Air Ministry on production matters.

In addition, there were Special Committees for most of the principal aircraft companies, with offices at the main office of the company, and Special Rings for each of the industries which supplied the aircraft industry. The Special Committees were especially important in the cases of the principal "complexes", Junkers, Messerschmitt, and Focke-Wulf. They funneled the requirements of the member firms of the "complex" as to materials, facilities, and workers. In 1943 the Main Committee for Airframes was made into the Main Committee for Aircraft and centralized the requirements and facilities of the entire industry. In 1944, the Air Ministry was formally dissolved and

its procurement facilities taken over by the Speer Ministry, working through and with the Committees.

The procedure for program planning, while it was still undertaken by the Air Ministry, was as follows: 1) the General Staff of the Air Forces originated the requirements for aircraft by type, approximate numbers and delivery schedules, 2) the Air Ministry received the request from the General Staff and the planning group in the Procurement Division undertook the preparation of studies aimed at the fufillment of the requirements; 3) the planning group consulted the Main Committees for airframes, engines, and accessories, and the divisions of the Speer Ministry which had jurisdiction over materials, machine tools, and other matters which were basic to the proposed aircraft plan; 4) the planning group set its completed study to the German Staff of the Air Forces. Goring personally approved each official program, presumably after consultation with Hitler. After the Air Ministry was transferred to the Speer Ministry, the procedure remained substantially the same.

Comparison

A discussion of the relationships between the aircraft industry and the government would inevitably infringe on the story of military aviation, since the story of the aircraft industry is inseparable from that of the Luftwaffe. However, a comparison of the German and American war-time aircraft industry would stress the following differences:

The complete integration of all German aircraft, industry, experimental engineering, production and operation, under one central directing organization.

The complete regimentation of all German labor, and the retention in the industry of engineering, supervisory, and mechanical skills under a policy which made them ineligible for combat service until proved otherwise. The German policy, plus the use of slave labor, plus the rigid military control over migration of all labor, left to all German establishments stable seasoned staffs of managements, engineering, tooling, supervisory, and mechanical skills which permitted rapidity of evolution in experimental engineering and productive efficiency.

The lavish variety of German experimentation on all manner of highly speculative devices in a large number of highly specialized and elaborately equipped individual laboratories. This provided an integrated but highly diversified program of specialized experimentation, which, in combination with (1) and (2), gave to the German aircraft industry a rapidity of technical evolution, and a degree of flexibility and adaptability in rapidly changing tactical situations.

The marked emphasis on internal combustion turbines and jet and rocket propulsion, and on development and application of self directing ("robot") control devices, which in Germany at war's end were distinctly in advance of the United States developments in similar lines.

The elaborate underground laboratory and factory installations in Germany which, aside from their bomb-proof characteristics, greatly facilitated preservation of secrecy.

The much longer period of continuous German concentration on war production under compulsory government control which conditioned the individual German establishment to far greater dependence on centralized government planning, and made it far more amenable to government control than the individual United States establishment.

(e) Government promotion of aeronautical research is presented in the following sub-study. Changes due to the war are also included.

The Air Ministry, as set up in 1933, placed a Technical Office, headed by General Udet, at the apex of the research system. The difference between research and development was recognized by the creation of two different departments headed by the Technical Office, and thus responsible to one man, Udet, who was also the procurement officer.

The Development Department was broken down into 9 divisions, with complementing testing stations: air frames, motors, apparatus, and radio, all tested at Rechlin; weapons, tested at Tarnowitz; bombs, ground organization, torpedos, and long distance steering apparatus, tested at Udetfeldt; jets and guided missles tested at Peenemunde; fighter planes and tactics, tested at Diepensee. The leaders of the divisions were Air Force Officers, usually with the rank of colonel, and generally selected for their engineering background. Each division had a dual responsibility; development and production. It is estimated that perhaps 10 percent of the developmental work was actually done by the Air Force, and 90 percent by the research institutes of the large commercial firms. There were a large number of such institutes, since industrial research in Germany has always been well advanced. However, the research institutions frequently became service units because of their close association with aircraft manufacturers.

Aeronautical research, specifically, was the responbilility of the ex-Weimar official, Adolf Baumker. He apparently regarded the institute as the fundamental unit in research; by "institute" he meant a unit small enough to be administered effectively by leaders only one echelon removed from

the workers themselves. In practice, this meant about 300 scientists. The institute leader was required to know each member of his staff personally, and to be thoroughly conversant with the technical aspects of the work. The institute had to be almost autonomous in scientific research, even though a number of institutes might be grouped under the administrative or fiscal management of one establishment.

The director of an establishment coordinated the work of his institutes, provided heat, light, power, guards, and draft deferments, but did not attempt to direct their scientific activities. The institute leader received research projects directly from the Air Ministry, or originated projects himself. His reimbursement was determined by the Minister of Education, and was equal to that of a professor at the technical colleges. The group leaders at Luftfahrtforschunganstalt, Braunschweig, received an annual salary of 11,000 marks, which was equivalent to as many dollars in war-time Germany. The institute leader received somewhat more, and the staff workers somewhat less, but salary was not dependent on immediate performance. Most important, the institute leader reported directly to Bäumker, and was immune from other pressure.

The "fixed" plants: buildings and real estate - were owned by the government, and assigned to the establishment without cost. The "movables", apparatus, instruments and furniture - belonged to the establishment. The aeronautics Research Establishment at Braunschweig (LFA) had 70 buildings and 5 major wind tunnels. One firing range alone had cost 4 million marks. The Luftwaffe was equally lavish with its own testing stations: Peenumunde represented an investment of $120,000,000; the Otztal extension was planned to cost $60,000,000 to $75,000,000. Juridically the institutes were corporations under public law, and maintained their civilian character throughout the war. Operating expenses came from two sources, the Air Ministry and the industrial firms, who were charged for work done. All money received was accountable, and the Air Ministry would decrease its grants if in any period the money derived from industry was considerable. Bäumker adopted the policy of refusing to accept industry commissions since too many ad hoc tests prevented proper calibration of equipment.

Parallel to the research establishments, but without actual physical facilities, were the two honorary organizations - the German Academy of Aeronautical Research and the Lilienthal Society. Membership in the Academy was the result of election, and was a high distinction. The Academy is perhaps comparable to the National Academy of Sciences, though restricted to aeronautics. Göring was President, and Bäumker Managing Chancellor. The exchange of ideas between the science and industry was the task of the Lilienthal Society, also presided

over by Bäumker. The Central Office for Scientific Aeronautical Publications, which published and distributed all classified aeronautical research, was a part of the Lilenthal Society.

A change in the organizational structure of aeronautical research in 1941 occurred as the result of three events: the death of Udet, and his replacement in the Technical Office by Milch; Bäumker's illness and semi-retirement and the reorganization of the dormant national research institute, the "RFR". One of Milch's first acts was to detach the research function from the Technical Office, and to make it personally subordinate to him. Due to Bäumker's state of health, it was necessary to substitute for him a four man Aeronautical Research Direction, the "Forschungsfuhrung der Luftfahrt".

The position of the RFR in aeronautical research needs special clarification. Its theoretical assignment was to govern the research work of the technical schools and colleges, but it had been inactive during the early years of the war. In July 1943, Göring revived its powers and placed Ozenberg in charge. The latter made vigorous efforts to build a powerful agency to coordinate research in all its phases, to protect scientists from the draft, and to accelerate the release of those already in the services. His relationship to aeronautical research was therefore twofold: 1) as a source of material and personnel, 2) as the director of all university and technical college research work.

Ozenberg's final plan was never carried out, but is presented here as an example of German thinking on the organization of research in the last desperate phases of the war. In October 1944, he succeeded in getting Göring and Hitler to sign an order creating a Military Research Association, an over-all body to include the Army, Navy, Air Force, and the universities and technical colleges. The order creating the Military Research Association assigned to it these tasks:

> The control and intensification of all research dictated by war developments.
>
> Examining basic research results to determine what development work would be most fruitful.
>
> Securing the necessary research staff and materials to produce the results required.

The RFR was subdivided into fifteen branch directories, and twenty plenipotentiaries. The branch directors were representatives of each of the important fields of science, engineering, and industry. The plenipotentiaries represented sub-classes of those fields of industrial production or of research of special importance in war. For example, there were branch chiefs for physics, iron and steel, and organic chemistry, and plenipotentiaries for explosive physics, plastics, jet propulsion, and remote steering research. The

plenipotentiaries determined the research institutes and testing stations to which research and development projects would be assigned. The branch chiefs supported the plenipotentiaries in their smaller fields, and saw to it that all available facilities and man power were fully utilized. In addition to the technical staff, there were special commissions who effected liaison with the commissions of the Speer Ministry for Armament and War production.

However, the burden of aeronautical research throughout the war rested with the Aeronautical Research Direction, whose focus was the Managing Office. The Managing Office was charged with (1) the allocation of research orders, (2) the supervision of research commissions once allocated, (3) the supply of material and personnel, (4) liaison between the Research direction and the appropriate officials in the service ministries. To accomplish these functions, the Managing Office was subdivided into one department, the Research Department, and two main groups, Supply of Material, and Operations and Administration.

The group Supply of Material provided the establishments with the apparatus and instruments they themselves could not procure. A "Central Managing Depot for Aeronautical Apparatus" was established to supervise the storage, maintenance and overhauling of the material used by the research institutions. Since part of its supply function was to keep scientific personnel out of the draft, this group worked closely with the "RFR". The Operation group provided and assigned the funds and examined the books of the member establishments. The money came from the office of the General Managing Aircraft Supplies, through the Economic Board of the Air Ministry. One of the four members of the Research Direction was the head of the Board of Directors of every establishment. The annual business account was checked initially at the research institution, and finally by the Air Ministry's Economic Board.

The Research Department's sole function was to order the research project. The problem, as the Managing Director described it, was that there was no central plan coordinating the research programs of the services. Research requests might originate in the Research Division itself, in the Development Office, in the aircraft industry, or be suggested by the research institute itself. When Georgii assumed office in November 1943, he found 2,200 unfulfilled research orders on hand. About 600 of these were farmed out to the universities and technical colleges, 300 to industry, and the remainder to the aeronautical research establishments.

Georgii's solution was to withdraw less important problems and cancel those investigated over a long period of time without success. In addition, he attained a more systematic subdivision of the program by differentiating between research commissions requiring about a year, and those demanding immediate solution.

More promising, he states, was the practice gradually evolved of joining research institutions and industry into joint permanent conferences on broad problems. For example, the Aerodynamics Committee, composed of leading experts of research and industry, established the priority for problems involving the use of wind tunnels. The acceleration of the power increase of the Argus-Schmidt jet pipe for "V-I" was a problem for which industry voluntarily called in the research institutes. New developments like the Me 163, the Natter, the Enzian, and the Wasserfall were the result of industry-research cooperation.

(f) The following sub-study summarizes the extent of government promotion of aeronautical education and evaluates the results.

There were in pre-war Germany for aeronautical engineering, as for all other branches of engineering, two alternative courses of study: 1) entry to an engineering school after technical continuation school (or from a secondary school with a first or second-rate certificate) after two years' workshop experience; 2) entry to a technical college after graduation from a technical school and one year's workshop experience. The first course gave a certificate in aeronautical engineering, the second course a diploma.

The Air Ministry and the Aircraft Industry Economic Group promoted aeronautical engineering education by means of grants in aid for living expenses, tuition, and examination fees, and even full-time scholarships. It is estimated that 30 percent of all aeronautical students received financial aid from the Government. These aids were not restricted to the aeronautical engineer; they were available in all branches of engineering.

Theoretically, the courses had different aims. The certificate course was designed to produce the practical engineer, sufficiently grounded in theory for general engineering duties, perhaps best qualified for design and production work. The "diploma engineer" was the highly trained scientific engineer, able to direct technical development, to engage in research, and to discern fundamental laws. In practice, the certificate engineer often stepped over the lines set up by this demarcation, but government agencies and the military held fast to the distinction until 1938.

The period of time given to these courses was the same as for other branches of engineering; five half-yearly terms for the certificate course, and seven half-yearly terms for the diploma course. At the schools of engineering, certificate examinations were held at the conclusion of the school term; at the technical colleges, the graduate examination could not be taken before seven full terms were completed.

At the technical colleges the course of studies for the "junior division" (the first three or four terms) did not differ materially from that in mechanical engineering. The senior division, entered after successful completion of an over-all examination, was divided into the three departments: airframe construction, aero-engine construction, and aircraft operation (that is, equipment, armament, and maintenance). Airframe construction included the aerodynamics of design, testing, research, strength of structures, unit construction, and materials; aero-engine study embraced the design and construction of aero-engines, materials, altitude performance, fuels and storage, and propeller problems; the aircraft operation course included radio engineering for communication and navigation and control in flight.

Not all engineering schools or colleges could offer these special courses. The National Ministry of Science and education, as the responsible authority in matters of education, had set up courses in "light construction" (aircraft construction) at the following engineering schools: Berlin-Beuth, Bremen, Essen, Esslingen, Hamburg, Constance, Magdeburg, Stettin, Wismar, and at the seven-term State Technical Academy of Chemnitz. The Air Ministry maintained a school of aeronautical engineering at Thorn, which trained suitable candidates from industry, without cost.

The technical colleges were of two types: The "Lehrzentren" (Instructional centers) giving instruction in all three specialized sections, and the "Lehrstätten" (Instructional Establishments), instructing only in general aircraft construction. In the first category were the colleges at Berlin, Brunswick, and Munich; in the second, Aachen, Darmstadt, Stuttgart, Vienna, and Danzig (after 1938 and 1939). After 1939, it was also possible to acquire the degree of Doctor of Physics from the Chair of Applied Mechanics of the University of Göttingen.

The certificate engineer had to show two years' practical workshop experience before starting his studies. These two years were made up of one year's general engineering practice, and one year's special experience. Graduate engineers had to complete at least six months' general workshop experience before starting the course.

However, the aeronautical engineer was the special concern of a central directing body: the Engineering Recruiting Section of the German Aeronautical Research Institute of Berlin-Adlershof. This office supervised and assisted engineering students, starting with the preliminary workshop training until their transfer into professional employment. The department allotted the workshop posts for the second section of the

practical training, the course in the manufacturing plants, in collaboration with the Reich student organization. It allocated funds for the promotion of aeronautical studies, and directed the activities of the student flying groups and study groups.

Admission to the higher technical grades of the government service was conditional upon passing a state examination. The examination gave the title of "Flugbaumeister" (Aircraft Constructor) and was preceded by three years' probation as an Assistant Aircraft Constructor. Training and examination were subdivided into the following sections: airframe construction, aero-engine construction, aircraft armament, aircraft equipment, operational administration. The probationary constructor could select one of these sections, but was required to study armaments and aero-engine construction. Flight training was taken in addition to professional instruction. At least one year of practical work in the aircraft industry was insisted upon, plus two years of training in the testing establishments of the Luftwaffe or in the Research Institutes.

The Air Force itself was active in the education of its officers and enlisted personnel. Four air-war colleges, situated at Gatow, Dresden, Fürstenfeldbruck and Werden, were training 800 active officers annually by 1938. The technical schools at Adlershof, Juterbog, Halle, and Gottingen produced about 7,000 specialists in that year. In cooperation with industry, a four year course in metal aircraft working and aero-engine mechanics was provided at the larger factories. On completing their training, the pupils were required to begin a long-term enlistment with the Luftwaffe. The practical training was divided into two sections: two years in the training workshops, followed by two years in the assembly and repair shops. At the same time, the apprentice was required to attend the training schools of the factories, and devote two hours a week of his time to glider construction.

In 1938, Dr. Otto Fuchs, the official charged with the government survey of aeronautical engineering education, reported on the results of his study. His prime conclusion was that German aeronautics suffered from a lack not so much of aeronautical engineers as from the general dearth of engineers of all categories. The decline in the amount of general technical education particularly affected aviation, because German aviation was built on the mechanical rather than the aeronautical engineer.

At the date of his report, there were in Germany 220,000 graduates of the mechanical branches of engineering, of whom one-tenth (22,000) were engaged in aeronautics. A yearly increment of 500 graduate engineers and 2500 certificate engineers could be expected. Of that total, even a peace time aviation would need 1,400 engineers as replacements. If the 1 to 10 ration were maintained, only 50 graduate engineers and 250 certificate graduates would turn to

aviation; if special circumstances diverted a larger number to aviation, other industries would feel the want. A cursory examination of the "help wanted" advertisements in war time issues of magazines like the Zeitschrift des Vereines Deutscher Ingenieure will reveal the truth of this prediction.

Others of his observations on the state of German aeronautical engineering merit repetition here. Dr. Fuchs' position gave him definite information, and the occasion of his lecture assures the objectivity of his judgments:

The workshop training of the future graduate engineer was seldom forwarded by industry, which concentrated on its own apprentices.

In general, the graduate engineer was less competent that the certificate engineer. "Industry complains about the long period of time necessary to work him into the factory . . ., research complains about his deficient physical and mathematical knowledge". Proof of this incompetency was the number who failed the Flugbaumeister examination, even after a three year probationary period.

The university teacher was overworked, and sometimes incompetent. Of the 19 institutions giving aeronautical engineering courses, some had two or three instructors and a few only one. The average teaching load throughout the universities was 20 to 24 hours a week. Of 21 instructors queried, 15 had acquired their special aeronautical knowledge in a one year course given in 1934/1935.

The cost of an engineering education, plus the lack of social prestige as compared with the officer of the Army or Air Force, caused fathers to influence their sons to turn their attention away from engineering. An officer with the rank of captain had received an income of 32,000 RM by his 29th birthday; his graduate engineer counterpart had cost the family 2,500 RM at the same age, and was just beginning in his profession. The social inferiority of the graduate engineer was evidenced by the special formation of an Engineer Corps in the Luftwaffe, which set the engineer socially distinct from the officer.

(g) Lufthansa trained its own pilots at the German Traffic Pilots School, subsized by the Air Ministry on a non-profit basis. Lufthansa formulated educational policy, and provided the teaching staff, while the Air Ministry supplied the equipment. Most of the trainees were Lufthansa employees, although some foreigners were admitted as a propaganda measure.

(h) The only reliable statistical information on German exports and imports of aeronautical equipment predates September 1931. After that date statistics concerning the exports and imports of aircraft and automobiles, were combined with aircraft and automotive parts.

For the exporter of aircraft or aircraft equipment to Nazi Germany, the market was to all intents a military and governmental one. There were no private companies with real independence of action. Germany bought aircraft equipment, particularly British engines, and was eager for manufacturing licenses. The Hamilton propellor, for example, was licensed for German manufacture. The whole procedure required preliminary approval by the Air Ministry, if difficulties in payment in foreign exchange or transfer of license fees were to be avoided. Germany's own exports were included in the Hjalmar Schacht manipulation of "blocked marks" and barter agreements. The market therefore was primarily in the German satellite countries, Turkey, Russia, and South America, and the method of salesmanship was diplomatic pressure.

(i) The German airport system assumed its first structural organization in the period of free competition before the formation of Deutsche Lufthansa. Before 1926, states, cities and smaller political units created "regional associations" first to build airports, and then, (with the bait of local subsidy), to induce airlines to use their facilities. For example, the largest airport, that at Berlin--Adlershof, was owned in 1928 jointly by the City of Berlin, the State of Prussia, and the Reich. The Reich was financially interested in 15 airports; approximately 70 other commercial airports were creatures of the local governments. In 1936 the Reich assumed full title and control of the airports used in regular air transportation through the device of a National Union of German Airports.

The purpose of this organization was, according to paragraph III of its constitution, the promotion of the common interest and prosperity of German airports. The Union took the orders of the Airport Department of the Air Ministry bargained with Deutsche Lufthansa, apportioned lump sum profits to its members, and issued unofficial directives and advice. Its main purpose was the establishment of uniform airport fees, in the form of the"General Conditions for the Rent of Airport Facilities". Lufthansa went through the formality of paying the Union the fees which its financial reports show were annually returned to it by the Reich.

Visitors to pre-war Germany commented on the disproportion between the elaborateness of airport facilities and buildings, and the paucity of actual air traffic. Obviously part of the intention was to create visible symbols of German air power, and for this reason many party gatherings were held in the local airport. Local pride perhaps explained much of the German airport system, but we have the word of Heinz Bongartz, Lufthansa's public relations director, that "certain it is that every airport installation will, in case of war, be of use to military aircraft".

(j) Administration of the exclusive control of aerial navigation granted to the nation by the act of December 15,1933 was delegated to the local Air Boards and their field stations at the airports. The Air Ministry insured the competency of air navigation personnel by training candidates at the navigation school in Wildpark near Potsdam. Employment was on a civil service basis.

There was some effort made to distinguish between the facilities provided by the government as part of its civil airways system and those furnished by Deutsche Lufhansa. Lufthansa operated its own message service and the short wave radio stations on its international routes. Since the government operated the long wave ground installations, any message to or from aircraft had to clear through government facilities. The ground station also furnished direction finding service in close cooperation with similar stations at other airports through a system of direct telephone connections. Because there was little night flying, and the actual volume of traffic was small, Germany's air navigation system, while adequate, was never particularly promoted.

3. (a) Prewar German government policy with regard to ownership of air carriers is discussed in the following sub-study:

1919 - 1926

The first peacetime German airline began operations in 1918, but was actually incorporated as early as 1917, significantly under the auspices of the National Transport Ministry and the Reichsbank. Official encouragement was immediate, largely because of: (1) the classic German economic philosophy of state participation in public transportation, (2) the clamor of a greatly expanded war-time aircraft industry for a domestic market, (3) the political particularism of the various German cities, communities, and states, and (4) the presence at hand of large numbers of war-trained personnel eager to return to aviation.

The first national subsidy was given in 1920. The flow of subsidies from the nation and the smaller units was so great that in 1921 there were 42 airlines, all competing for subsidies. In 1922 the German-Russian Air Transport Association ("Deruluft") was formed as

a joint German-Russian enterprise. By 1925 two interest groups -- Deutsche Aero-Lloyd and the Junkers Luftwerkehrs-Gesellschaft -- had assimilated all others. These two organizations had built up a structure of 23 local associations -- the so-called "regional" air transport companies -- to tap the local subsidy-givers.

The largest shareholder in Deutsche Aero-Lloyd was the Reichsbank; Junkers represented the aircraft industry and other private investors. Aero-Lloyd had affiliated itself with the International Air Transport Association (IATA); Junkers worked out "union" agreements with the airlines of other countries, pooling planes, research and facilities. The "union" agreement principle, if properly implemented, would have meant an extra-national enterprise conducted by one private company in agreement with foreign companies, without state control.

Pressure from the National Ministry of Transport was exercised in favor of a merger of all airlines. Junkers refused, but Brandenburg and Fish of the government capitalized on Junkers' financial difficulties to force through this merger in 1926. The Deutsche Lufthansa was the result of the combination of Aero-Lloyd and Junkers. The stock in the new company supposedly assigned to Junkers was actually retained by the Reich.

The financial organization of the Deutsche Lufthansa at its founding was:

Nation	6,500,000 RM	26 %
States	4,750,000 RM	19 %
Cities	6,875,000 RM	27.5 %
Junkers and Aero-Lloyd	6,875,000 RM	27.5 %
	25,000,000 RM	100 %

The Deutsche Lufthansa assumed the international and important internal routes of its predecessors. In theory the Deutsche Lufthansa did not constitute a monopoly, but in practice the Reich expressly withheld the granting of national subsidies to any other lines. The Deruluft line could be left undisturbed because all its German capital was held by the Deutsche Lufthansa. Throughout the Nazi regime, the Deutsche Lufthansa retained the forms of private economic enterprise, but was a state subsidized complete monopoly in all essentials.

1926 - There is considerable unanimity on the larger goals of the Deutsche Lufthansa. German publicists present them as:

"Creation of quicker and more frequent air connections between all important economic and cultural German cities under consideration of their utility in the German folk economy, in which the most important depots shall also receive a night traffic for post and freight.

"Extension of the inner-European German air transportation net to all important centers of Europe, placing particular weight on a service as frequent as possible.

"Building of the planned long-range airways to the U.S.A., South America, and the Far East."

The story of Lufthansa's own growth and the development of its subsidiaries will illustrate how fully it realized these aims.

In 1926 Deutsche Lufthansa accumulated a total of 3,710,814 plane-miles. It operated nine foreign routes in cooperation with foreign airlines and had opened night services from Berlin to Koenigsberg and to Paris. A survey flight with two Junkers G-24's was made to China by way of Siberia. This expedition laid the groundwork for the Eurasia Aviation Corporation, which was founded in 1930 under Chinese-German auspices, the Chinese Ministry of Communications holding two-thirds of the stock. A Dornier "Wal" Flying Boat was dispatched to Brazil to survey the possibilities of a South Atlantic route.

1927 - Trial flights were made over the Alps. The newly established lines, Geneva-Marseilles and Berlin-Oslo, pointed the way for later important lines. Condor, a Lufthansa subsidiary in South America, received the concession for service on the Rio de Janeiro-Porto Alegre coastal route, paving the way for the subsequent German penetration of Brazil.

1928 - A regular service was established between Berlin and Madrid. Routes from Berlin to Zurich, Vienna and Leningrad, as well as from Munich to Milan, were put into operation.

1929. In spite of a 50 per cent reduction in subsidy, the company kept expanding. In July, a seaplane catapulted from the deck of the Bremen en route to New York initiated a regular ship-to-shore mail service. A similar catapulting took place off Cherbourg on the return trip, the plane carrying the mail on ahead to Bremerhaven.

1930 The dirigible Graf Zeppelin flew to South America to lay the groundwork for a regular South Atlantic route. Air-mail services were increased and additional long-distance routes were planned. An expedition was sent to Baghdad, and catapult ship-to-shore flights were extended.

1931-32. A scheduled passenger service was opened over the Alps from Munich to Venice. There was a 15 per cent reduction in traffic in 1932 as a result of the world economic crisis, but the number of special flights increased.

1933. The character of the company was fundamentally altered as a result of the seizure of control in Germany by the Nazis. From a conventional airline, founded and subsidized with the usual economic and political objectives, it changed into a direct instrument of military power. The newly-created Air Ministry assumed jurisdiction over Lufthansa. Without relinquishing his business connections, Erhard Milch, executive director of the company, became Secretary of Civil Aviation under Hermann Göring in the new Ministry.

1934. Considerable equipment was added, notably Diesel-powered aircraft. The last independent internal air transport company expired and Lufthansa became practically a monopoly. On February 3, 1934, Lufthansa began scheduled air-mail flights across the South Atlantic to South America. A specially-converted steamship, the Westfalen, served as a floating airbase. Dornier Wal flying boats operated from Bathurst to Natal, refueling from the Westfalen in midocean. The aircraft was then catapulted from the ship, in order to attain take-off with the maximum load.

1935. The number of international routes was increased to eleven; trans-Atlantic airmail service to South America was accelerated, and Condor extended its route to Santiago. The German Zeppelin-Reederei was formed to operate the Graf Zeppelin on regular trips across the South Atlantic from Frankfurt to Recife (Pernambuco) to Rio de Janeiro. Before 1935, French and German interests in South America had conflicted. In May of that year Air France and Lufthansa agreed to technical cooperation and a division of schedules. This collaboration increased, and in July 1937 a new agreement provided for the pooling of receipts on the South America routes, and for technical cooperation on the projected services in the North Atlantic and to the Far East. One of the objects of these agreements was, apparently, to counteract the growth of the Pan American system in South America.

1936. Trial flights to New York were begun in 1936 with two-motored Dornier flying boats. Routes varied, but most of the flights were made by way of Lisbon and the Azores.

1937. A great expansion of Lufthansa routes took place in 1937. New routes were operated from Copenhagen to Oslo, London to Vienna, Berlin to Paris, Berlin to Stockholm, Berlin to Baghdad, and Buenos Aires to Santiago. Early in 1937 the Deruluft services were suspended, and the company was liquidated shortly thereafter. However, Lufthansa soon reopened the Baltic routes formerly operated by Deruluft. On the South Atlantic route the Graf Zeppelin was replaced by long-range planes such as the Do 26. The airbase vessels Westfalen and Ostmark were stationed on this route. The Schwabenland in the North Atlantic was joined by the new motor-vessel Friesenland to refuel and catapult four-motored Blohm and Voss flying boats on test flights to New York.

Condor, the large German subsidiary in Brazil, extended its operations, connecting with other pro-Axis airlines in South America. Sedta, a new subsidiary in Ecuador, began active operation. Independent companies also were aided, and planes were made available on generous financial terms. However, when Aeroposta Argentina, a bonafide independent airline, took advantage of this generosity, it had to agree to repair its planes in Condor's shops, to purchase only German parts and accessories, to buy only German aircraft for a period of five years, and to coordinate its schedules with those of Condor and Lufthansa. Other companies, like Varig, in which Condor had a large interest, and subsequently Vasp, masqueraded as national airlines. They employed largely German or Brazilian-German personnel, were controlled by German company officials, and received their equipment from Deutsche Lufthansa. The Latin American states were aware of the subterfuges but were loathe to interfere with companies which provided transport into regions hitherto almost inaccessible.

1938. Lufthansa expanded its eastern operations into Afghanistan by extending its Baghdad line to Kabul. In the west, Deutsche Lufthansa-Peru went into active operation. A transcontinental route was established from Rio de Janeiro to Lima, with the collaboration of Lloyd Aereo Boliviano, a Junkers company. In late 1938, the route mileage of Lufthansa, exclusive of subsidiaries, was 32,720.

1939. On January 1, 1939, the Austrian airline, Oesterreichische Luftverkehr A. G., was taken over, completing the Lufthansa monopoly in the expanded Third Reich. In addition, the airlines in the so-called Protectorate of Bohemia and Moravia were absorbed by the German air transport system. During the year Lufthansa acquired Condor's parellel route to Santiago. Trial and publicity flights across the North Atlantic were still continued, but Lufthansa never received the necessary permission to establish regular service. The flying-boat mail service to South America was maintained successfully up to this time.

The War. With the outbreak of War, Lufthansa was nationalized and all commercial operations ceased. Later in the year a number of services were renewed, all on international routes. With rare exceptions, domestic operations were not resumed. New lines were opened to Moscow in 1940, and to Rovaniemi, Finland, in 1942. The number of routes steadily decreased, however, as many of them did not serve military purposes. The Moscow route operated until Germany's attack on Russia in the summer of 1941. By an "agreement" early in 1943, all accessible equipment and facilities of Air France were transferred to Lufthansa, as were also some of the French flight and ground personnel. In effect, Air France was taken over by the German company.

In the year before Hitler's advent to power, Bley, the official apologist for Lufthansa, asserted that three great groups contending for world power - the British Empire, the United States and European Continent - came into conflict in air transport as in other fields. The only solution possible was a Pan-European combination of air transport companies under German direction. By 1940 the geopolitical emphasis was even more pronounced. Bley stated: "Owing to the German air victories in East and West, air power is becoming a geopolitical factor. Its tremendous speed and radius of action make possible thinking in terms of continents; it is the means of traversing, covering and controlling great areas (Grossraume) from one point. And since the New Order of Europe is already definitely indicated as the next historical reality, air power can be considered in a double sense as the true bearer of this geopolitical event; firstly, because it has prepared the victory, and secondly, because it is the only means of mastering and controlling this area."

South America

Sindicato Condor, Ltda. was founded at Rio de Janeiro on December 1, 1927. It was the successor of a line known as Kondor Sindikat which had been operating between Porto Alegre and Rio de Janeiro since February 1927. The principal sponsors of the new line were Dr. Peter von Bauer and Captain Fritz Hammer, officials of the German-Colombian airline, Scadta. After failing to attract American capital to the line, Condor secured German financial aid, partly from Lufthansa through Aero-Lloyd, partly from Schlubach, Thiemer & Company of Hamburg, and partly from the Hamburg-American Line. Additional capital was furnished by South and Central American interests.

Condor was soon laying the foundation for a trans-Atlantic air service in cooperation with Deutsche Lufthansa. To advance this plan, the company began a weekly service between Rio de Janeiro and Natal in February 1930. This was later extended to Fernando de Noronha, where mail for Europe was handed over to a Hamburg-American ship which subsequently transferred it at the Canaries to a Lufthansa plane bound for the continent.

In May 1930 the arrival of the Graf Zeppelin at Rio paved the way for a contract with the Brazilian government in March 1934, calling for a minimum of 20 trips a year. Condor became general representative in South America for the Deutsche Zeppelin-Reederei, working closely with it until 1937, when the Hindenburg disaster compelled cessation of operations. Condor also cooperated in the establishment of transoceanic mail service with catapult planes. This replaced the mail-carrying services of the dirigible.

In 1932 Condor extended its route to Uruguay and to Buenos Aires. Lufthansa also extended its routes from Natal to Rio de Janeiro and Buenos Aires. In October 1935, through the efforts of Captain Hammer, Condor received a four-year concession for a route to Santiago, Chile. In 1939, this contract was extended to 1942, but this time it was granted to Lufthansa, an indication of the interchangeability of Lufthansa and Condor activities.

In common with all the German-dominated lines, Condor had little difficulty in securing excellent equipment and personnel, all of whom were German or "German nationals". Condor's managing director, Ernesto Holck, was a German; its 18 pilots included 16 Germans or naturalized Germans; and its planes were serviced by 13 German mechanics.

Condor acted as the feeder for planes and personnel for all other Axis-affiliated airlines in South America. Despite the formality of Brazilian registry, Condor

was a part of Deutsche Lufthansa, whose economic, political, and military purposes it served. From a small beginning, Condor grew until it operated over 10,000 route miles, possessed one of the largest and most modern air fleets on the continent, and had the resources to undercut the tariffs of all its principal rivals.

On Christmas Day, 1941, Condor was forced to cease operations because of lack of gasoline, its supply having been cut off as a result of pressure by the American and Brazilian governments. The company was then purged of some, but not all, of its pro-Axis elements. As a result, it was continued on the Proclaimed List. Late in August 1942, its managing director and traffic manager were arrested, and the other German employees were dismissed. With the cooperation of the Defense Corporation, the company was turned over to native Brazilians and the name changed to Services Aereos Cruzeiro do Sul, Ltda. On November 22, 1942, it was removed from the Proclaimed list.

Sedta (Sociedad Ecuadoriana de Transportes Aereos) was founded in 1937 by a group of Ecuadorians and Germans, headed by Captain Fritz W. Hammer. The contract with the Ecuadorian government provided for the operation of a route between Guayaquil and Quito. Hammer was killed in an accident in 1938, and replaced by Gustave A. Wachsmuth, who had been a pilot for Condor for ten years. Ecuador granted to Wachsmuth and Koosmeyer, head of Lufthansa in South America, an extension in Ecuador of the Rio to Lima service. In 1940, the company sought permission to operate to the Galapagos Islands, and proposed a line to Bogota to connect with the Scadta system. These requests were refused, although a line from Guayaquil to Loja was approved.

Lufthansa did not absorb Sedta directly, but complete control was assured by an equipment agreement and a monthly subsidy of $2,100. The company was capitalized nominally at $12,000. Passenger revenues were far below the established rates because of Sedta's custom of liberal discounts and distribution of free passes.

In 1939 about half the passengers paid no fare. Sedta's personnel was almost without exception German. The line's turbulent history ended in September 1941, when the Ecuadorian government expropriated the company and seized its two Ju 52's.

Lufthansa-Peru was founded in May 1938, as a German subsidiary, but was registered as a Peruvian company. Until some expansion took place in 1940, its only route was Lima-Arequipa-La Paz, with occasional stops at Tacna and Puno. Its importance was more strategic

than economic, as it formed the western link of the transcontinental penetration by the Axis. At the height of its activity, it operated about 1,200 miles of route with its two Ju 52's. In 1940 it carried 1,100 passengers and 3,400 pounds of express.

After World War II began, it had considerable difficulty in obtaining supplies and capital. Repeated German violations of Peruvian neutrality culminated in the scuttling of two ships in an attempt to block Callao Harbor. This resulted in the expropriation of the company and the internment of its personnel on April 1, 1941.

Within Germany

Within Germany Hansa Flugdienst was organized April 30, 1938, with a capital of 50,000 RM (Lufthansa, 45,000 RM; Hansa Luftbild, 5,000 RM). The company was established to take over the charter services and special flights operated in Europe by Lufthansa. The chief activities of Hansa Luftbild consisted of making aerial surveys and conducting special and scenic flights.

Deutsche Zeppelin-Reederei was formed March 22, 1935. Its capital stock of 9,559,000 RM was owned by Luftschiffbau Zeppelin and Deutsche Lufthansa. The line operated fortnightly services between Frankfurt, Pernambuco, and Rio de Janeiro in the summer, and had plans for increasing this to a weekly schedule in 1936. However, the destruction of the new dirigible, Hindenburg, forced a suspension of company activities.

In Europe

Outside of Germany the Lufthansa's European plan was subordinated to its South American traffic. Services Aereos Portugueses in Lisbon operated no air services of its own, but managed the Portuguese end of the Berlin-Stuttgart-Geneva-Marseilles Salamanca Lisbon line of Deutsche Lufthansa. The plan was apparently to make it possible for Deutsche Lufthansa to use Portuguese airfields for flights to the Azores and Cape Verde Islands.

Franco's Spain, in 1938, agreed to the formation of an Hispano-German company, the Iberia Compania de Lineas Aereas, to operate airlines internally and between Spain, Morocco, and the Canary Islands. The German interest in this company was sold on August 7, 1943, to the state owned Institute Nacional de Industria. Lufthansa monoply of Spanish internal traffic was justified by the necessity of flying over Spanish territory when operating routes to South America.

The situation in two other countries, Greece and Iceland, is still unclear. The Icelandic Aviation Company (Flugfjelag Islands H/F) had originally been founded by Finnish interests, to provide local service within Iceland. Deutsche Lufthansa provided the aircraft and personnel. In addition to transportation, the planes were used to search for shoals of herring for the Icelandic fisheries. As a reward, Lufthansa received a note from the Premier of Iceland, which, according to the German interpretation, contained a promise to Lufthansa of flying rights equal to those granted any other nation until April 1, 1940. The American occupation of Iceland in 1941 prevented the completion of any arrangement. For Greece, we have only Wronsky's statement that Lufthansa owned 51 per cent of the stock of the Greek Aerial Communications Company (Societe Hellenique des Communications Aeriennes).

Far East

In the Far East, Deutsche Lufthansa's weapon was the Eurasia Company, formed in February 1930. Two-thirds of the capital was advanced by the Chinese Transportation Ministry, one-third by Deutsche Lufthansa. Actually, however, half of the Chinese capital had been borrowed from Deutsche Lufthansa at seven per cent interest. Eurasia flew the routes Shanghai-Lantschau, Peiping-Canton, Lantschau-Factau, Sian-Kunming. Equipment and personnel were almost entirely German. In 1939 seven flights to Kabul and a few test flights from Germany to Baghdad were carried out. The route Germany-Kabul-Afghanistan was later covered once a week as part of a projected link with the Far East.

(b) (See A. 2(d).)

(c) No competition existed since Lufthansa was a monopoly.

(d) By arrangements made under the auspices of the International Air Traffic Association, Air France was permitted to use the ports at Berlin, Hamburg, Cologne, and Nuremburg; Imperial Airways used the Cologne Aerodrome; the Dutch KLM line used the ports of Hamburg, Berlin, and Frankfurt am Main; the Polish line "Lot" the Berlin-Templehof airport; and the Belgian Sabena line, the ports at Berlin, Hamburg, and Cologne. Deutsche Lufthansa undertook the representation of those lines in Germany, and was accorded the same privileges in the countries represented by these national airlines.

(e) See A 2(a&b)

(f) On December 29, 1939, the Deutsche Lufthansa had a total of 146 air transports. The Blohm and Voss 222 and 228 flying boats and the Junkers 290 were war time developments. None of these types saw extensive commercial service, as during the war production was concentrated on the more critical military models. The backbone of the Lufthansa fleet remained the Junkers 52, which was first developed in 1928. In 1935, C. G. Gray, the English student of aeronautics, called the Ju 52 the best transport plane in the world, and France and Britain today are still using this model to some extent on internal lines.

The cost of operation of German air transportation demonstrably increased as a result of technical development. Over the period 1919 to 1940, Deutsche Lufthansa used the following carriers in civil air transportation:

Model	Speed (km per hr.)	Useful Load	Transport Utility (Ton km per hr.)
F 13	185	0,345	66
M 20	170	0.96	163
Ju 86	260	1.05	273
He 111	270	1,07	288
Ju 52	230	1.50	345
FW 200	315	2,50	787
Ju 90	290	3,80	1,100

A direct comparison of planes having approximately the same useful load capacity and flying over the same categories of routes gave this result:

Period	Model	Operation Cost
1932-34	M 20	100
1936-38	Ju 86	95.2
1936-38	He 111	83.8

(g) Lufthansa's fleet in peace-time was entirely German, since part of its overall mission was to demonstrate the worth of German industry. During the war, some DC-2's and DC-3's were seized from the Dutch and Belgians. By contract with neutral Switzerland, the Lufthansa DC-2's and DC-3's were kept abreast of the latest CAA and Douglas factory changes throughout the war.

(h) For Lufthansa and the International Air Transport Association and Lufthansa's operations of foreign airlines, see A. 3 (a). Germany regulated its air traffic and commercial relations with other countries through separate treaties. These so-called Air Traffic Conventions were all practically identical, and generally followed the C.I.N.A. Convention. Although Germany, like the United States, was never a party to that convention, these separate treaties were often described as preliminary, and were provided with cancellation clauses.

Such separate treaties were concluded by Germany with Switzerland (September 14, 1920), Denmark (April 25, 1922), The Netherlands (July 24, 1922), Norway (January 23, 1925), Austria (May 19, 1935), Sweden (May 29, 1925), France (May 22, 1926), Belgium (May 29, 1926), Czechoslovakia (January 22, 1927), Italy (May 20, 1927), Great Britain (June 29, 1927), Spain (December 9, 1927), Poland (August 28, 1929), United States (May 31, 1932), Hungary (January 13, 1933), Yugoslavia (September 3, 1936), Greece (November 9, 1936), Portugal (March 11, 1937), and the Union of South Africa (March 17, 1937).

Of the various international conventions signed by Germany, the Warsaw Convention of October 12, 1929 is the most important. On January 12, 1937, the Second Convention of May 29, 1935 (The Rome Convention) regarding the Unification of Rules Relating to the Precautionary Attachment of Aircraft came into force, together with the Act regarding the Inadmissibility of the Precautionary Attachment of Aircraft. The other Rome Convention, relating to Damages caused by Aircraft to Third Parties on the Surface, was not ratified by Germany. The International Sanitary Convention for Aerial Navigation signed April 12, 1933 was in force in Germany.

4. The administration of both civil and military aviation by one ministry indicates how completely they were allied in the German point of view. German civil aviation, strictly speaking, was not influenced by military aviation; it was merely another aspect. The Lufthansa was a secondary Air Transport Service for the Luftwaffe; the air sport movement was pre-military training for the Luftwaffe; in the absence of personal flying or competitive air transport, the aircraft industry had no recourse but to the Luftwaffe.

What will be said in this paragraph about civil aviation as a reinforcement of the military potential is not confined to Germany alone. The British Cadman report of 1938 states that "the problem of the air is one - two sides of a single coin - and the military aspect of aviation cannot fundamentally be separated from the civil aspect". The civil aviation of any country is an auxiliary of the military in that: (1) it maintains a system of high speed communication for government and industry, in both peace and war; (2) it justifies the existence of a system of lighted and radio equipped civil airways; and (3) it creates an organization of highly trained personnel.

who can be drawn upon for military use. The relationship between the peace time maintenance of the aircraft industry and civil aviation is, of course, a fundamental one. It is not included here because German civil aviation after 1933 was not an important customer of the aircraft industry, although perhaps its best advertisement.

Since the volume of transport operation determines the extent of the contribution civil aviation can make in any of these respects, it is doubtful if German civil aviation was regarded by the Nazis themselves primarily as a successful civilian counterpart of the Luftwaffe.

Part of the answer is, probably, that Germany valued its civil aviation as an immediate political activity of great potential commercial value. German students of air transport repeated the classic statement of the 1930 League of Nations report that state participation in European civil aviation is an act of politics, rather than of economics. Indeed, Walter Pahl says that all transportation is an act of politics, but that air transport, more than any other form, is an act of high politics. The phrase, high politics, had connotations for the Nazi mind that require definition. It is, in essence, the politics that Clausewitz meant when he said war is the continuation of politics by other means. The Nazi contribution was to stress the converse: "peace is the continuation of war by other means".

German aviation certainly was not economic in what the Nazis called the "narrow" meaning of returning dividends on capital invested. There is no doubt, however, that the ultimate aims of German expansion in South America, for example, were broadly economic, with the purposes of attaining markets and raw materials. This trade campaign was also a political enterprise. For W.Burden says, in his "Struffle for Airways in Latin America", "under the Nazi regime, foreign trade became so regimented as to constitute for all practical purposes a part of government activity. The full force of the German government was consequently thrown behind the propaganda efforts designed to help the trade program and increase the prestige of the Reich".

5. Germany's civil aviation was under the nominal supervision of the Council of Ambassadors from 1919 to 1926. From the Paris convention of that date until Germany's withdrawal from the League of Nations, it is possible to say foreign powers exercised influence over German civil aviation in a negative sense. In March, 1935 with the public recognition of the Luftwaffe, all external restraints were cast off.

6. The data to answer this question are still lacking. It is possible to estimate Germany's national income in this period as: 1932, 45 billion RM; 1934, 52 billion RM; 1935, 57 billion RM; 1938, 76 billion RM, and to guess that military expenditures consumed one-eighth to one-ninth of the national income. During the war years, aircraft, together with air force equipment, represented approximately 40 percent of total German production, and this percentage may be applicable to the period of preparation before the war. No budget as such were published after 1934. The finances of the totalitarian state defy examination by orthodox standards.

7. Probably the largest vested interest in Nazi Germany was the Nazi party itself. That group was split internally by clashes of temperament and the personal ambition of a few vigorous personalities for Hitler's favor, but presented a united front to the rest of Germany. Milch, for example, intensely disliked Willy Messerschmitt, and the development of the Me 262 suffered in consequence; Göring and Schacht quarrelled over the conduct of the four year plans as they concerned aviation; Rust felt that education and research were more properly his provinces than Göring's. But Göring remained, before the war, at least, Hitler's "truest paladin," and German aviation was safe from other influence. During the war, Speer got Hitler's ear, and the result was the formal dissolution of the Air Ministry in 1944.

On the whole, the wishes of the banking interests and the aircraft industry of Germany paralled those of Göring. The Reichsbank headed by the confirmed Nazi, Georg von Stauss, the "aviation banker" - had been behind the formation of Deutsche Lufthansa, and owned or controlled some of the larger private aircraft and aero-engine companies. For purposes of representation in German's economic corporate structure, the aircraft industry like 30 other branches of industry, had been organized into an Economic Group: Main Committees and Special Rings were expressly founded to present the industry point of view to Speer's Armaments Ministry, and Frydag, Speer's delegate for aircraft production, was a member of the Board of Directors of both Henschel and Heinkel.

Yet it is altogether true to say that the final word rested always with the government official and the party he represented. The Nazi state prided itself on having achieved the "revolutionary solution of retaining the entrepreneur in his functions and at the same time converting him into the service of the state...Chambers and groups, main committees and rings, and economic groups all have one thing in common - they reflect the tendency to place the relationship of state and industry more on the basis of common trust and cooperation than on the basis of command." At the time, the industrialist was reminded: "One thing will remain after the war and become more and more established: the conviction that the State is the legitimate partner ("Teilhaber") in every enterprise," and that "the partnership of the state is all-embracing." The industrialist already knew that for Hitler "the Party created the State."

8. See A 2(f)

9. See A 2(e)

10. Generally, aircraft development was forwarded in Germany by government initiative and supervision of a development contract. The head of one of the development divisions of the Technical Office would discuss the desired characteristics of a new weapon or device with industry representatives, and then issue development contracts to one or more firms. Often the idea originated with the firm, was successfully developed, and then presented to the Air Force for trial and acceptance. The costs of research and development to the firms were borne in their entirety by the Air Force.

B. CIVIL AIR ORGANIZATIONS

1. The governmental structure of Nazi Germany differed so completely from accepted standards that any direct description is not only extremely difficult, but of somewhat dubious value. The best study of the German state (by F. Neumann, published in 1942) is prefaced by the remark that National Socialist Germany was a "non-state, a chaos, a rule of lawlessness and anarchy."

Essentially, the hierarchy of peacetime civil aviation was indistinguishable from that of military aviation. Adolf Hitler, as National Leader and Chancellor, and Commander of the Armed Forces, was also the supreme authority for civil air matters.

Officials controlling aviation:

National Minister of Aviation--Hermann Göring (also Supreme Commander-in-Chief of the Air Force)

State Secretary of Aviation--Erhard Milch (also Inspector General of the Air Force)

Under Milch:

Chief of Air Defense

General Aviation Office
- Air Traffic
- Air Police
- Weather Service
- Flight Protection
- Supervision of Local Air Boards

General Commanding Aircraft Supplies
- Research Institutes
- Development--the testing stations, the industry
- War Economy
- Industry Personnel--delegated to the German Aeronautical Research Establishment, Berlin-Adlershof
- Supply

Outside of this organization, but still subordinate to Hitler were the following organizations:

Sport:

- The National Socialist Flying Corps
- Air Squadrons of the Hitler Youth--Reich Youth Leader
- Model Plane Building Associations--Reich Youth Leader

Scientific and Technical Associations:

- National Union of German Airports
- German Academy of Aeronautical Research
- Lilienthal Society
- Standards Committee for Aviation--branch of the German Standards Committee

Industry Associations:

Economic Group of the Aircraft Industry

Research and Education:

Schools and Colleges--Ministry of Science and Education
National Research Council--Göring

2. (a) (b) & (c) It is believed that the functions of prewar German Government agencies concerned with civil aviation have been fully covered in other sections of this report.

3. In the absence of parliamentary debate or of a free press on the English or American model, an accurate documentation of German prewar public opinion is impossible. However, it can be taken for granted that the aviation interests, the armed forces, and the general public were satisfied with German civil aviation in direct proportion to their contentment with the ideology of the Nazi party. When Germany had political parties, none, with the exception of the Communists, objected to state subsidies. Since the most important competitive forms of transport were also either owned or controlled by the State, there was no overt act of resentment. At this time it was stated, "The present frictionless cooperation of all branches of transportation with aviation ...is noteworthy. The railroad and the automobile, which fight each other, work willingly with the airplane. In large degree this is brought about by the smallness of the part played by air transportation in the actual movement of passengers and freight, and by the fact that the plane accomplishes functions, particularly in international transportation, in which the others are not interested." The position the State would assume in the event of such a conflict was plainly indicated: "A preference of air transportation as against all other branches of transportation justifies itself through the national interest."

4. The plan of authority of the Nazi state was: (1) the concentration of all power into the hands of a Leader in whose person the means of governmental and extra-governmental adjustment were combined; (2) the deliberate elimination of any statutory confines qualifying that power. Under such a system, Hitler, or his creatures, controlled everything, made all decisions, and resolved all conflicts. Göring, when in favor, exercised this unlimited power over all phases of aviation in Hitler's name.

C. PROCEDURES AND REGULATIONS

1. Air Routes

See A-3 (a).

Since Deutsche Lufthansa was a member of the government, its overall policy was controlled in its entirety by the Air Ministry. At the same time, Lufthansa made and enforced its own operating policies and procedures. Under such a system there could be no place for a Civil Aeronautics Administration or a Civil Aeronautics

Board. A member of the Lufthansa expressed his bewilderment at the American air transport industry, "shared in by many companies, suffering under rigid, all-inclusive laws, regulations and decrees, which in allegedly old and bureaucratic Europe are not thought of."

2. Rates

Rates were fixed by Lufthansa on the basis of what the traffic would bear. In theory, Lufthansa attempted to bring its rates down to the equivalent of prices for first class accomodations on the railroad. Rates averaged about 8 cents a mile in July 1939. As propaganda, prices were lower on certain routes than first class railroad accomodations, prices in winter were lower on all routes, rebates were given for the purchase of return tickets, and for special occasions like the Leipzig Fair.

3. Safety

Lufthansa was responsible for conducting its own operation as safely and efficiently as possible. There were actually no transport category regulations. For example, no landing speed limitation was imposed on aircraft. Lufthansa, however, had an operations manual outlining its policies and procedures for all personnel.

4. Inspection

There was no governmental regulatory body controlling in any way equipment, personnel, or aircraft maintenance. It must be repeated that Lufthansa was a governmental agency as far as its operating policies and procedures were concerned. Lufthansa depended primarily on the knowledge and technique of the older maintenance men for the overhaul, maintenance, and inspection of aircraft. The usual procedure was to inspect and repair the airplane and equipment more frequently than is the custom in this country. This practice was partly due to the operation schedule which consisted of short hops and low over-all time per month per airplane.

5. Airports and Communications

See A-2 (1).

6. Reports and Forms

All the log-books, archives, index cards, legal contracts, literature and other files of the Company were destroyed or lost in the course of the fighting in April and May 1945 both by fire and by other agencies.

D. GENERAL EVALUATION

1. Considered only in terms of the Nazi frame of reference, German commercial aviation was sound, progressive, and well adapted to the country's political and economic wants. Deutsche Lufthansa, for example, was described by a French student in 1939 as

"presenting none of the inconveniences that one meets usually in the 'chosen instrument,' or those with which one customarily reproaches state enterprises."

2. The failure of civil aviation was primarily the failure of military aviation. German civil air rose and fell with the Third Reich.