

~~75 1908~~

5-12. 6501-7  
28 Mar-17 Apr 1941

RETURN TO:

Director  
Air Force Studies Inst  
Air Force Archives Branch  
Randolph AFB, Alabama

**CONFIDENTIAL**

DECLASSIFIED MR 22 SEPT 72

A.I. 36) R/L 245

Report on the loss of industrial  
inspection of Russia

DECLASSIFIED MR 22 SEPT 72

REPORT ON THE TOUR OF INDUSTRIAL INSPECTION IN RUSSIA,  
28th March to 17th April 1941.

Compiled by:- Fliegerstabsingenieur A.K. Eugen Guttler

Issued by:- Reich Minister for Air and C. in C. G.A.F.  
Director General of G.A.F. Equipment (GL 7)

GL 7, No.1065/41. SECRET.

Abstract only; omitting details of machinery and processes throughout.

SUMMARY (pp.2-4). The industrial commission, invited by the peoples commissar for Aircraft construction, inspected the five most important Russian air armament works, a light metal works and a ball bearing works.

The general impression of Russian industrial organization was that Russia, instead of attempting to train her simple and primitive people, has taken the short cut of adapting production processes to their capacity, by extensive breaking down into detailed operations, leaving responsibility for the operation to the worker himself and applying only one direct and final check. The methods follow those of America, which supplies 75% of imported machinery.

The system results in work which requires no finishing and adjusting at assembly and disassembly; it allows for an unusually high proportion of women's labour, and, given a certain basis of skilled labour, it is capable of indefinite extension, so long as reserves of labour of a primitive people remain.

The report on the eight works is a synopsis of the reports of the experts, which are still available in GL 7.

Report (p.5)  
Works inspected:-

Airframe Works	No.1	Moscow
" "	No.22	Moscow
Aero Engine Works	No.19	Molotov
" " "	No.24	Moscow
" " "	No.26	Rybinsk
Light Metal Rolling Mill	No.150	Moscow, Stupino
Ball bearing works	No.1	Moscow
Testing and Experimental station, ZAGI, Mr. Moscow		

The tour was made by the German air attache and assistant air attache, Moscow, three representatives of the G.A.F. and eight representatives of German industrial firms. (Names given).

The report has two parts:-

- (1) description of works inspected.
- (2) technical data of aircraft and aero engines seen.

Works No.1. "Aviachin"

(pp.6-11)

visited 7 April 1941.

CONFIDENTIAL / Illustrations

512.6501-7

28 MAR - 17 APR 1941

2-5132-188

Illustrations:-

- (1) Layout: Aircraft works No.1 "Aviachim"  
(P.10) by the Central Airfield, Moscow.

Abstellplätze	Parking places
Außenflächen	Outer surfaces
Fahrwerke	Undercarriages
Fertigmontage	Final assembly
Rech. bearbeitung	Mechanical processing
Neuer Teil (in Bau)	New part (under construction)
Rumpfbau	Fuselage construction
Startklarmachen	Take-off signal
Teil-u. Spitzwerkbau	Fitting and control surfaces construction
Übergabe	Delivery
Verwaltungsgeb.	Offices
Vormontage	Preliminary assembly
Werkeinfahrt	Works entrance
Zentral-flughafen	Central airfield
Z. Leningrader Chaussee	To Leningrader Chaussee
see	
Z. Flugplätze	To Airfield
3 - stöckiges Gebäude	Three-floor buildings

- (2) Oblique aerial photograph: Airframe works No.1.  
(P.11) "Aviachim"  
by the Central Airfield,  
Moscow.

Situation: south-east side of the Central Airfield, Moscow.

Products: fighter planes. formerly I-15 and I-153; now I-61 with engine AM 35.

Plant: see Layout and photograph.

A delivery hall and a special hangar for preliminaries for taking off and "flying-in" were among the sections inspected.

Area: about 100,000 sq.m. (estimates from 70,000 to 120,000 sq.m.) Large connecting bays, resembling those in American industry, are a striking feature; older bays of wood, the assembly being of lean-to type and the remainder having saddle roof, 8 m. wide and about 4 m. to the lower side of the trusses, space between the pillars about 6 m. by 8 m. specific buildings for pressing, hardening etc. exist in annexes of appropriately greater height. Air heating, with pipes carried above on the pillars. Only one transformer station noticed; probably two existed.

Equipment: general purpose equipment, the works being in a position to make everything, above all standard parts itself. jig and tool shop, metal cutting, press work, founding and hardening sections are particularly well equipped; plant for heat treatment of light metals is not very large. Equipment allows extensive breakdown into detailed operations and shows that the new type has long since passed the O series.

Personnel: two shifts. total: 12 - 14,000 of which 9 - 10,000 are productive.  
Women: 20-25%. only 20% need be really skilled workers. Good rate of work.

/ output:

output: 100 aircraft per month; 180 to 200 if fully operational; increase possible if extensions are completed. plans are for a minimum series of 1,200 to 1,500 units. some reserve sites are still available.

the following are obtained from outside:-

Radiators from works No. 34, Moscow.  
propellers.  
wheels and tyres from "Jaroslauer Pezino Kombinat Instrumente".

tanks are presumably made in the works.

(the works is well guarded but the fire service seems inadequate; no air raid warning service or black-out.)

works No. 22. "Gorgunow"

(pp. 12-15)

visited 15 April 1941.  
Moscow, Fili.

illustrations:-

(1) Layout: Aircraft works No. 22. "Gorgunow"  
(p. 14) Fili near Moscow.

Aussenflügel	outer foils
Blechverformung	sheet metal work
Fertigmontage	final assembly
Flügelnasen und Enden	wing noses and tips
Höhenflosse	tail plane
Holmbau	spar construction
Mech. Bearbeitg.	mechanical processing
Mod. Blechverformung	modern sheet metal work
(pressen)	(presses)
Rumpfmitterteile	fuselage after parts
Rumpfvorderteile	fuselage forward parts
Startbahn	runway
Teilbau	fitting construction
tragfläch-mittelstücke	supporting surfaces; middle parts
triebwerke	power units
vorrichtungsbau	jig construction
z. Flugplatz	to Airfield

(2) oblique aerial photograph: Airframe works No. 22.  
(p. 15) "Gorgunow"  
in Fili near Moscow.

situation: west of Moscow on the R. Moskwa.

products: general purpose aircraft p-2 in serial production; bombers up to now, type SB-2 most recently.

plant: see Layout and photograph.

Area: about 100,000 sq.m. wooden construction; extensions made piecemeal; space for further extension.

Equipment: general purpose equipment. A very large mechanical section assures considerable self-sufficiency in production. there are a number of special machines and

some large presses for the formation of plates by the extrusion method (?) (gummi-pressverfahren). A kind of line in the assembly is not used. New appliances will be installed, the manufacture of p-2 being not fully under way.

Personnel: Total, 12 - 14,000. Women, 30%. skilled workers, 20-25%, principally in the jig and tool and the mechanical sections. The workers are experienced, which is a great asset in conversion to another type of aircraft.

Output: 40 aircraft per month. plans are for a large scale series of 60 aircraft, which can be counted on within five months at the latest. Equipment is not in full use but conversion can be readily effected.

Works No. 24.

"Prunse"

(pp. 16-21)

visited 8th April 1941.

Moscow.

Illustration:

Layout: Works 24. Moscow. scale:- 1:2,500  
(p. 21)

The buildings shown in broken lines were not inspected and their purpose is not known.

Feinmessraum  
Gesenkbau  
Gleisanlage  
Härtere  
Haupteingang  
Lehrenbohrwerk  
mechanische Abteilungen  
Montage  
Montagestrasse  
offene Prüfstände  
Öleinlaufstände  
Rückmontage  
Schmiede  
Speisehaus  
Strasse nach Moscow  
Strassenbahn  
Turm Prüfstände  
Verwaltungsgeb.  
Werkzeug und Vorrichtg.  
Werkzeugausgabe  
Zentral-scharf-  
schleiferei  
3 stöckig

Bay.

Gauging room  
Die construction  
Rail tracks  
Hardening  
Main entrance  
Gauge drilling  
Mechanical sections  
Assembling  
Assembly line  
Open test benches  
Oil supply stations  
Dismantling (?)  
Forge  
Canteen  
Road to Moscow  
Tramway  
Built-up test benches  
Offices  
Jig and tool construction.  
Tool distribution  
Central sharp grinding  
3-floored.

situation: East side of Moscow, immediately beside the Railway; entrance on the street, 16 Melerowski prospekt.

products: water-cooled 12 cylinder in-line engines of Russian design. Formerly AM 34; now AM 35 A (1,400 h.p.)

Plant: see layout.

built-up area, 130,000 sq.m.; area inspected, about 90,000 sq.m. The works developed from former aero engine repair workshops, but the layout is clear.

/ Equipment;

equipment: A building for jigs, tools and dies, 275 m. x 60 m. = 16,500 sq.m., which is divided into sections for dies, central tool grinding (branches in mechanical workshops), jigs and tools, tool hardening (not inspected) and side rooms (not inspected; for gauging and for gauge drilling machines), has full equipment of milling and grinding machines etc., and a special apparatus for end measures.

The building for mechanical processing, 350 m. x 110 m. = 38,500 sq.m., with the office building at the top, has about 3,000 machine tools, mostly American. production lines for crankcases, cylinder blocks and cylinder heads are equipped for mass production on a large scale and have multi-spindle drilling and screw cutting machines for all purposes. The crankshaft section is very extensive. A bottle-neck occurs in the simultaneous turning of all spindles and main journals and even more in the grinding of thrust bearings. The hand finishing is as carefully done as in Germany.

valves are made in the works.

The gear-cutting section has very fine equipment, including machines for double helical gear made by themselves.

The works has a forge but crankshafts and connecting rods are obtained from outside, as their own equipment is inadequate.

The hardening section has very modern equipment and assembly is well organized; there is very little finishing and adjusting.

personnel: total, 18,000; main shift about 9,000. women, 28%. checking staff about 12% of the number of productive staff.

output: About 13 engines daily for the main shift, i.e. some 500 pr.month. increase to 600 is possible without any great difficulty. some 5% are equipped with reversing gear, for installation in motor torpedo boats. The rate of work is comparable with the German. rejects: 14% conversion to another type of engine would be difficult as there are many special machines. There is no light metal forge or foundry.

The following are obtained from outside:-

forged and cast parts, from a foundry

19 km. away.

magnetos and sparking plugs from

Electrozavod, Moscow.

carburettors from works No.33, Moscow.

this is the best and most up-to-date works among those visited.

works No.26. "pawlow"

(pp.22-27)

Rybinsk.

visited 9th April 1941.

illustration:

Layout, works 26. Rybinsk. scale: 1,2,500

Allgemeiner Betrieb und  
 Maschinenreparatur  
 Eingang  
 Garderobe, 3500 Haken  
 Grundlegen  
 Härterei  
 Kino für 2000 Personen  
 Laboratorien  
 Mechanische Abteilungen  
 Mech. Prüfraum  
 Montage  
 Kleinlaufstände  
 Prüfstände  
 Richtung Bahnlinie  
 Richtung Wolga  
 Rückmontage  
 Schweisserei  
 Siedlung  
 Spektral - Anal.  
 Speisehaus  
 Strasse nach der Stadt  
 Rybinsk  
 Therm. Labor.  
 Verwaltungsgebäude  
 Werkzeugbau  
 Wohnblocks  
 Zaun  
 3 stöckig

general operations and  
 machine repair  
 entrance  
 cloakroom, 3,500 hooks.  
 fields  
 Hardening  
 Cinema for 2,000 people  
 Laboratories  
 mechanical sections  
 mechanical testing room  
 Assembly  
 oil supply stations  
 test benches.  
 to railway  
 to the volga  
 dismantling (?)  
 welding  
 workers' settlement  
 spectral analysis  
 canteen  
 road to the town of  
 Rybinsk.  
 thermal laboratory  
 offices  
 tool construction  
 blocks of flats  
 fence  
 3-floored.

situation, North of the railway station between the railway and the volga on the road leading from the town on the north-west. distance by road from the railway station 2 km.; by air about 1.5 km.

Products, water-cooled 12 cylinder in-line engines, Hispano Suiza licence. formerly types M 100 and 103, now M 105 P in large scale series. replacement parts for M 103 in addition.

plant, see Layout.

built-up area, 90,000 sq.m.; area of manufacturing premises somewhat less (86,000 sq.m).

Equipment, The section for materials testing has all well known instruments and testing machines on the international market, including that for mechanical testing, spectral analysis and a special laboratory with twelve furnaces for testing heat resistance. on the second floor are extensive laboratories for organic and inorganic chemistry; petrol used at present for military aviation has been shown to have an octane value of 93 to 95. A testing machine for valve springs, by which the springs are charged with electrical current and which they have made themselves, should be mentioned particularly.

The jig and tool shop is in a nearby building of three floors (100 m. x 350 m.), area about 10,500 sq.m., with about 500 machines and 750 workers. cutting and gauging tools as well as jigs can be made. The gauging room, which

is near the gauging drilling room, is particularly extensive.

In the general workshop, machine tools of the mechanical section are kept in repair and special machines are made.

In the mechanical section the machinery is not so well adapted to mass production and its condition is not so good as at Moscow; the machining does not show such a clean finish as the Germans require and is not up to the standard in works No. 24; accordingly much finishing and adjusting is done by hand.

The crankshaft shop is particularly extensive (over 5,000 sq.m.)

Equipment in the section for large parts and the control shaft section is antiquated and undoubtedly points to a bottle-neck in the latter. (The equipment used for cylinder liners, piston rods and small parts, in the gear wheel and automatic departments, and in welding and hardening is also referred to.)

The assembly makes a good impression, with two assembly lines, each of fifteen erecting trolleys. There are twelve oil supply stations and twenty-two open test benches.

personnel: Total: 15,000; main shift roughly 8,000.  
women: 30%.

output: About 450 engines per month (12 per day in the main shift). Increase to 600 is possible. Gen engines form a third of the present output; the remainder are not adapted to firing through the hub of a propeller. Transfer from M 103 to M 105 is going on steadily.

There are very few single purpose machines for large scale series production. Conversion to another type would be easier here than in works No. 24. As in the case of the Moscow aero engine works, the following have to be obtained from outside:-

forged and cast parts.  
magnetos and sparking plugs from  
Electrozavod, Moscow.  
carburettors from works No. 33,  
Moscow.

The standard of this works, though not so good as that of works No. 24, is still very high.

works No. 19. "Stalin"  
Molotov.  
visited 12 April 1941.

(pp. 28-33)

Illustration:

Layout, works 19. perm (Molotov) Scale: 1:2,500  
(p. 33)

CONFIDENTIAL

/ Altbau



Altban  
bleibronze Ausgie-  
sserei

Büros  
Erweiterungsban  
galvanik  
giesserei  
Härtere  
Haupteingang  
Lehrenbohrwerk  
mechanische  
Abteilungen usw.

montage  
montageband  
Oleinlaufstd  
platz für  
erweiterungen  
prüfstände  
siedlung  
stock  
teil-montage  
verwaltung  
werkstoffprüfung  
werkzeugausgaben  
werkzeughau  
zaun  
zur stadt perm  
3-stöckig

Old building  
Lead bronze foundry

offices  
extension building  
galvanising  
foundry  
gardening  
main entrance  
cange drilling work  
mechanical sections etc.

Assembly  
Assembly belt  
oil supply stations  
space for extensions

test benches  
workers' settlement  
floor  
part assembly  
offices  
materials testing  
tool distribution  
tool construction  
fence  
to the town of perm  
3-floored

situation: About 5 km. south of the town. distance by road from the railway station 8.3 km.

products: Air-cooled 9 cylinder radial engines, M 25B and M 62, Wright Cyclone licence. preparations are being made for conversion to a twin radial engine. During conversion the works is being used as an auxiliary establishment to the Moscow works and for production of AM-35 parts.

plant: see layout of buildings available and sections inspected.

Area of factory plant inspected: about 90,000 sq.m.; built-up area (including extension buildings); some 160,000 sq.m. further extensions are possible.

Equipment: A very well equipped section for materials testing was inspected.

The foundry makes a very good impression, though its equipment is not so modern as pantal for example. One cylinder was cast every 3.5 minutes. Large castings were made in a furnace of their own construction. Some of the processes were done in the basement. A particularly fine dressing shop for electron metal parts was placed near the electron foundry. The figure given for rejects, 3%, seems improbably low. A museum of castings was inspected.

In the very extensive mechanical section the machinery is more widely spaced than at No.26, Rybinsk, and the work is decidedly less systematically organised than at No.24, Moscow, and No.26, Rybinsk. Large parts are made on lines and small parts in groups.

Light metal stampings for crankcase blanks are brought from outside.

The production line for pistons is poorly equipped in comparison with the others. The best equipment is found in the production of cylinder liners, with one line for the air-cooled cylinder liners and another for those of the AM 35 A.

A large number of idle machines can be brought back into operation on the conversion. Supervision and discipline are not so good as at works No. 24, Moscow, and works No. 26, Rybinsk. The new mechanical section is equipped in part. Neither section has received new machinery although this would have been desirable on the conversion. An adjoining part of the extension has some equipment.

Attached to the mechanical section is a new hardening section with new modern furnaces. Adjoining it is a newly equipped bearings foundry for lead bronze bearings, with excellent equipment. The bushes are blocked in a newly equipped galvanizing section adjoining.

The assembly show the clean finish of the work and the absence of need of the finishing and adjusting usual in Germany.

The tool building is about 15,000 sq.m. Little equipment had been left in the jig and tool section.

personnel: total, 17,000; main shift roughly 9,000.  
women; 30%.

output: 500 per month, corresponding to 15 per day for the main shift.

Capacity of the works; 600 per month.

The types under construction at present, M 25 B (90%) and M 62 (10% of the total output), are going out of production within one month. The future type is not decided upon; a twin radial engine is contemplated. License for the 18 cylinder Pratt & Whitney double wasp has been obtained but another Wright license is being sought. Initial production can hardly be effected in less than ten months. Building is still in progress.

The works is even more self-sufficient than the others, being as far as is known the only engine works with its own light metal foundry; this is perhaps due to the difficulty of communications. Steel blanks might be obtained from the Ural steel works nearby. The only important parts obtained from outside are magnetos, sparking plugs and carburetors. In all three of the engine works inspected, these parts are obtained from the same sources.

Ball bearing works No. 1

(p. 34)

Moscow.

visited 16 April 1941.

situation: south-east of Moscow on the Ball bearing (Scharikopodschipnikowskaja) street.

products: ball roller and spring roller bearings for tractors, automobiles, aeroplanes and the electrical industry.

plant: the buildings are rather old. One, of 800m. x 300 m. = 240,000 sq.m., is the largest seen during the

CONI

/ whole

whole tour. The administrative offices are in a building of six floors communicating directly with the main works building.

Equipment: The works itself makes all parts required for the finished product. Apart from machine tools, the rate of work is very high, and the forged parts show very clean finish.

output: with a total area of over 300,000 sq.m., personnel and output must be very high. Spring bearings are a speciality and the works should be able to make precision bearings. In one section bearings for special purposes were made with the greatest accuracy. Bearings were from 3 mm. to about 300 mm. bore.

Light metal rolling mill No.150  
Stupino near Moscow.  
visited 14 April 1941.

(pp.35-37)

Illustration:

Layout: Light metal rolling mill No.150.  
(p.37) Stupino near Moscow.  
sketch only. Not according to scale.

phf. Stupino	stupino railway station
giesserei	foundry
Hauptstrasse Moskau-	main Moscow to Kaschira road
Kaschira	
Lehrlingswerkstätte	gauging shops
mech. Antrieb	driving machines
n. Kaschira	to Kaschira
n. Moskau	to Moscow
nicht gezeigt	not shown
schmiedepressen	forging presses
verwaltung	offices
Walsstrasse	mill train
werkeinfahrt	works entrance
Zaun	fence

situation: stupino lies 100 km. south south-east of Moscow on the railway line from Moscow to Kaschira and Stalinogorsk, about 7 km. to the north of Kaschira. The works is about 300 m. west of stupino railway station.

products: Light metal plates to 1 mm. gauge. Steel forgings for aeronautical requisites.

plant: see layout.

built-up area, 70,000 sq.m. The buildings are very high and bright, of ferro-concrete construction with steel girders. The main building, in which are the foundry and the mill train, is about 40,000 sq.m. driving machines are in a narrow strip, partitioned off lengthwise. The transformers and the rest of the electrical installation are in the basement below. Another mill train of equal size is to be erected.

Equipment: full equipment from the United Foundry Engineering Company; building structure also probably delivered by Americans. Hardening furnaces are in the same building as the mill trains. some of the equipment for

/ automatic

automatic transport is ready. Although already on serial production, the works is not yet fully equipped. Driving machines and electrical installation of Russian origin.

personnel: Accurate estimate not possible. Almost all operations are done by the machines but 1,000 to 2,000 workers must be employed in each shift. Women, 30-40%.

output: Given as 2,000 t. per month; can be doubled as soon as the necessary annexes are completed.

Wind tunnels at the testing and experimental station, "ZAGI"  
(pp. 38-41)

Ramonskoje near Moscow.  
visited 15 April 1941.

Illustrations:

(1) sketch  
(p.40)

small wind tunnel at the testing and experimental station, ZAGI.  
Ramonskoje near Moscow.  
purpose: propeller, power units and power unit fairing investigations.  
blast velocity: approximately 500 km. per hour.

Messstand  
Rundöffnung  
Spezialentlüfter  
Zuleitungen

measuring stand  
round opening  
special fans  
supply lines

(2) sketch:  
(p.41)

Large wind tunnel at the testing and experimental station, ZAGI.  
Ramonskoje near Moscow.  
purpose: complete aircraft investigations.  
blast velocity up to 300 km. per hour.

Elliptischer Querschnitt  
Fahrstuhl  
Gleisanlagen mit  
fahrbarem Gerüst  
Messstand  
Schaufelräder  
Tulenkschaukel

elliptical cross-section  
Elevator  
track with movable frame  
measuring stand  
impellers  
guide vane.

situation: Ramonskoje lies 45 km. south-east of Moscow on the Moscow-Kolomna railway line. The exact situation could not be ascertained in the darkness (22 hours).

scope of work: Aerodynamic investigations on propellers, power units and power unit fairings (small wind tunnel) and on complete aircraft (large wind tunnel).

plant: As far as could be seen in the darkness, the two wind tunnels are arranged as wings left and right of the administrative buildings. The whole station is accommodated in a building of fifteen floors.

Equipment:

Small wind tunnel:  
The e

The sketch shows the construction.

the technical data are, diameter of the circular opening, 7 m.; blast velocity to 500 km. per hour can be obtained; power consumption required for this 30,000 kw. The part under investigation is placed on a covered frame over the measuring chamber. The measuring chamber is half sunken and in it the registering of the six-component balance takes place. whereas registration by other types is in relation to fixed axes, the construction of this balance makes registration of moments about the centre of gravity of the aircraft possible.

Large wind tunnel, said to be the largest in the world. The opening is an ellipse of 14 m. x 24 m. The sketch shows the ground plan of the closed structure. measuring stand as in the small tunnel. highest blast velocity 300 km. per hour. power consumption of the two impellers 30,000 kw. A movable frame is used for assembly operations. The movable guide vanes at the corners of the tunnel are about 0.80 m. apart.

The bottle-neck lies in the high power consumption, which can be obtained on the normal network only at night and apparently only occasionally then.

Technical data of Aircraft and Aero engines seen. (pp.42-58)

- (1) fighter plane I-61, with illustrations inserted from other sources:-

Silhouettes of single-seater fighter I-187, 617). (Soviet Union. Annex 7) (p.46)

Annotated sketches of single-seater fighter recently introduced (I-187, I-617). (Soviet Union. Annex 8) (p.47)

- (2) General purpose aircraft P-2, with illustrations inserted from other sources:- (pp.48-53)

Illustrations of P-2 in flight (Soviet Union. Annex 13) (p.52)

Annotated sketches of P-2 (Soviet Union. Annex 9) (p.53)

- (3) Aero engine AM 35 A (pp.54-55)

- (4) Aero engine M 105 (pp.56-58)