CENTRAL INTELLIGENCE AGENCY

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SECURITY INFORMATION

INFORMATION REPORT

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SUPPLEMENT TO REPORT NO. 25X1

[redacted]

THIS IS UNEVALUATED INFORMATION

25X1

[redacted]

WORK GROUP [redacted] 25X1

Organizational Setup

1. A group of German scientists [redacted] was detained in Kuryakino Camp, about 2.5 km south-southwest of Bolshevo (55-56N, 37-51E). The team was directly assigned to the Ministry of Internal Affairs, Department IV, which was also referred to by the designation "IV. Special Department."[1] 25X1

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[redacted]

2. It was learned in meetings that Department IV, Soviet Air Force, with its chief, Major General Kutyepov (fnu), was subordinate to MVD General Kaburov (fnu).[1] The position of Major General Professor Kravchenko (fnu) was not determined, since he partially functioned as chief of Department IV and partially as scientist in the field of thermodynamics. Department IV was organizationally composed of nine sections, with subsections which were referred to as TBs. 25X1 [redacted] group was designated TB 4. It was Subsection 4 of Section 9. Soviet Major Zmiyevskiy (fnu) was chief and liaison officer of TB 4. Through the channels of Department IV, the [redacted] group was in 25X1 contact with several plants and institutes, and there were meetings with representatives of the plants and institutes. Major Nikolayev (fnu) from the Scientific Research Institute of the Soviet Air Force (Narodnyy Isledovatelskiy Institut Voyenno-Vozdushnykh Sil)(NIIVVS) and chief engineers of the following aircraft engine plants: Rybinsk, Plant No. 45 in Moscow, Kazan, and the airframe plant in Kuybyshev, visited TB 4 to discuss work orders. The plant in Kuybyshev was, hereupon, ordered to manufacture samples of hollow blades. The TsIAM and VIAM Institutes furnished production records for turbine blades, injection nozzles, and materials; the Ministry for Aviation Industry in Moscow, Department IX, issued general directives; and the Kaganovich Ball Bearing Plant in Moscow supplied records on Soviet types of ball bearings. A ceramic plant in Leningrad was also appointed to contribute information. The expert for propeller construction was allegedly a winner of the Stalin award. Major Nikolayev frequently talked about his visits in England, whereupon conferences with him were held in English. Soviet Colonel Stern (fnu) was the interpreter; he spoke Russian, German, and English.

3. Major Zmiyevskiy stated that by June 1948 the completed TRDW 5 project was to be transmitted to the aircraft engine plant in Kazan for the construction of ten models, which were to be accomplished within two years. In connection with this, Zmiyevskiy mentioned the name of Yakovlev. However, it was not 25X1 determined [redacted] what tasks would be delegated to him.[2]

4. In addition to the research material mentioned in Paragraph 2 above, the German work group was issued research material from English and US technical magazines. Besides evaluations for their own purpose, they had to prepare extracts for the Soviets covering the field of materials, especially for turbine blades; precision casting and precision forging; and aerodynamic research for supersonic flying.

Activities of the Various German Experts

5. Prior to the end of 1947, four projects had been worked on. All efforts then were concentrated on the development of the TRDW 5, TRDW being the Soviet designation for turboprop engines, and No. 5 indicating the fifth project of TB 4.

6. The entire research program covered the following:

a. Project 1: A turbojet engine designed on the basis of the BMW. The project was not considered important by the Soviets.

b. Project 2: A turbojet engine equipped with a preheater. [redacted] 25X1 designed this power plant for a four-engine aircraft which was supposed to fly the distance between Moscow and New York in nine and a half hours. This project was of no interest to the Soviets.

c. Project 3: A turboprop engine without a preheater.

d. Project 4: Preliminary developments for Project 5.

e. Project 5: Turboprop engine TRDW 5. The engine was also referred to by the designation TRDW 50.

f. Project 6: The installation of turbojet engines in PT boats. (see Paragraph 10). Other activities [redacted] included the improvement of the Schmidt pulse jet, as well as an aircraft for this power unit, and the development of internal combustion engines. All activities of the group were handicapped by the lack of trained German engineers. The Soviet assistance mentioned in Paragraph 2 above finally facilitated the exact duplication of the TRDW 5. 25X1

7. Following are the technical specifications of the TRDW 5 turboprop engine:

a. Total power: 7,500 hp.
b. Power available: About 5,000 hp.
c. Revolutions at cruising speed: 4,500 to 5,000 rpm.
d. Revolutions at maximum speed: 7,000 rpm (some calculations included revolutions of up to 9,200 rpm).
e. Fuel consumption: 0.0008 to 0.009 kp per kg air mass flow.
f. Specific fuel consumption: 1.2 to 1.5 kg/kp/hr respectively 230 to 235 g/hp/hr.
g. Fuel: Kerosene. Water injection and after-burning were not projected.
h. Length: about 7,000 mm.
i. Diameter: 1,000 to 1,100 mm.
j. Weight: 900 to 1,000 kg and, according to other statements, 1,800 to 2,000 kg. The lower weight probably referred to the engine without propeller and gears.
k. Compressor: Seven-stage axial flow compressor.
l. Compression ratio: First projected with 1 to 6.5, and finally increased to 1 to 8 ratio.
m. Combustion chambers: Two rings of six combustion chambers each.
n. Turbines: One two-stage unit and one single-stage unit.
o. Air mass flow: 18 to 25 kg/sec.
p. Combustion temperature in burner cans: 1,070 to 1,250 degrees k.
q. Temperature of turbine blades: 1173 degrees k.
r. Temperature forwarded of first turbine stage: 1,193 degrees k.
s. Specific weight: 0.45 to 0.5 kg/kp.
t. Efficiencies: Diffuser, 85 to 90 percent; compressor, 80 to 85 percent; turbine, 75 to 80 percent; and the exhaust unit, 80 to 90 percent; total efficiency 85 to 87 percent.
u. Propeller: Two five-bladed counter rotating propellers with an outer diameter of 5,000 mm.

The engine was projected for a maximum speed of 950 km/h. Charts indicated altitude curves up to 15 km. No details were available.

Structural Data of the TRDW 5

8. See Attachments Nos. 1 to 14 for sketches [redacted] representing the TRDW-5 engine and some of its individual parts. 25X1

a. The diffuser was a spot welded construction of duraluminum. The outer diffuser ring had an inner intake diameter of 570 to 600 mm and a maximum outer diameter of 1,050 to 1,150 mm. The outer ring was mounted on the front propeller and the center section of the diffuser was fitted to the rear propeller. The adjustable intake cone (Attachment No. 3, b) had a diameter of about 560 mm and was to control the intake flow according to altitude and speed. This unit was also to be constructed of spot welded duraluminum. Control was effected by a shaft which was also connected to the exhaust cone through the hollow main shaft. Thus, the ratio of air mass flow to thrust could be controlled. The automatic governor was installed in the exhaust cone. However, there were other tested versions available, and it was not yet decided which one would finally be chosen for the TRDW 5.

b. The propeller was to be adjustable from feathered to full power position, about an angle of 90 degrees. The governor was similar to the latest German designs used on the Me-109 and Me-110. The angle of pitch of the propeller blades was to be controlled automatically, and a double planetary gear was designed to drive the unit.

c. The gear (box) had a total diameter of 520 to 560 mm, which could only be achieved by using special alloys for the bearings. These alloys were allegedly not available in the USSR and were possibly [redacted] 25X1 25X1

[redacted]

d. TRDW 5 was projected with a seven-stage axial compressor with a final compression ratio of 1 to 8. Previous versions were designed with a compression ratio varying between 1 to 6.5 and 1 to 7. The compressor casing was to be assembled from two longitudinal shell parts which were to be screwed together horizontally at both sides. The vane rings with stator blades were to be fixed to this casing (see Attachment No. 4). They were projected with 60 to 65 stator blades of some high quality steel, equal to the German steel E C Mo 1000 (case hardened chromium molybdenum steel). The stator blades were to be forged. It was not known what packing method would be used to fill spaces between guide vanes and compressor wheels. The type of packing used with the BMW-003 would probably be basic for its development. Rotor blades were to be manufactured of a material equal or better in quality than the German steel V C Mo 140 (heat treatable chromium molybdenum steel). The Soviets frequently emphasized that high quality materials were available. The American lost wax casting method was to be used for the compressor blades. Samples were cast during the spring of 1948. The test casting was supervised by a Soviet engineer who had studied the lost wax casting method in the United States for two years and had returned to the USSR in late 1947. This casting method, particularly well suited for compressor blades, was not known by Dr. Christian and his staff. Since designing activities were not completed by 7 June 1948, it was not known yet how the discs would finally be fixed to the main shaft and how the disc section would be shaped. The discs, however, were to be manufactured of an average steel, usually used for such machine parts.

e. The gear and compressor port was to be die-cast aluminum. In addition to its main purpose, the unit was to hold the front bearings of the main shaft and two vertical and two horizontal spindle sleeves. One of these was to lead up to the bevel gear driving the starter engine, and one was to lead down to the oil pump, while the horizontal spindles were to drive other accessories.

f. There were three versions designed for the first ring of combustion chambers, one with six burner cans, one with eight, and a later version had an annular combustion chamber with sixteen or eighteen fuel injectors. The final version was not determined, but it was believed that the annular combustion chamber would be suggested. Attachment Nos. 7 and 8 represent the version with eight combustion chambers. The port, a casting of an unknown material, was to hold the second and third bearings of the main shaft and had hollow cones to hold the small and large mixing chambers and the support of the fuel igniters (see Attachment No. 8). The material to be used for the combustion chamber liners was a problem frequently discussed but not solved during the period reported on. It was suggested that the outer and inner liner be provided with additional insulated steel coats. The type of insulation material was not known.

g. As was previously mentioned, the combustion ring was projected with eight mixing chambers, each of them having a fuel injector and, in addition, every second one was equipped with an igniter. There were four mixing

chambers with combined starter and cruising fuel injectors and four ordinary mixing chambers. However, as the Soviets did not trust these starter fuel injectors (see Attachment No. 9), the combustion chambers, including the direction of fuel spray, remained in an early stage of development.

h. The first turbine was fitted with its first guide vane ring aft of the combustion chambers. The stator wheel was composed of an outer and an inner ring of steel sheets, about five mm thick. The inserted stator blades were fastened by step notches, and each blade was secured by a hexagon screw. In order to increase stability and density conditions the notches were prepared with a ceramic adhesive substance (see Attachment Nos. 10 and 11). It was not known from what kind of material the guide vanes would finally be made. Possibly the aforementioned ceramic plant in Leningrad was to produce these units. The Soviets abstained from comments. The guide vane ring of the second turbine stage was to be constructed like the first one. There were 55 to 60 stator blades projected for each stage. The turbine discs were coupled via the main shaft. The hollow air-cooled blades were to be forged of nimonic steel No. 80 2.5 to 3.5 mm thick. The above data also refer to the second ring of combustion chambers and to the second turbine.

i. The main shaft was a hollow design with nothing worthy of mention.

j. TRDW 5 was projected with a conventional exhaust nozzle. An attempt was made to develop an improved governor superior to the one which was being used on the Jumo-004.

k. As the group had never prepared detailed diagrams of the lubrication system, [redacted] unable to reconstruct this system. 25X1

l. Cooling air was to be directed through the turbine blades, through spaces between combustion chamber coating and main shaft, and also through slots in the first combustion chamber port into interior sections of the power plant. Furthermore, there was cooling air branched off from the fourth compressor stage into two channels leading to the exhaust unit (see Attachment No. 14).

m. TRDW 5 was projected with a conventional two-cycle starter engine with about four HP running at 3,000 to 4,500 rpm. The design of a practicable shape was the major problem connected with this unit. The installation was projected above the compressor, together with pressure scale and rpm governor. The pressure scale was kept secret. The Soviets accepted this innovation and were highly interested in it.

n. Oil pump generators, rpm governors, flame igniters, etc., were to be supplied from Soviet plants. Tables of dimensions for these accessories were occasionally shown to the German engineers. The automatic switching system for the entire control equipment was a new development of Dr. Engineer Bodo Jordan and Graduate Engineer Guenther Rettschlag. The system was based on an electro hydraulic method with aneroid capsules, bimetal strips (foils), and relays. These units were to guarantee a fully automatic control system to be operated by the gas pedal.

25X1 9. [redacted] the following data contradictory to the other [redacted] statements: The compressor was a 12-stage axial flow unit with an air mass flow of 18 to 20 kg/sec. Compressor blades were to be manufactured of ceramic material. The turboprop TRDW 5 was to fly at a maximum altitude of 12,000 meters with an overhauling time of 100 hours. [redacted] 25X1

25X1 [redacted] the status of development reached by mid-1948 did not allow any conclusions as to maximum altitude and overhaul time.[3]

Turbo Engine for PT boats

10. Another project being worked on simultaneously was the installation of turbo engines in PT boats. The boats were to be about 14 meters long, two or three meters wide, and two and a half to three meters high, and were designed to carry a crew of six or seven. The projected turbo engine was to be less powerful than jet engines developed by the aviation group. The power unit, extending half of the length of the boat, was to be installed in the rear section on the bottom below the cabin. The two air intake apertures were to be on either side of the bow. Two pipes were to conduct the intake air to the turbine. The exhaust pipe led up above the cabin roof and to the rear. A diesel engine was to be installed forward of the turbo engine. The screw propeller was connected by one shaft to both power units. One of the two engines was to be in operation at a time, i.e., the diesel for cruising speed and the turbo engine for combat action.

INFORMATION ON OTHER EXPERT TEAMS

11. [redacted] 25X1

25X1 [redacted] PW experts in Focsani received work orders from Moscow. The activities included a study on the Natter composed by Engineer Breyer (fnu),

25X1 [redacted] The construction of a tank which was suited for the operation under water was considered sport rather than serious research. Another project accomplished in an excellent manner was the modification of German teletype equipment for Soviet use and the development of simplified telephone nets with improved capacity. Studies on pistols with silencers, one-man torpedos, and AA shells and rockets were not seriously considered.

12. Activities of the specialists detained in Krasnogorsk included Boettner's designing of an egg-shaped tank capable of a speed of 65 km/h and a climbing ability of 45 degrees. For protection against hollow charges, the ovate tank was to be equipped with an armor plate which could be retracted during normal operation and kept in the rear of the tank. The extendable (versenkbar) turret was equipped with one 8.8 cm or 12.2 cm tank gun, a two cm AA gun, and a flame thrower. With extended turret the tank was 2.85 meters high and with retracted turret only 2.05 meters. After the project was completed, Boettner was taken to Moscow and never returned.

25X1 1. [redacted] Comment: [redacted] Department IV of the MVD in the last
25X1 sentence of Paragraph 1 and to Department IV of the Soviet Air Force in the first sentence of Paragraph 2. Since [redacted] Department IV is 25X1
subordinate to an MVD general, it is possible [redacted] 25X1
that Department IV was under the MVD. However, from the nature of the work preformed it is probable that Department IV is under the SAF and that the MVD was responsible for the over-all administration of the Kuryakino Camp and for the assignment of German specialists to various work projects.

25X1 2. [redacted] Comment: This may refer to the designer of YAK aircraft. However, since Yakovlev is an expert for small, fast aircraft, it seems improbable that he should be engaged in the development of a prototype aircraft for TRDW 5 engines, which were supposedly projected for bomber aircraft.

25X1 3. [redacted] Comment: The reported 12-stage compressor and the calculated air mass flow of 18 to 20 kg/sec were probably data from a previous project. An air mass flow of 18 to 20 kg/sec would be inadequate for the projected output of the TRDW 5.

Attachments: 15

1. Sketch of the TRDW-5 turboprop engine.
2. Cross section sketch of the TRDW-5.
3. Diffuser, TRDW-5 engine.
4. Compressor, TRDW-5 engine.
5. Compressor rotor blades, TRDW-5 engine.
6. Gear and compressor port, TRDW-5 engine.
7. Combustion chamber port, TRDW-5 engine.
8. Burner can with mixing chambers and fuel injector, TRDW-5 engine.
9. Starter fuel nozzle, TRDW-5 engine.
10. Guide vane and turbine wheel, TRDW-5 engine.
11. Guide vane of turbine, TRDW-5 engine.
12. Turbine blade, TRDW-5 engine.
13. Main shaft, TRDW-5 engine.
14. Air cooling system of the TRDW-5.
15. Turbo engine for PT boats.

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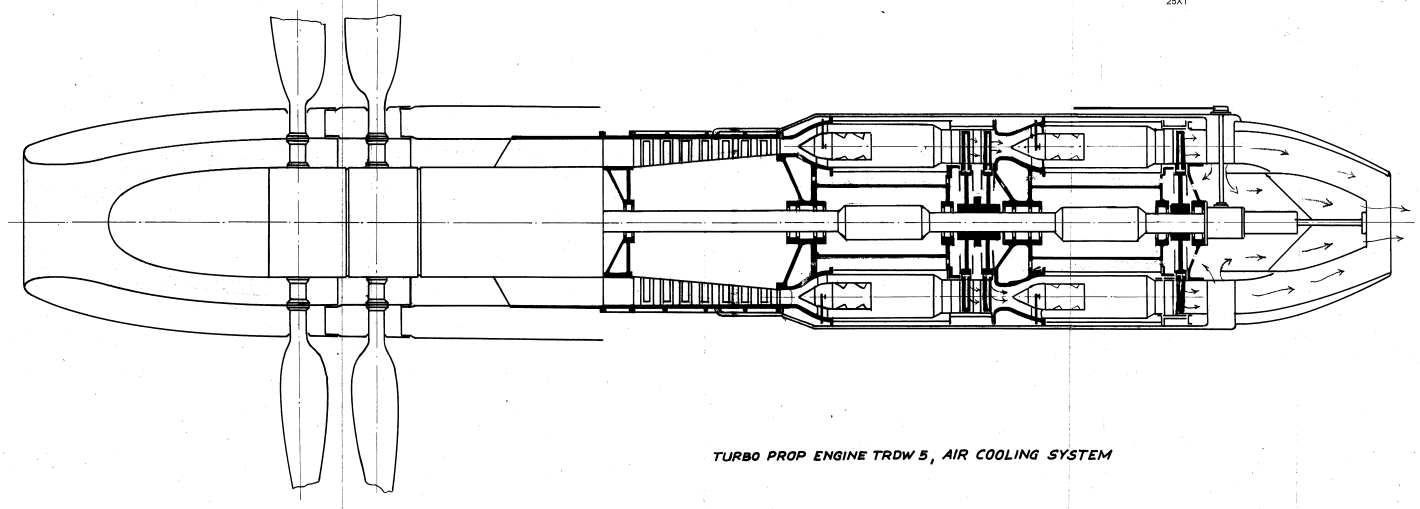
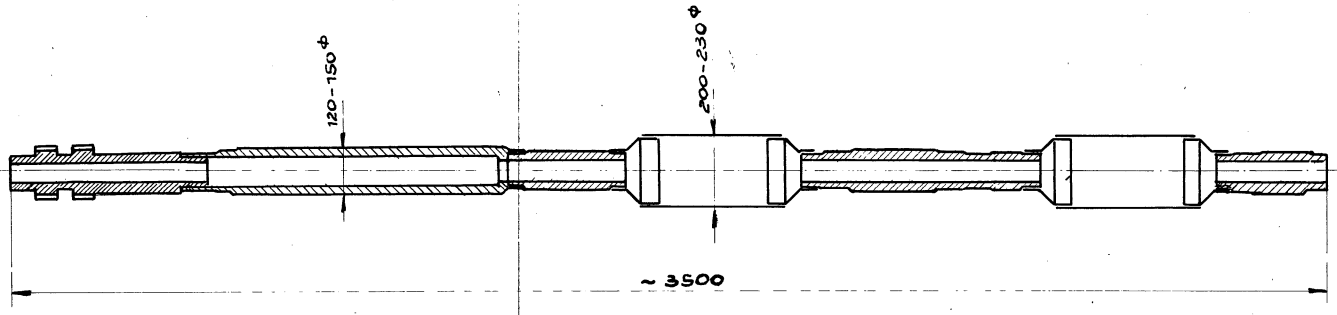
ex 14



TURBO PROP ENGINE TRDW 5, AIR COOLING SYSTEM

25X1

Annex 13



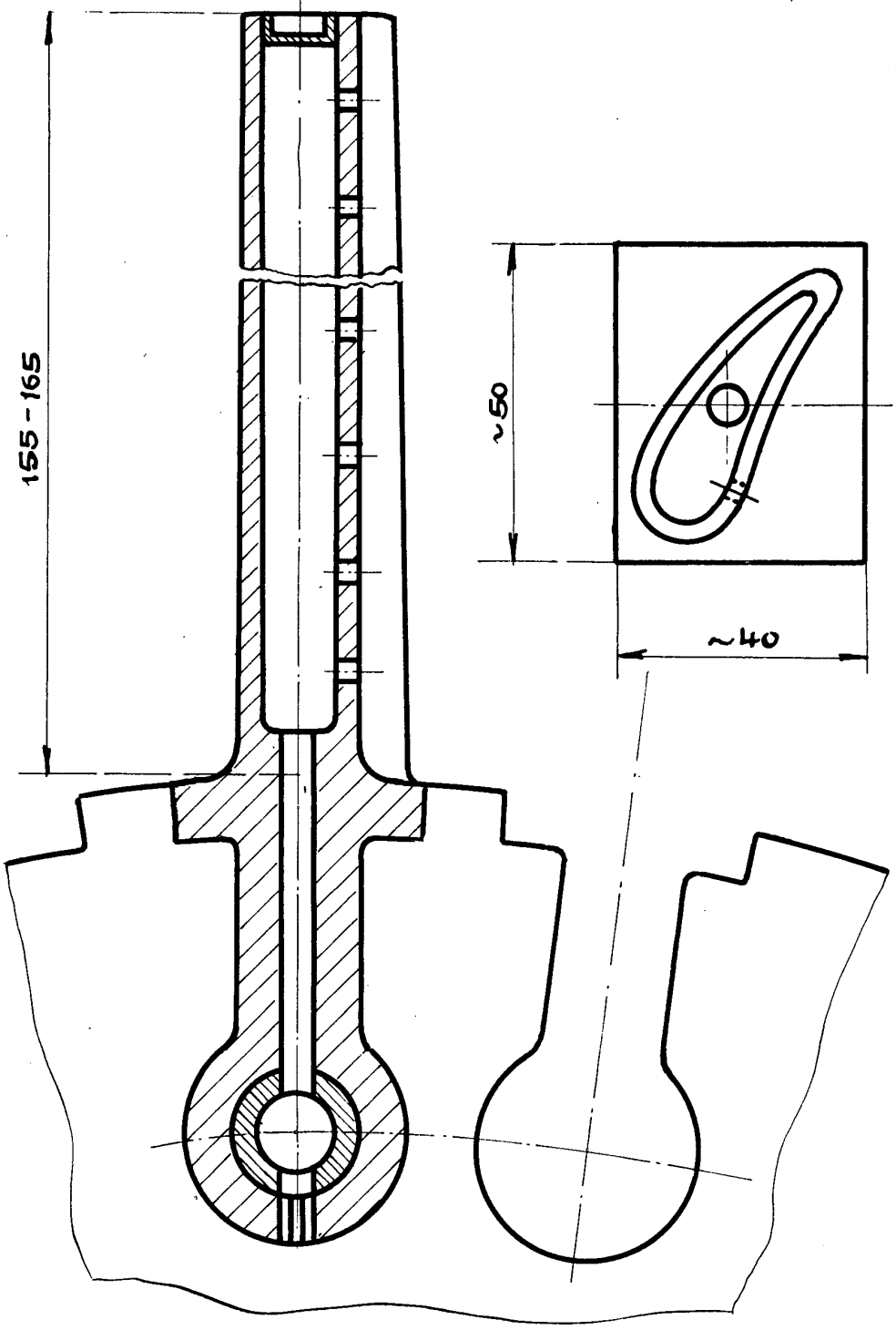
TURBO PROP ENGINE TRDW 5, MAIN SHAFT
(DIAGRAM)

SCALE: ABOUT 1:10

Annex 12

25X1

25X1



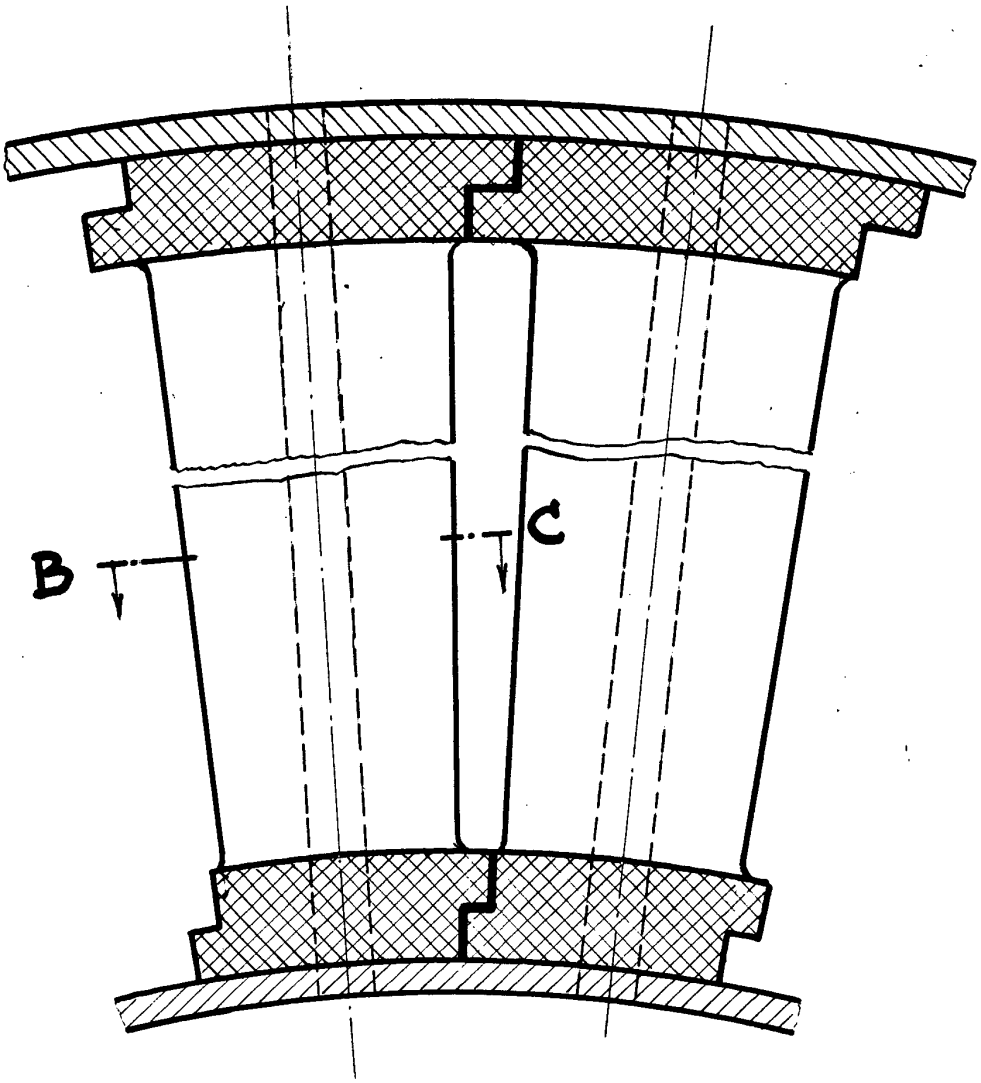
TRDW 5, TURBINE BLADE

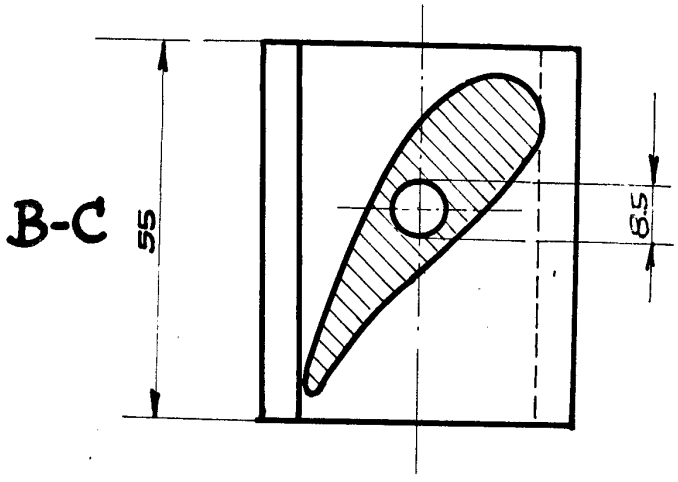
SCALE: 1:1

25X1

Annex II

25X1





TRDW5, GUIDE VANE OF TURBINE

MATERIAL: CERAMIC

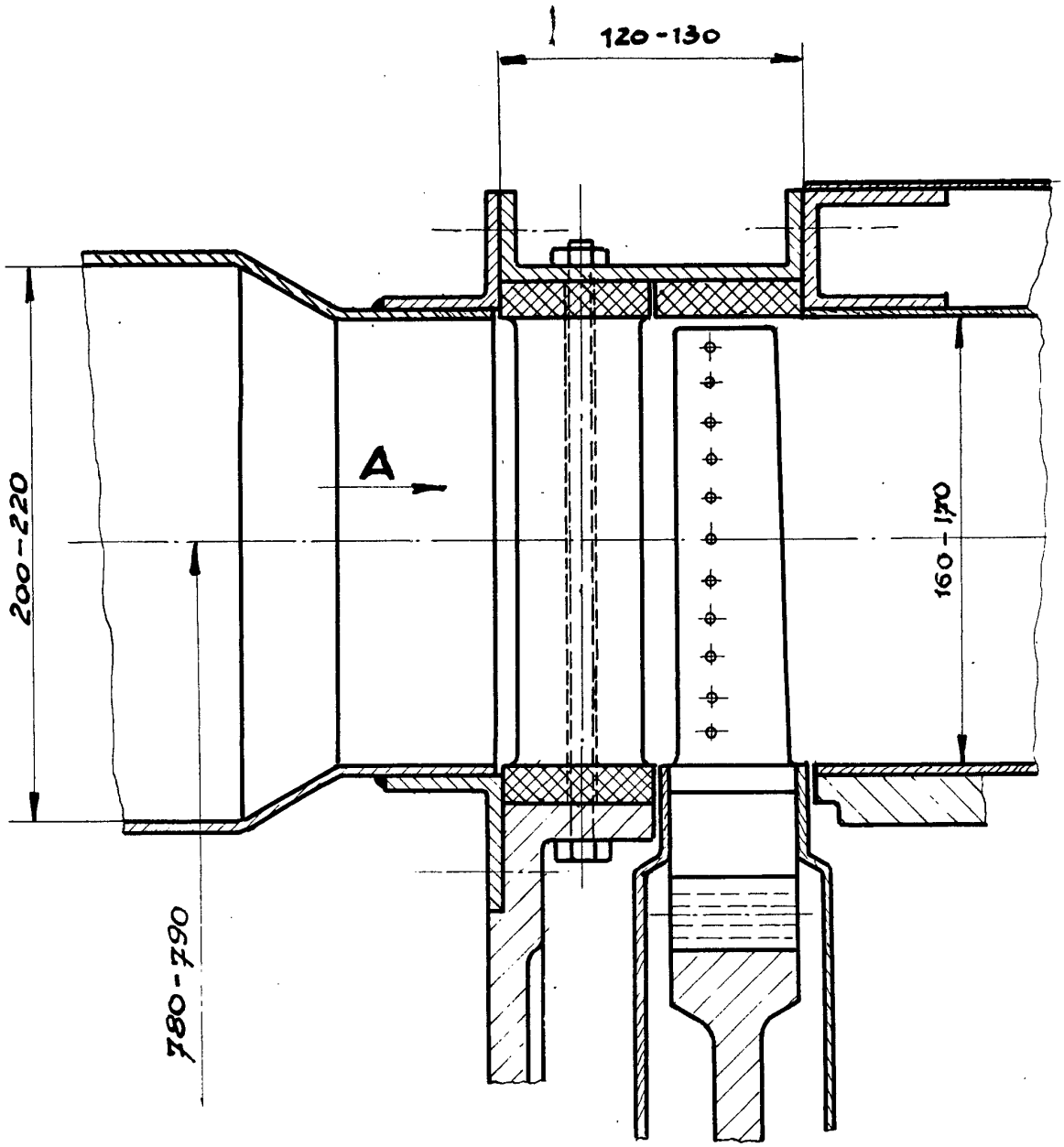
SCALE ABOUT 1:1

25X1

Annex. 10

25X1

25X1



TUBO PROP ENGINE TRDW 5

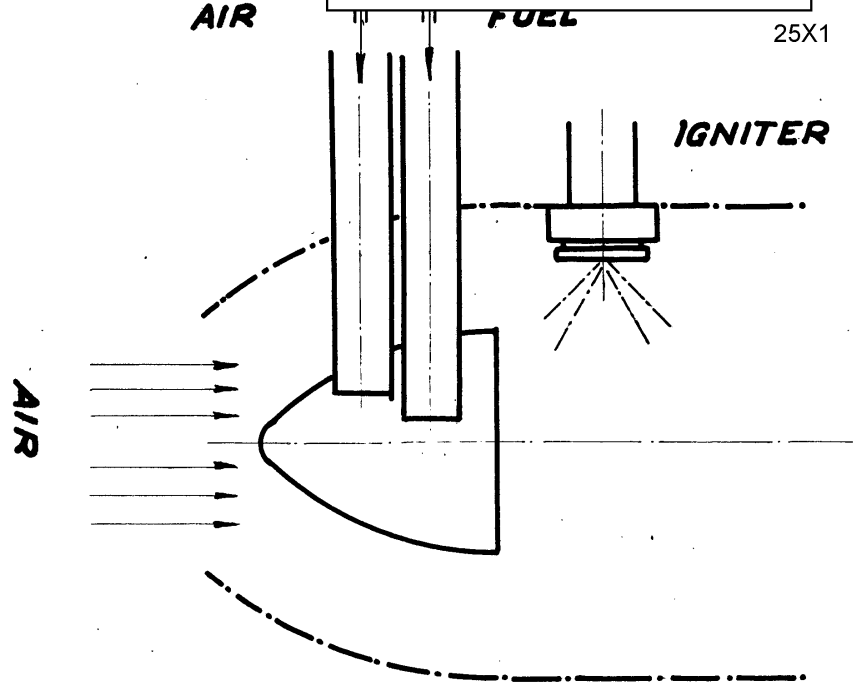
2 TURBINE

GUIDE VANE AND TURBINE WHEEL

SCALE ABOUT 1:2.5

25X1

Annex 9



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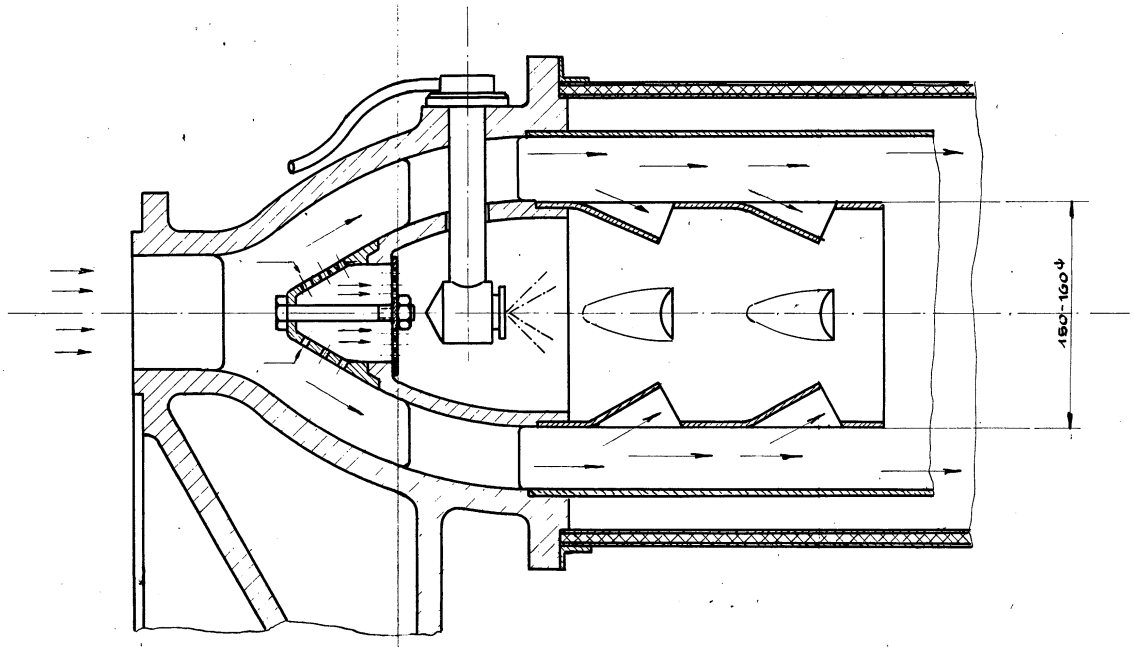
TURBO PROP ENGINE TRDW 5, STARTER FUEL NOZZLE
(DIAGRAM)

25X1

Annex 8

25X1



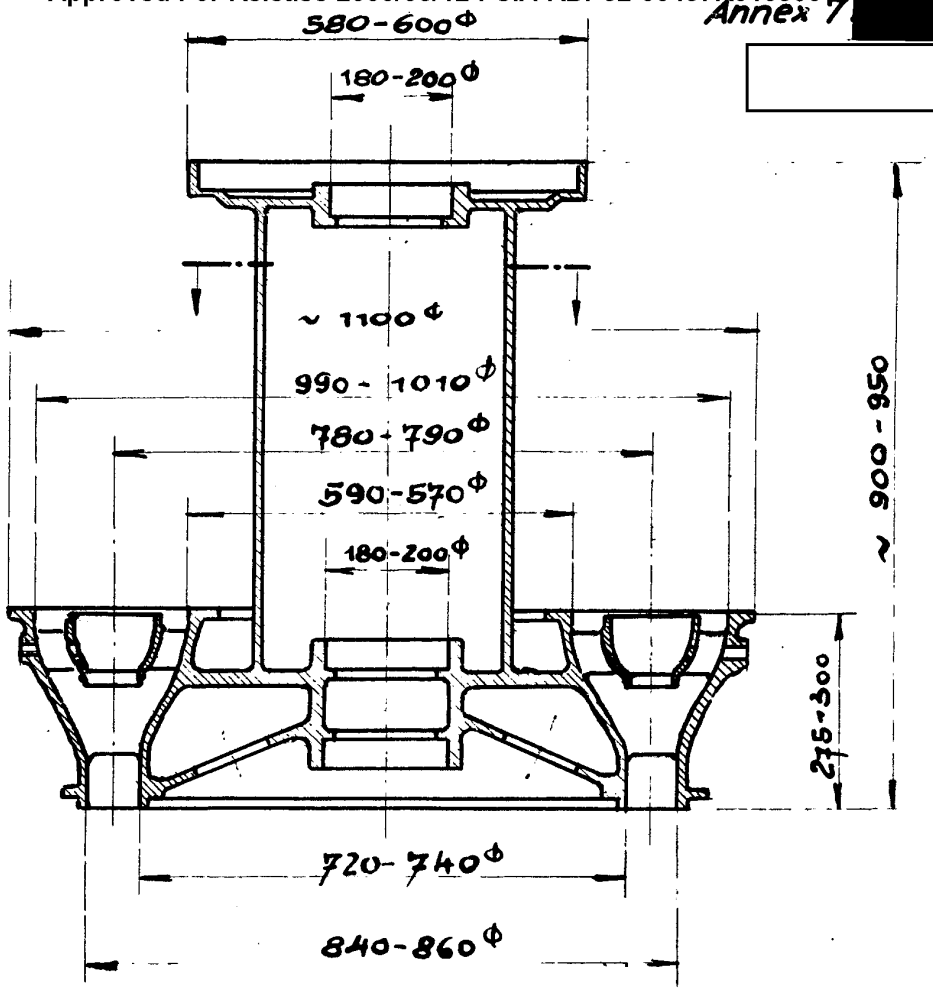
TUBO PROP ENGINE TRDW 5, BURNER CAN WITH MIXING CHAMBERS AND FUEL INJECTOR

SCALE: ABOUT 1:2.5

25X1

Annex 7

25X1



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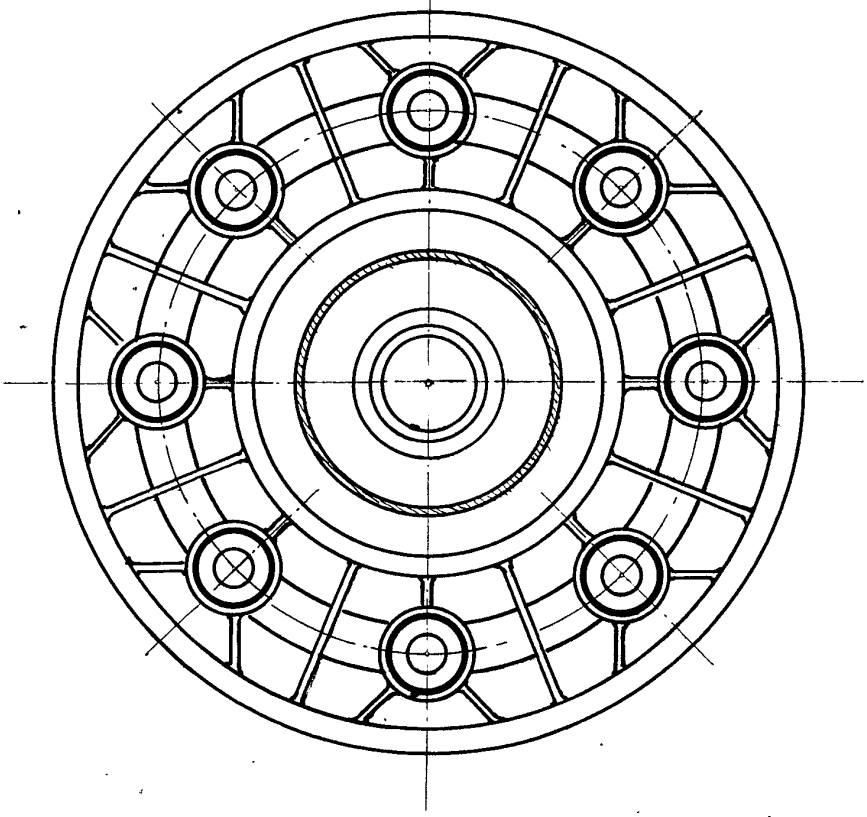

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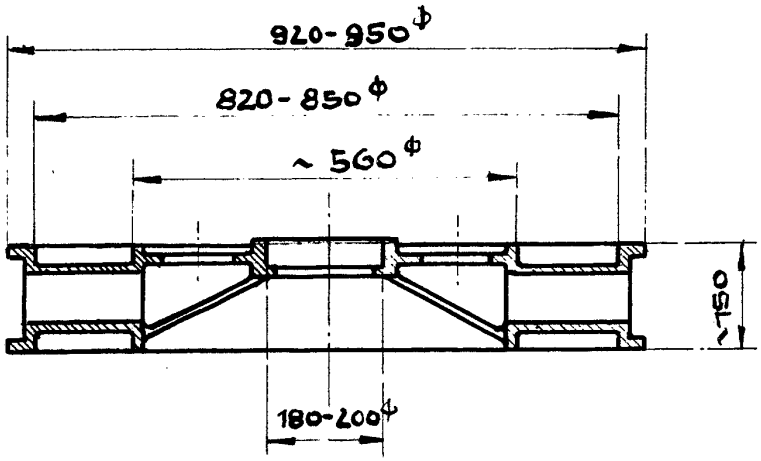
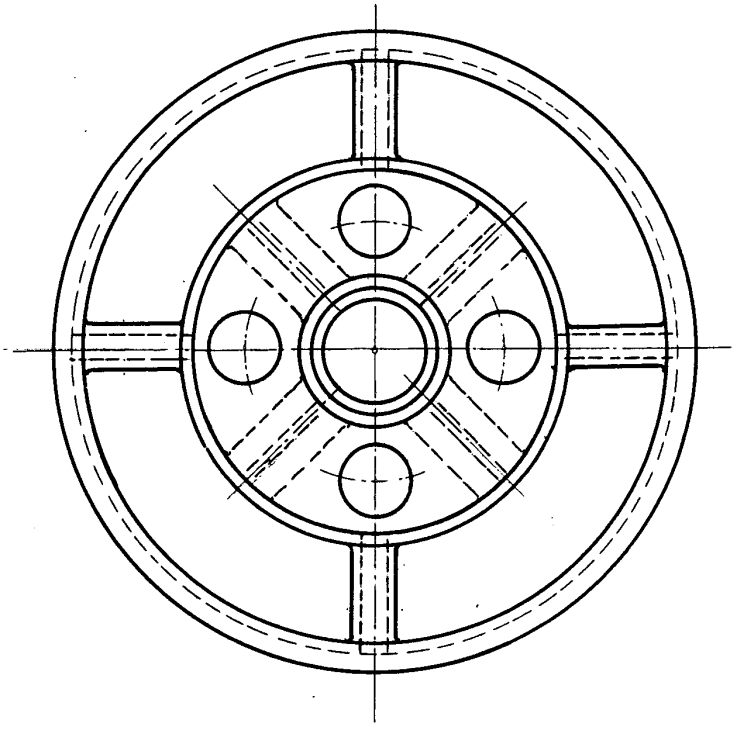
TRDW5, COMBUSTION CHAMBER PORT

25X1

TURBO PROP ENGINE TRDW5





GEAR AND COMPRESSOR PORT

MATERIAL : ALUMINUM

SCALE ABOUT 1:10

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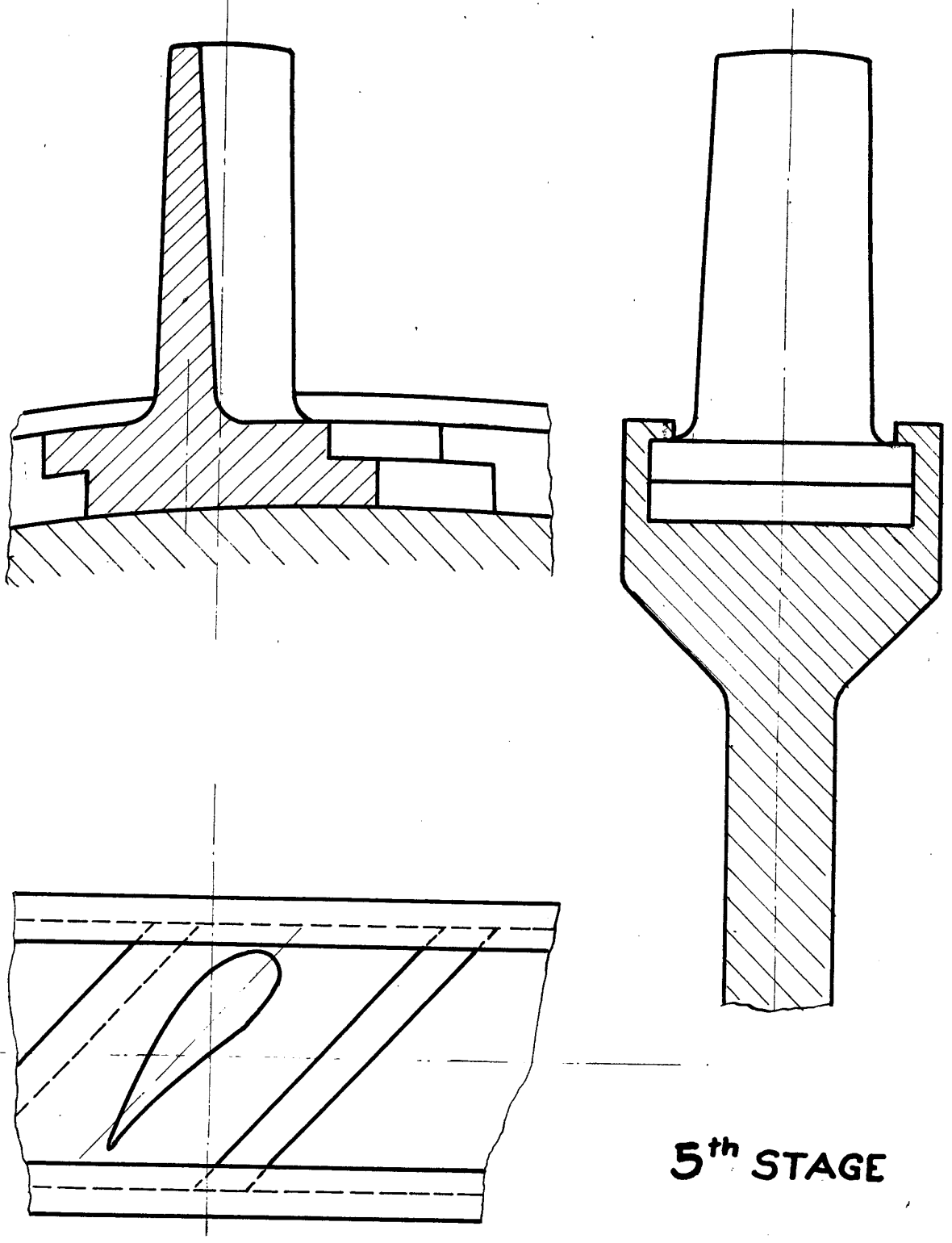
Annex 5

TURBO PROP ENGINE TRDW5

25X1



5th STAGE

COMPRESSOR ROTOR BLADES

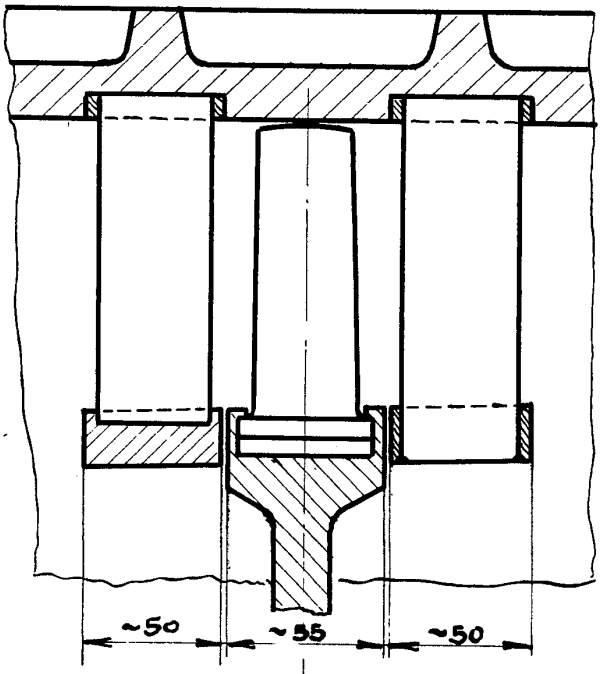
SCALE ABOUT 1:1

25X1

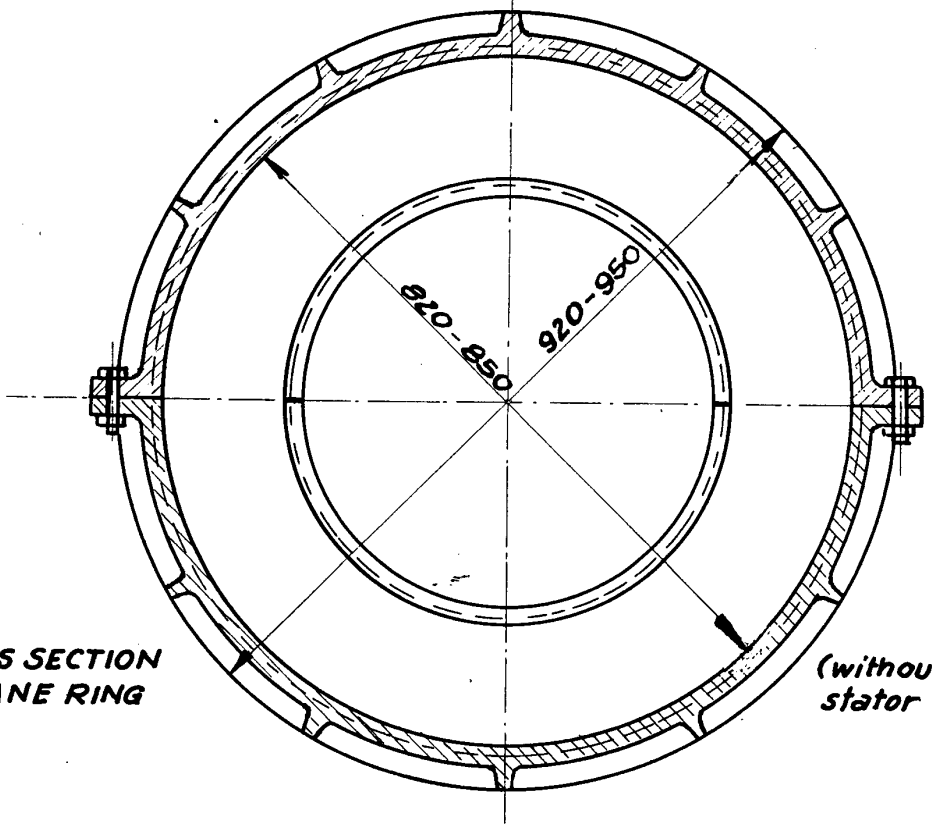
Annex '4

25X1

LONGITUDINAL SECTION



Scale about 1:2,5



CROSS SECTION OF VANE RING

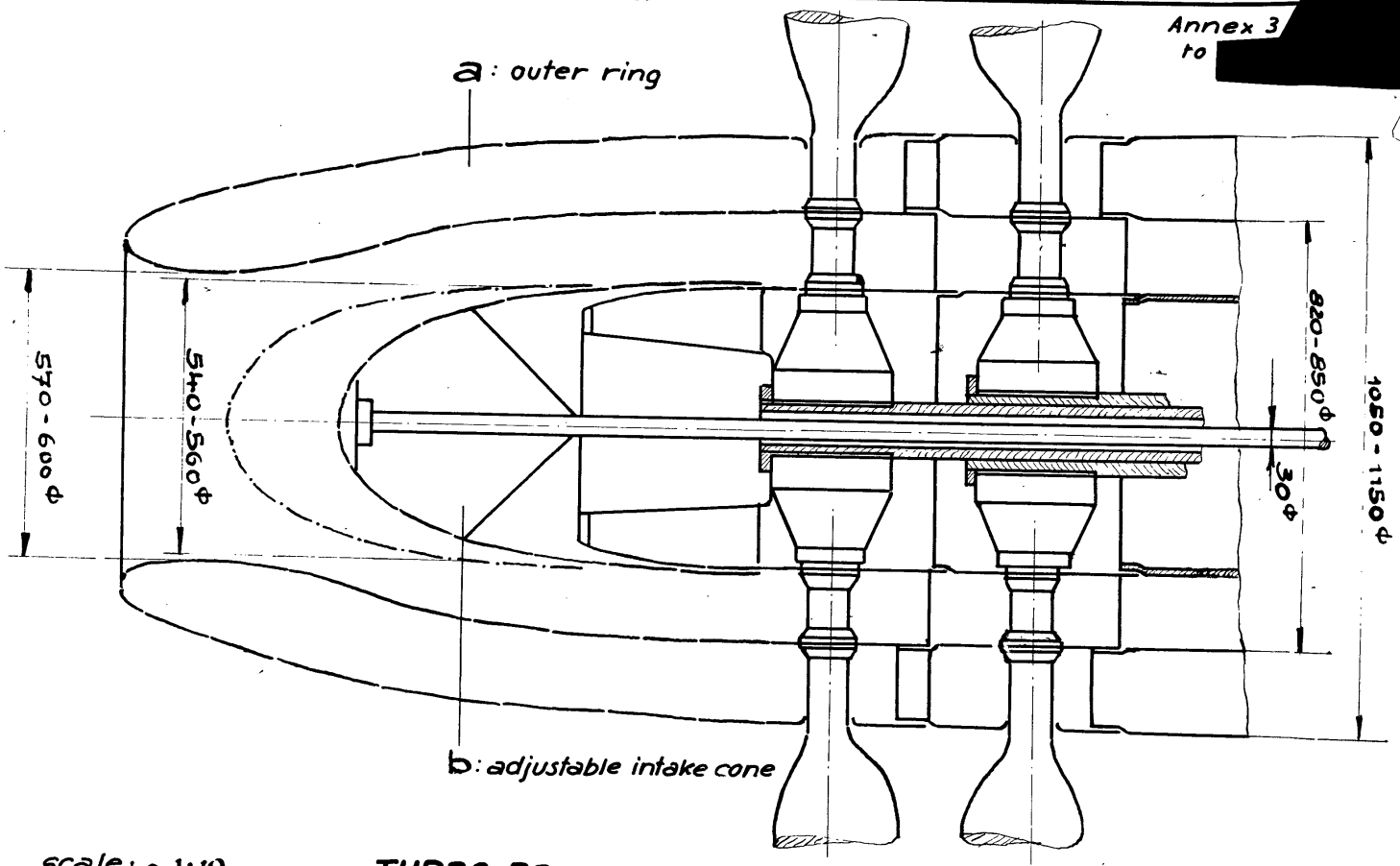
(without stator blades)

TURBO PROP ENGINE TRDW 5

COMPRESSOR

25X1

Annex 3
to



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TURBO PROP ENGINE TRDW5, DIFFUSER

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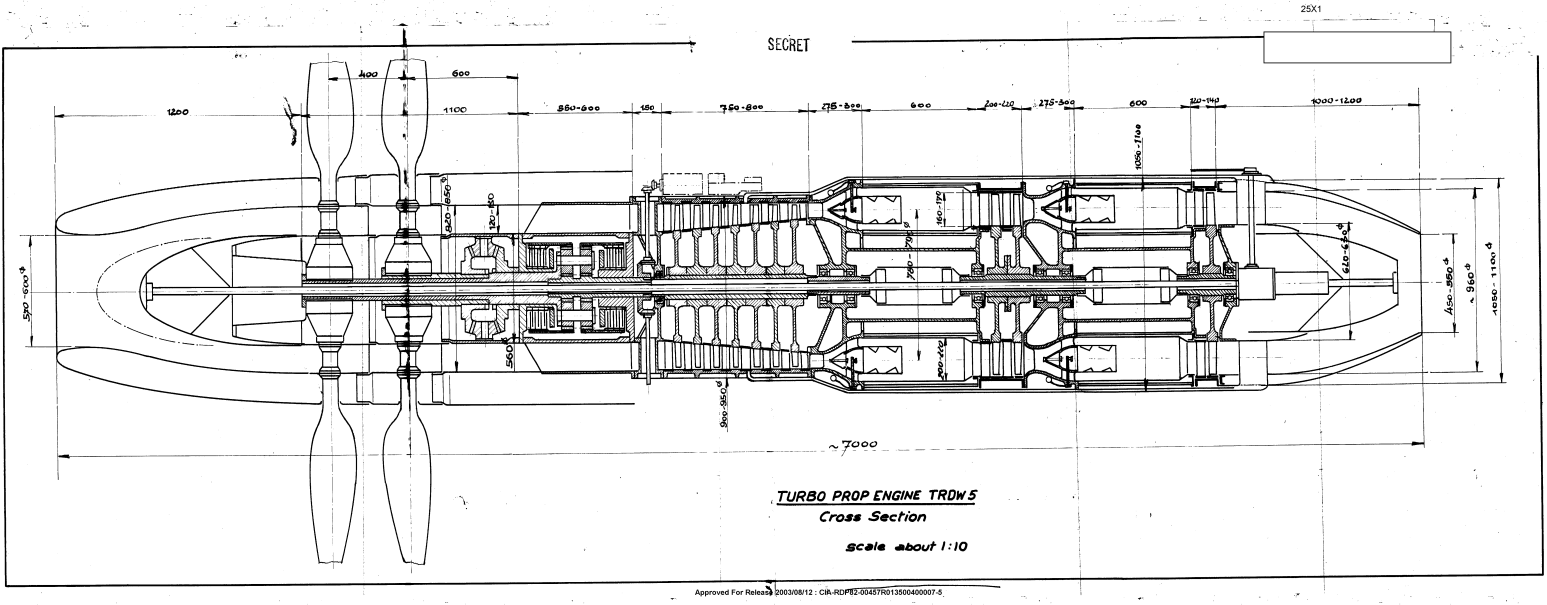


TURBO PROP ENGINE TRDW 5

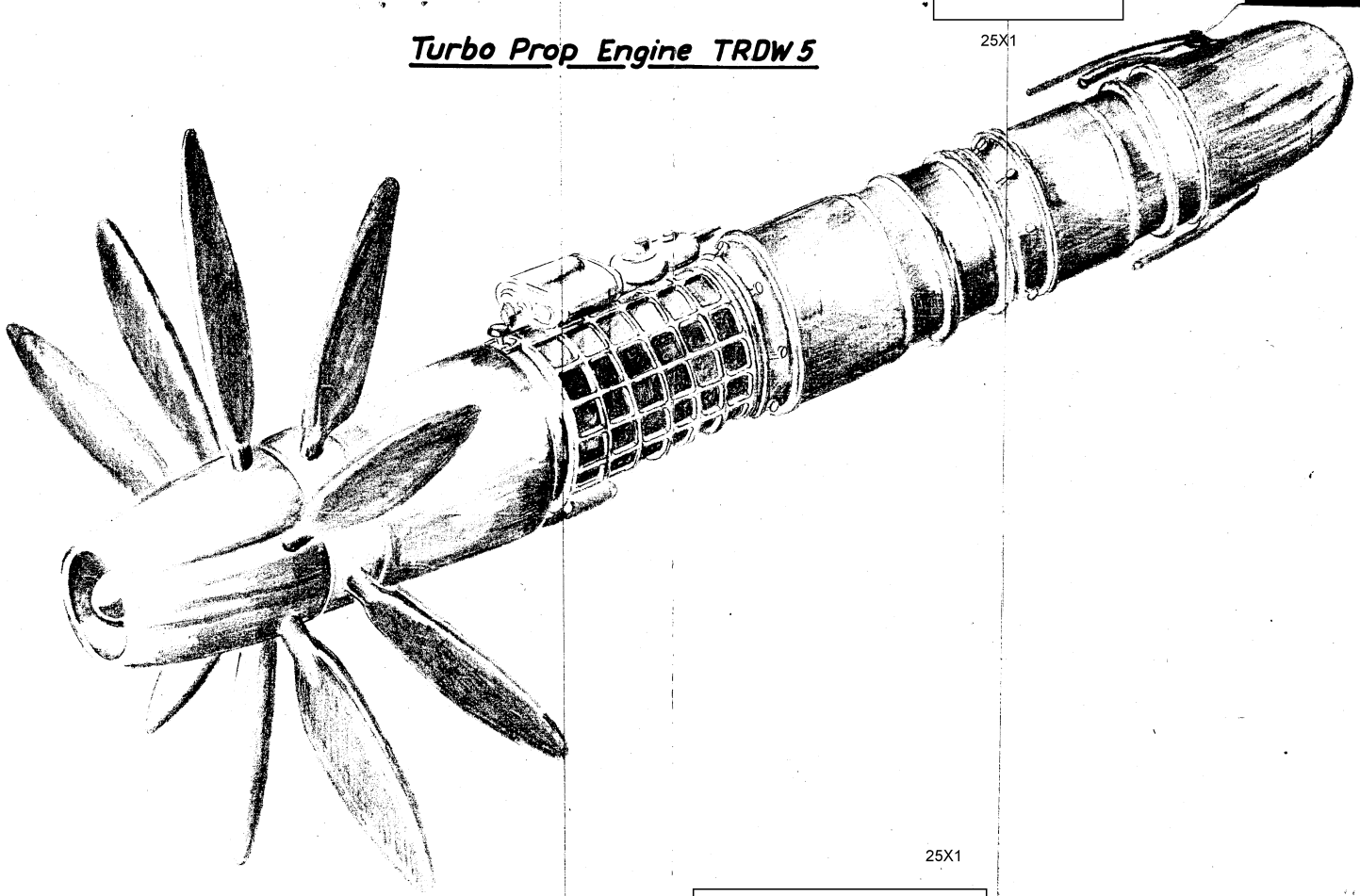
Cross Section

scale about 1:10

Annex I

25X1

Turbo Prop Engine TRDW 5



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Annex 15

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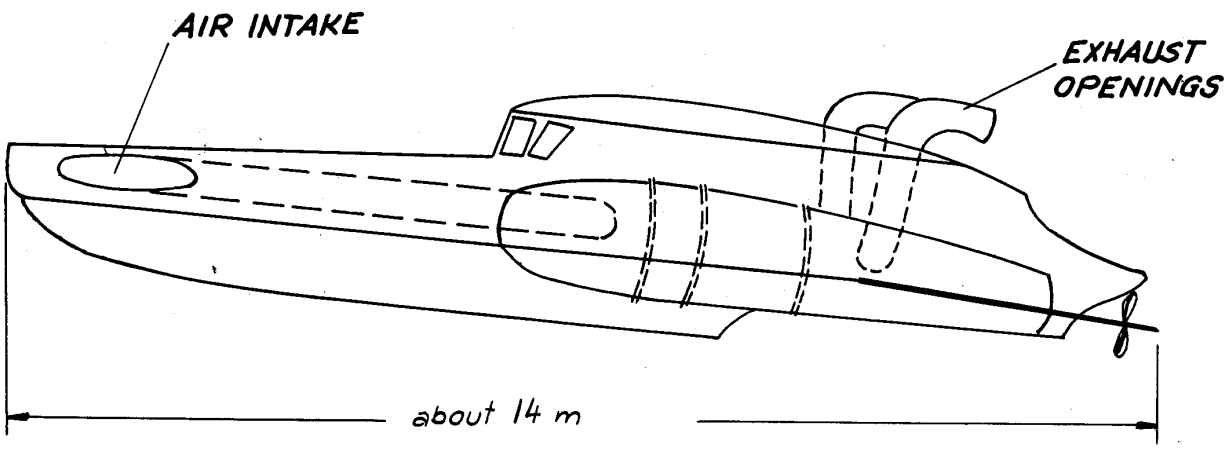
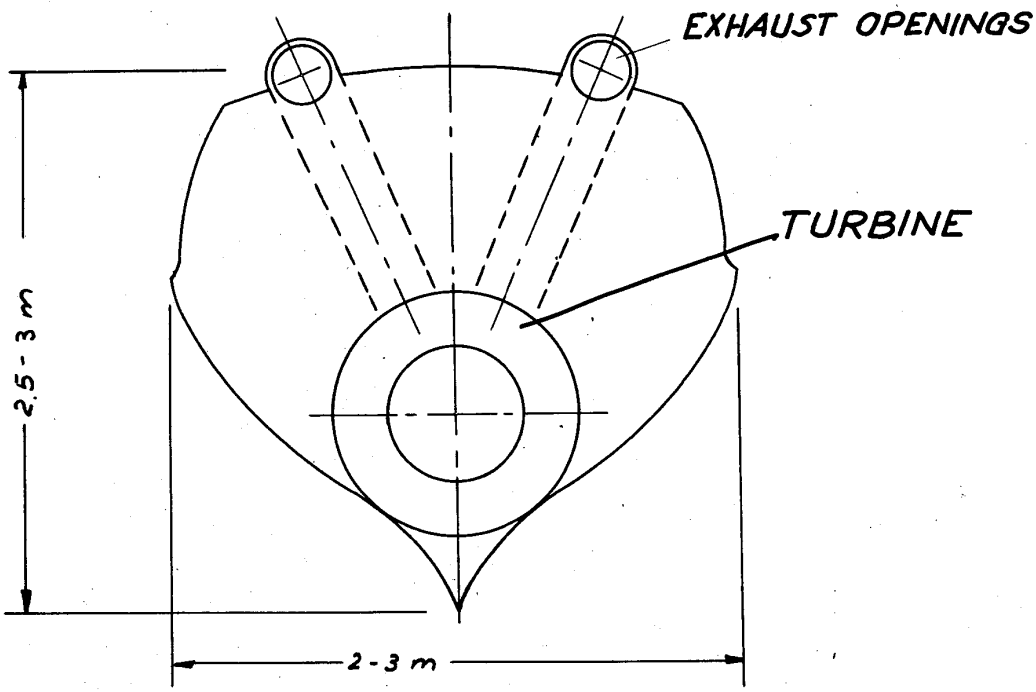
TURBO ENGINE FOR PT BOAT



CROSS SECTION



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Annex 15

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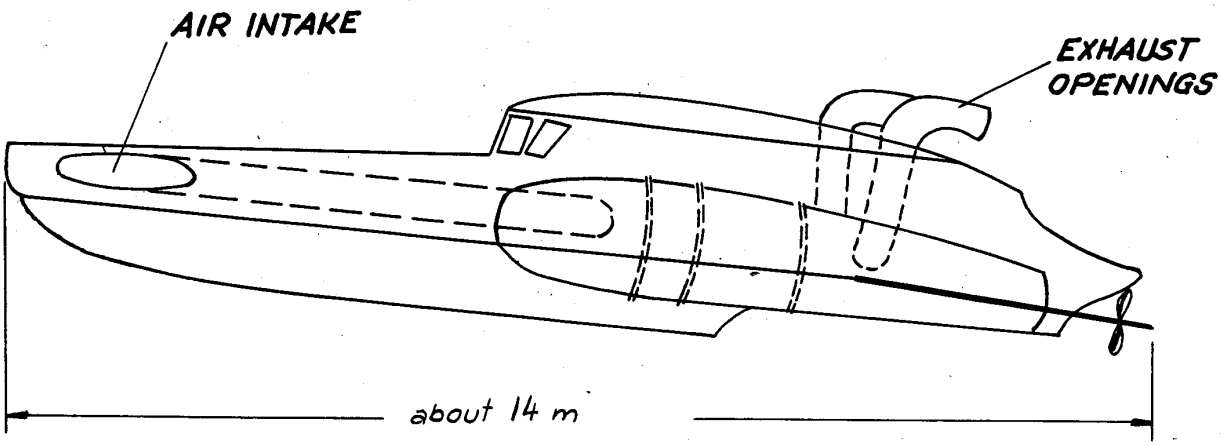
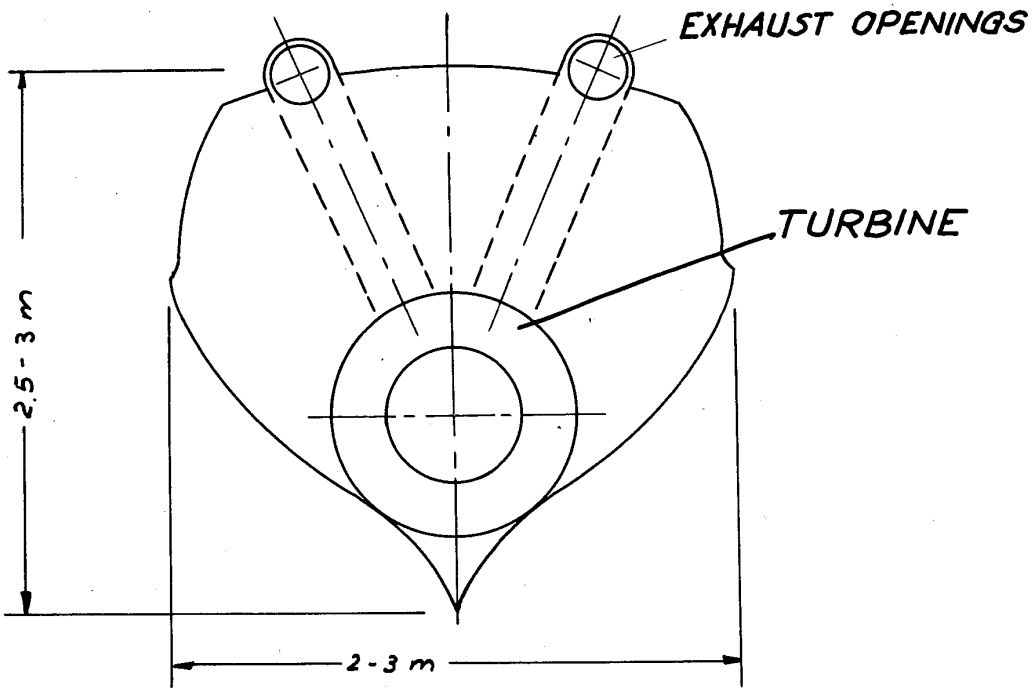
TURBO ENGINE FOR PT BOAT



CROSS SECTION



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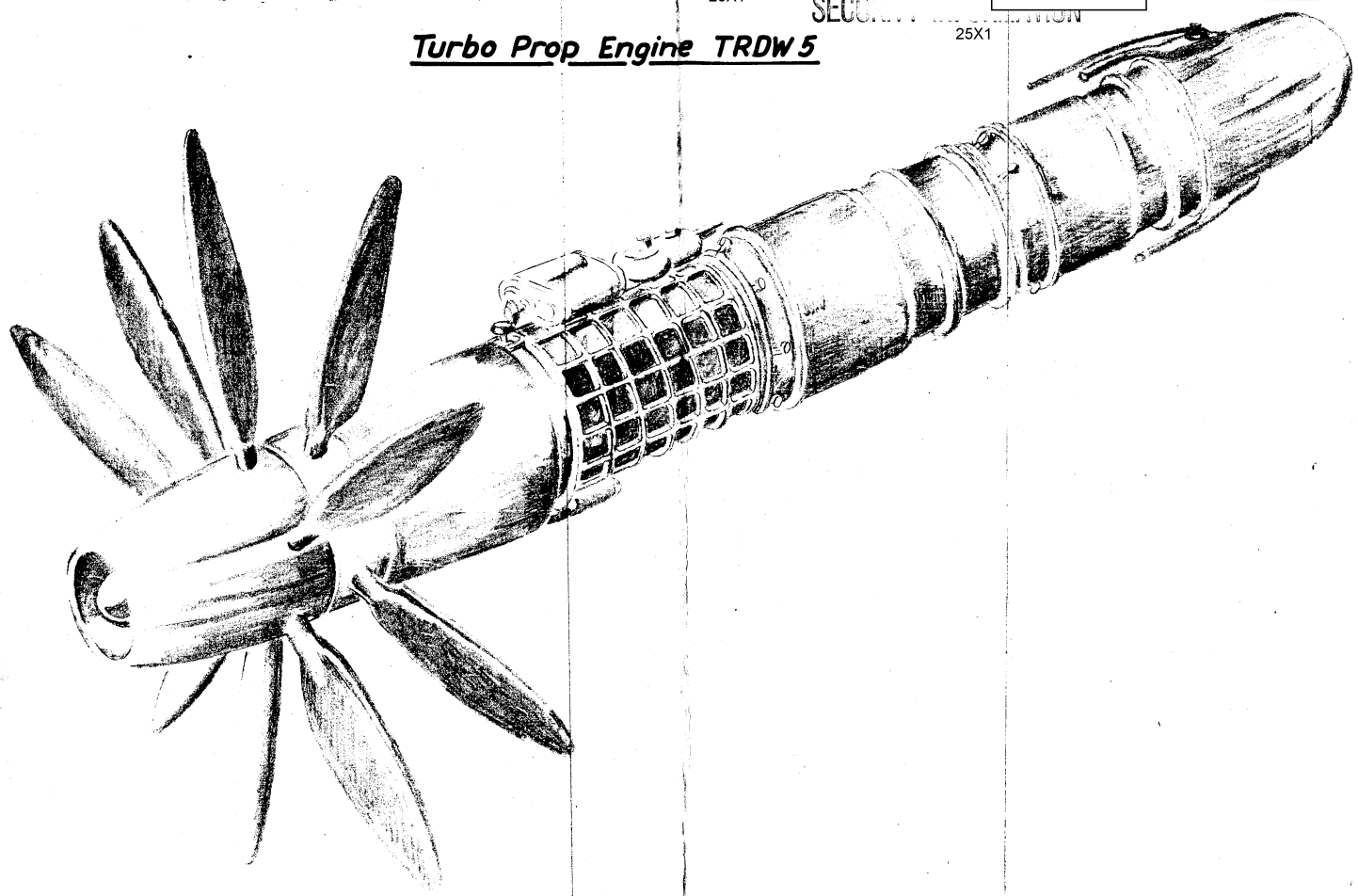
SECURITY INFORMATION

25X1

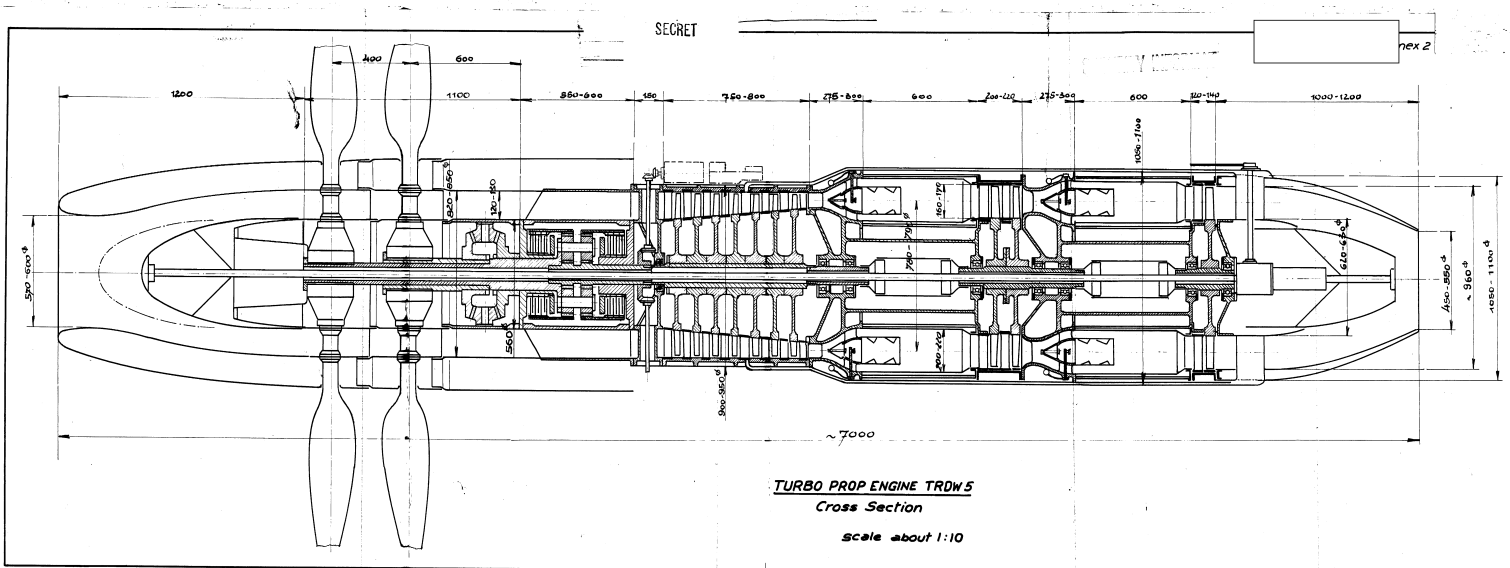
Annex I

Turbo Prop Engine TRDW 5



25X1

SECRET



TURBO PROP ENGINE TRDW 5

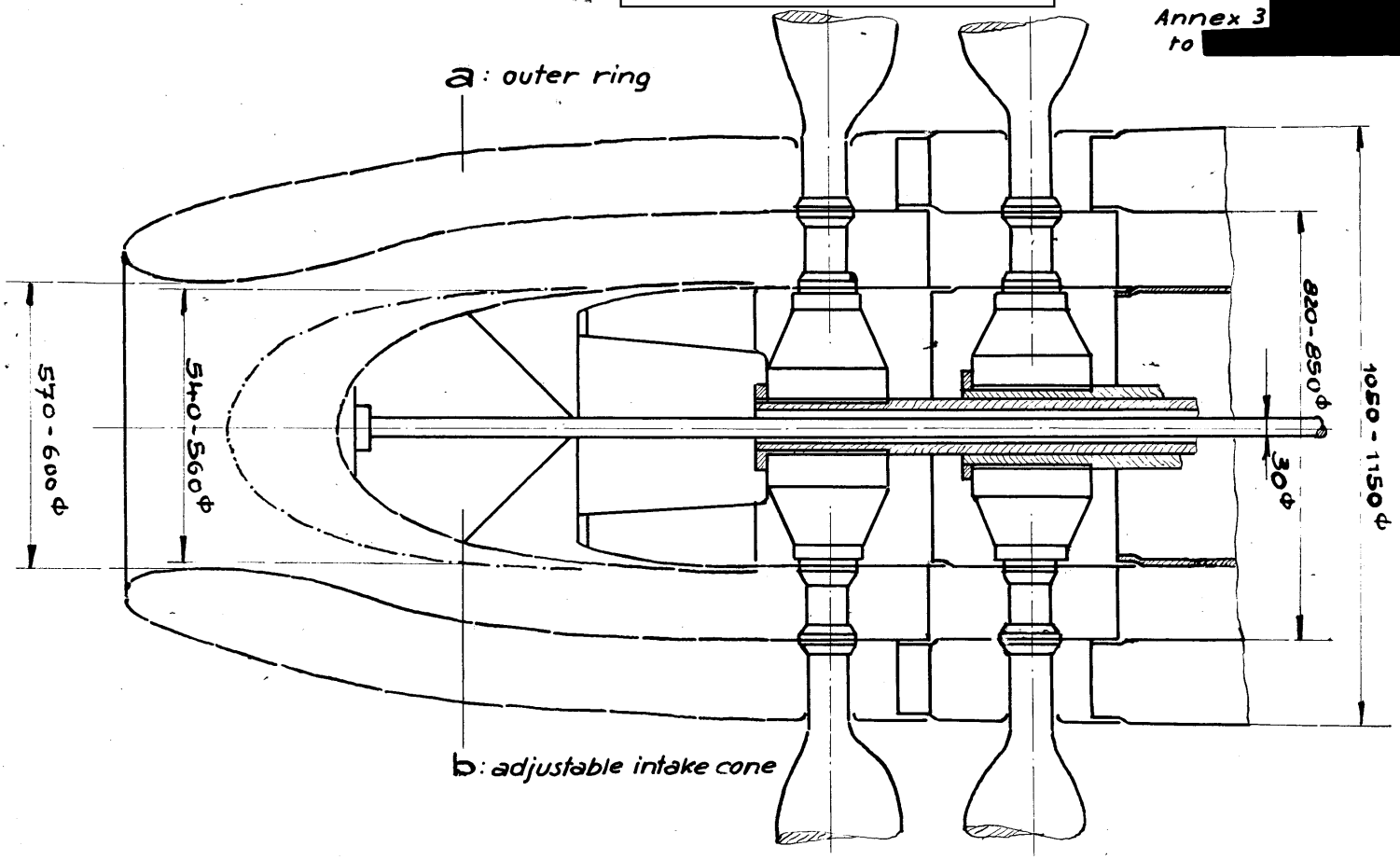
Cross Section

scale about 1:10

SECRET

25X1

Annex 3
to



scale : ~ 1:10

TURBO PROP ENGINE TRDW5, DIFFUSER

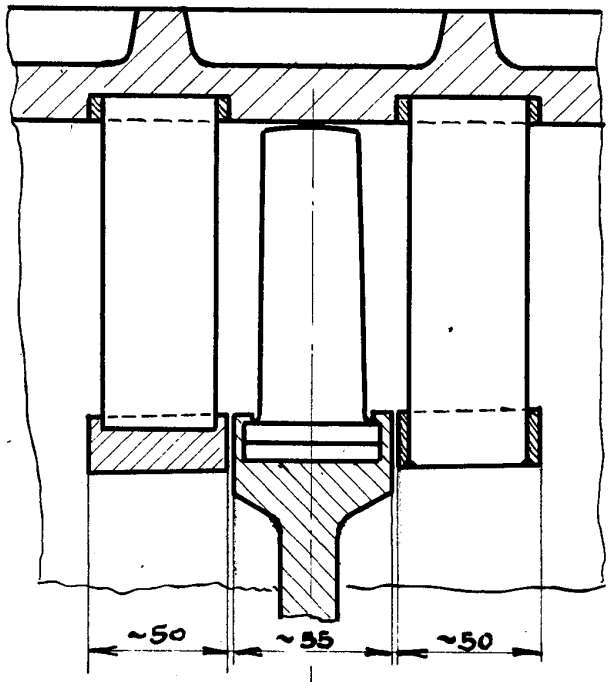
25X1

SECRET

25X1

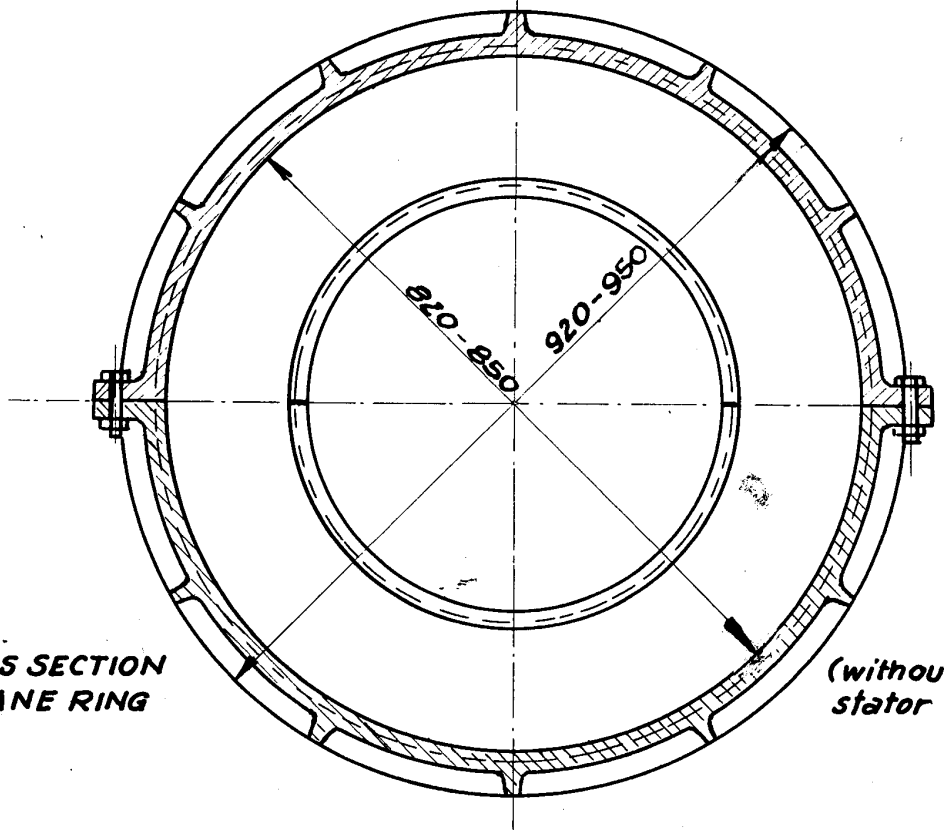
Annex 4

25X1



LONGITUDINAL SECTION

scale about 1:2,5



CROSS SECTION OF VANE RING

(without stator blades)

TURBO PROP ENGINE TRDW 5

COMPRESSOR

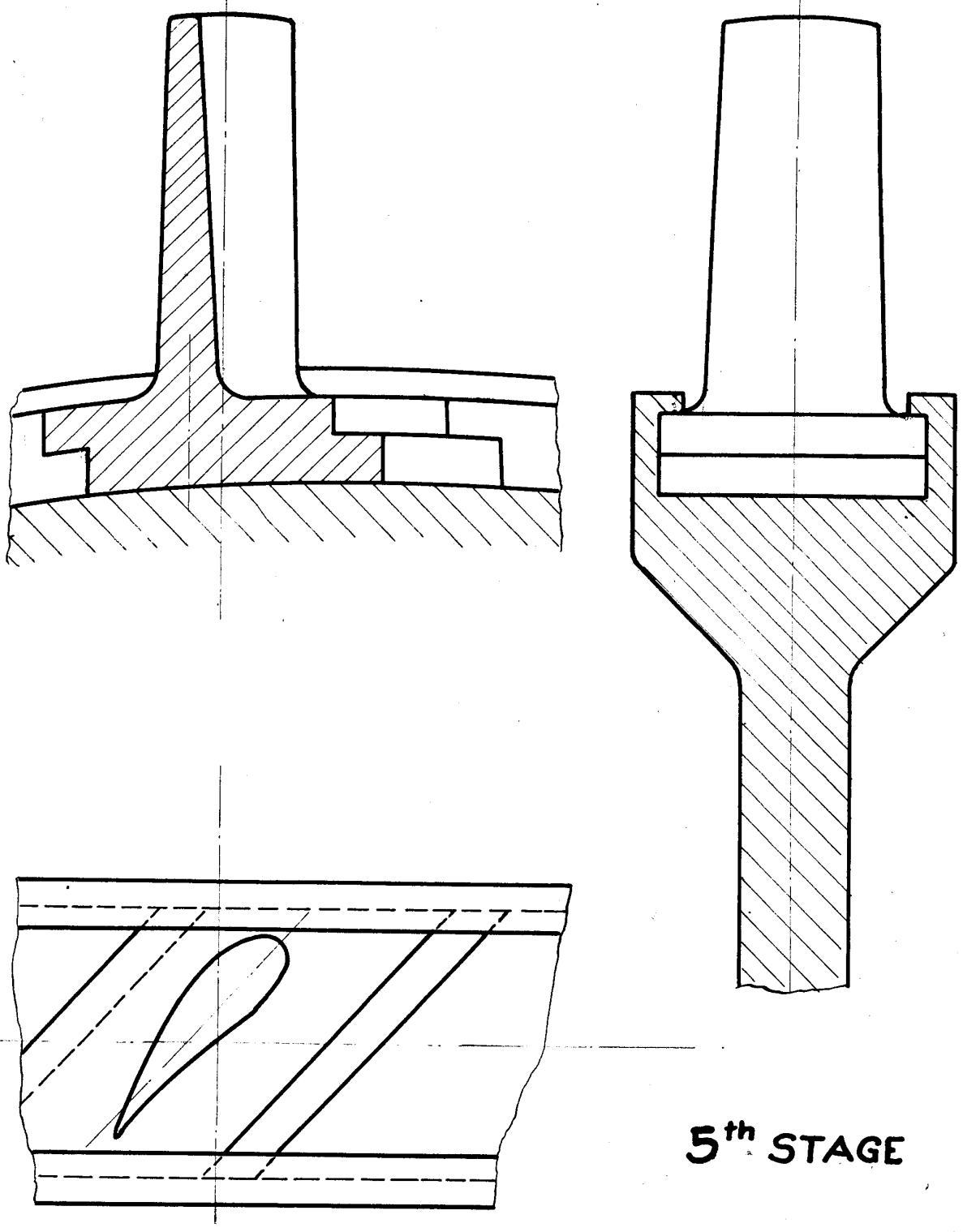
25X1

Annex 3

25X1

TURBO PROP ENGINE TRDW5

25X1



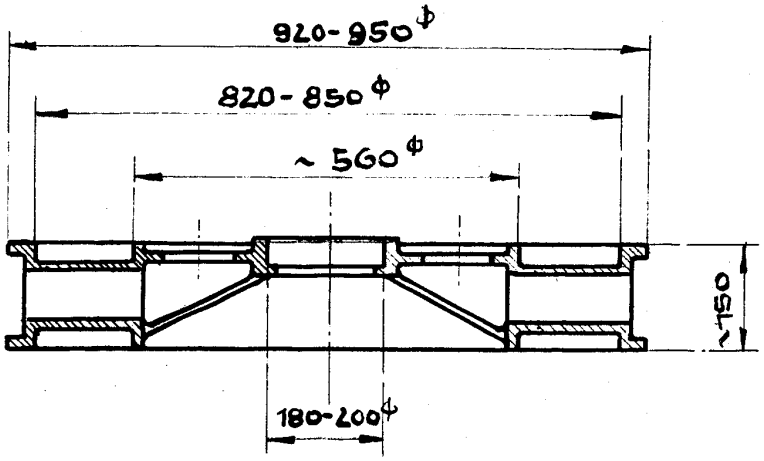
COMPRESSOR ROTOR BLADES

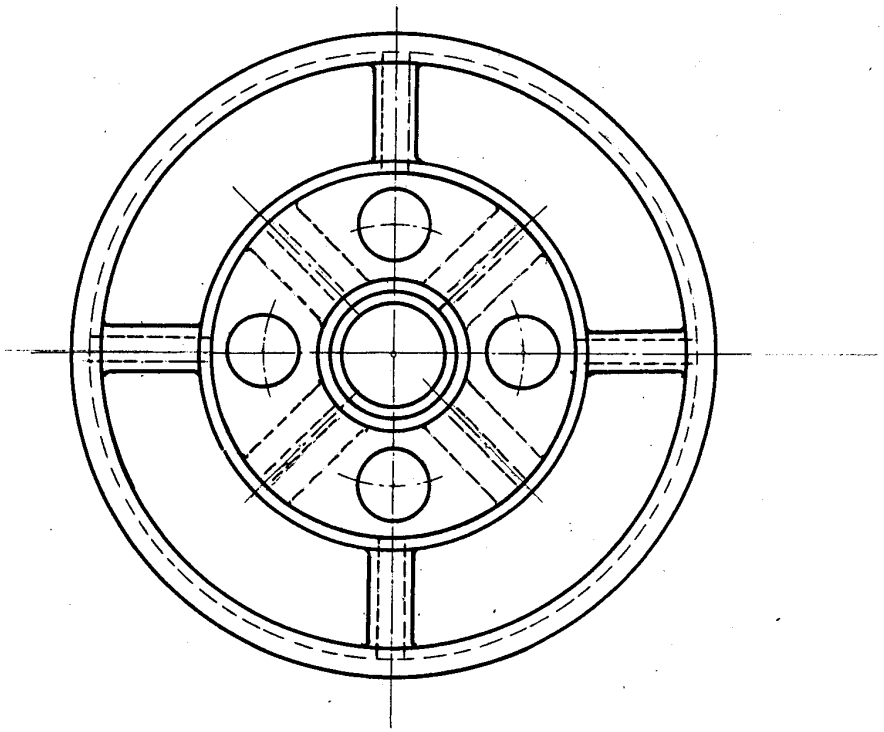
SCALE ABOUT 1:1

25X1

Annex 6

TURBO PROP ENGINE TRDW5





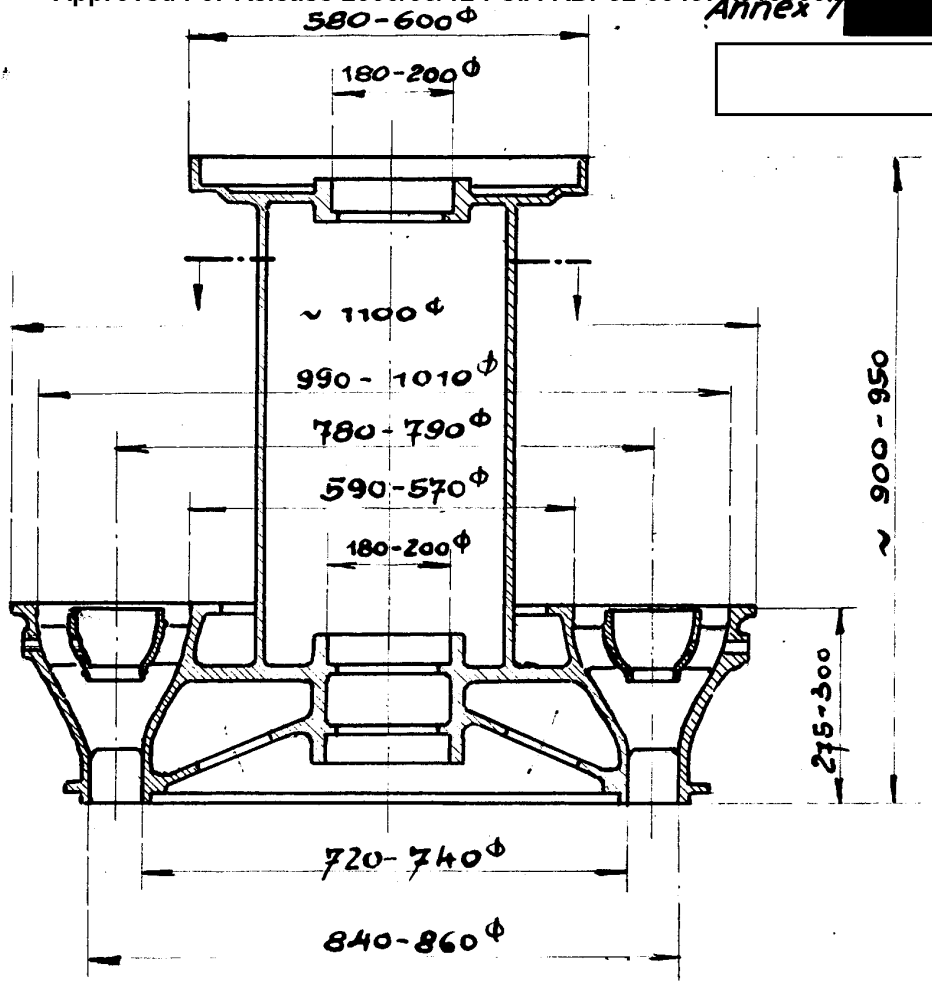
GEAR AND COMPRESSOR PORT

MATERIAL : ALUMINUM

SCALE ABOUT 1:10

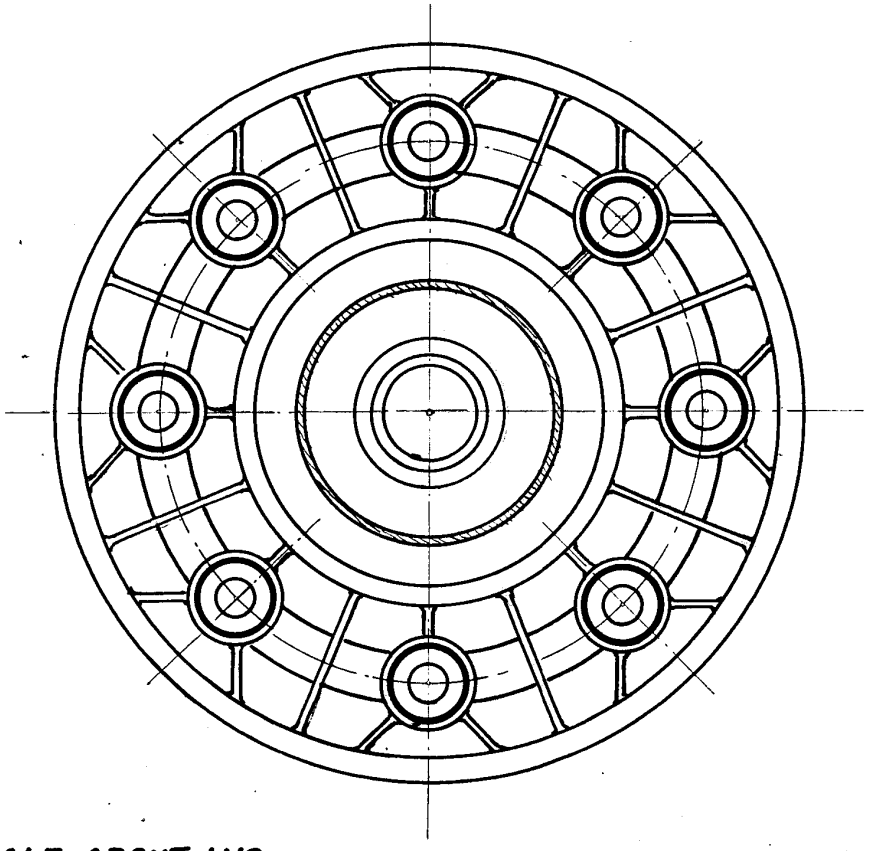
Annex 7

25X1



25X1

25X1



SCALE ABOUT 1:10

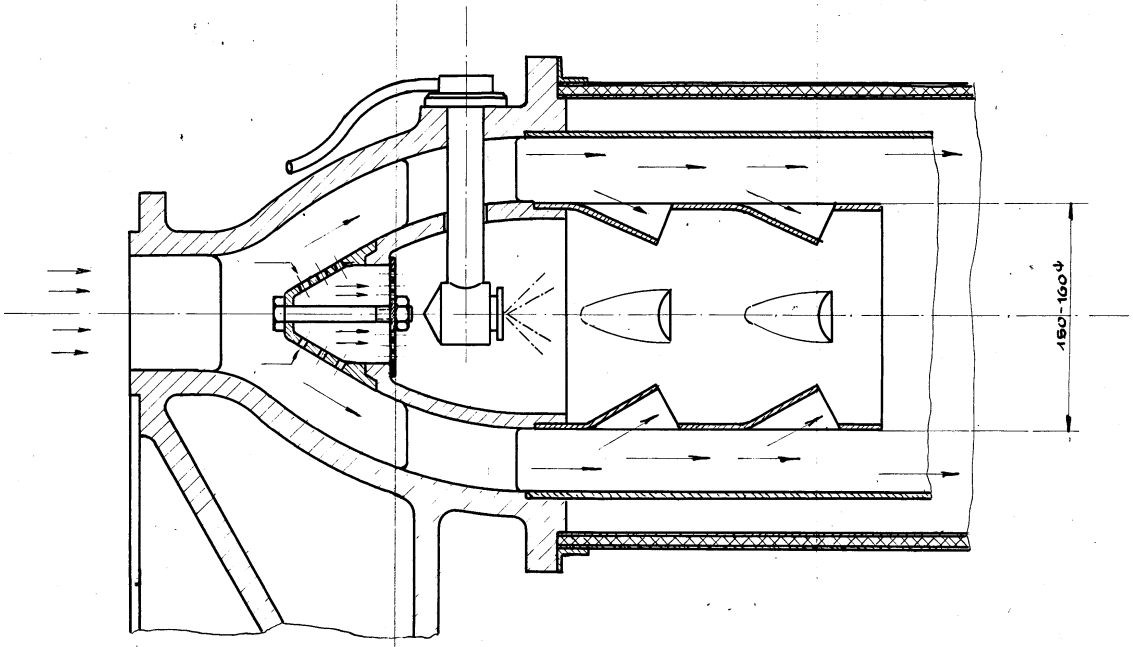
TRDW5, COMBUSTION CHAMBER PORT

SECRET

SECRET

Annex 8

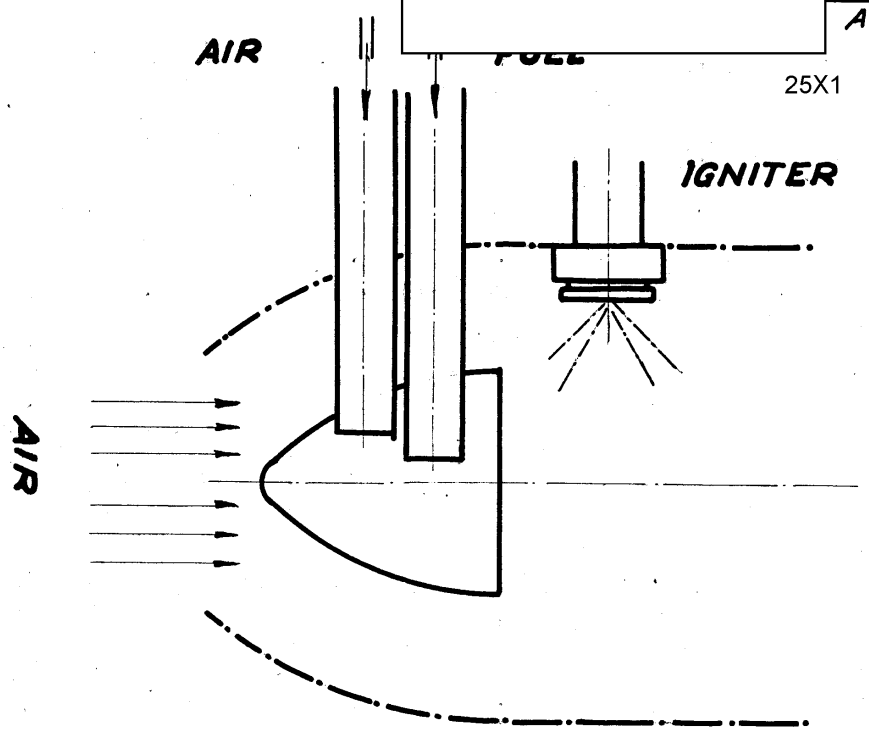
25X1



TUBO PROP ENGINE TRDW5, BURNER CAN WITH MIXING CHAMBERS AND FUEL INJECTOR

SCALE: ABOUT 1:2.5

25X1



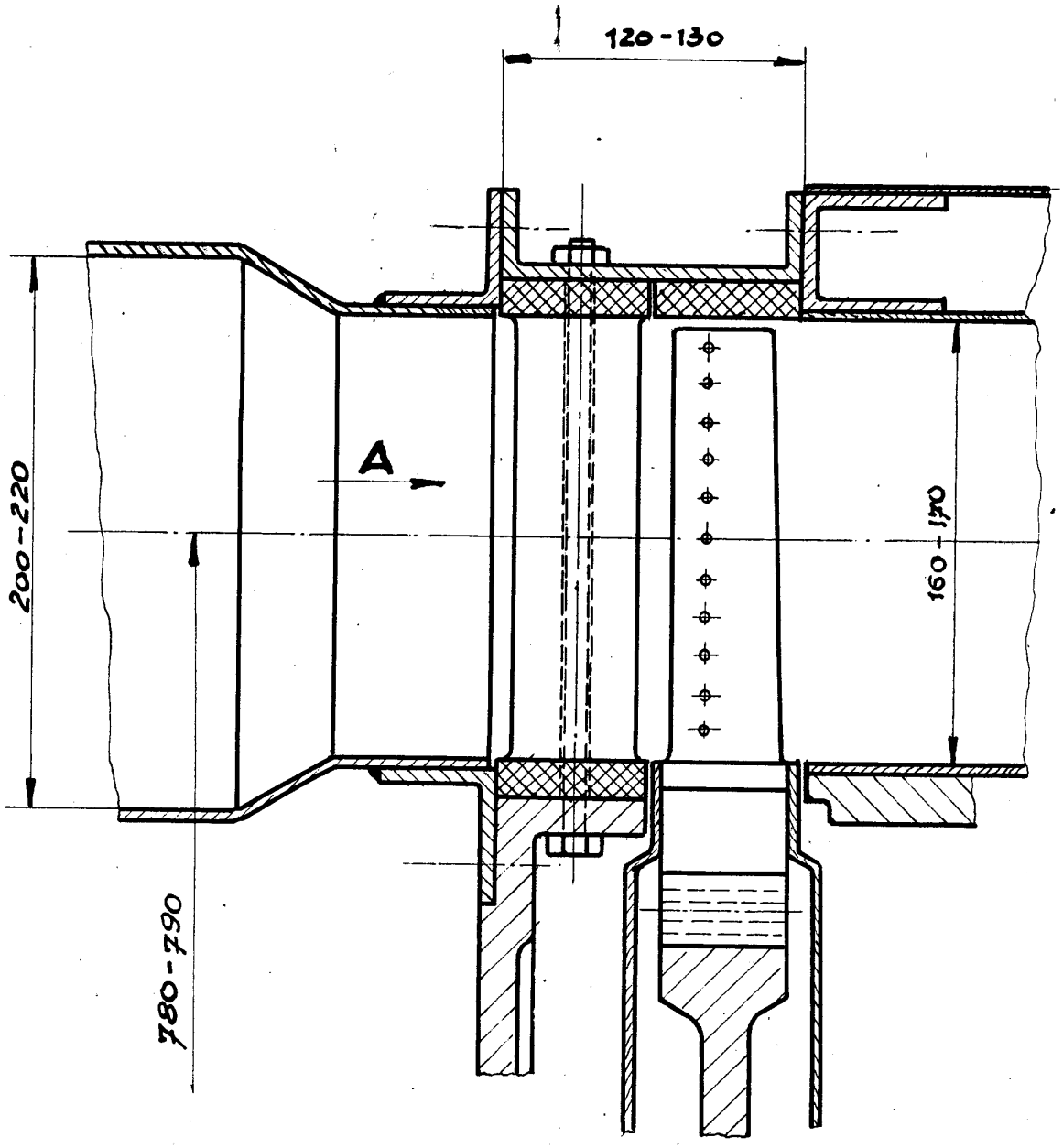
TURBO PROP ENGINE TRDW5, STARTER FUEL NOZZLE
(DIAGRAM)

25X1

Annex 10

25X1

25X1



TUBO PROP ENGINE TRDW 5

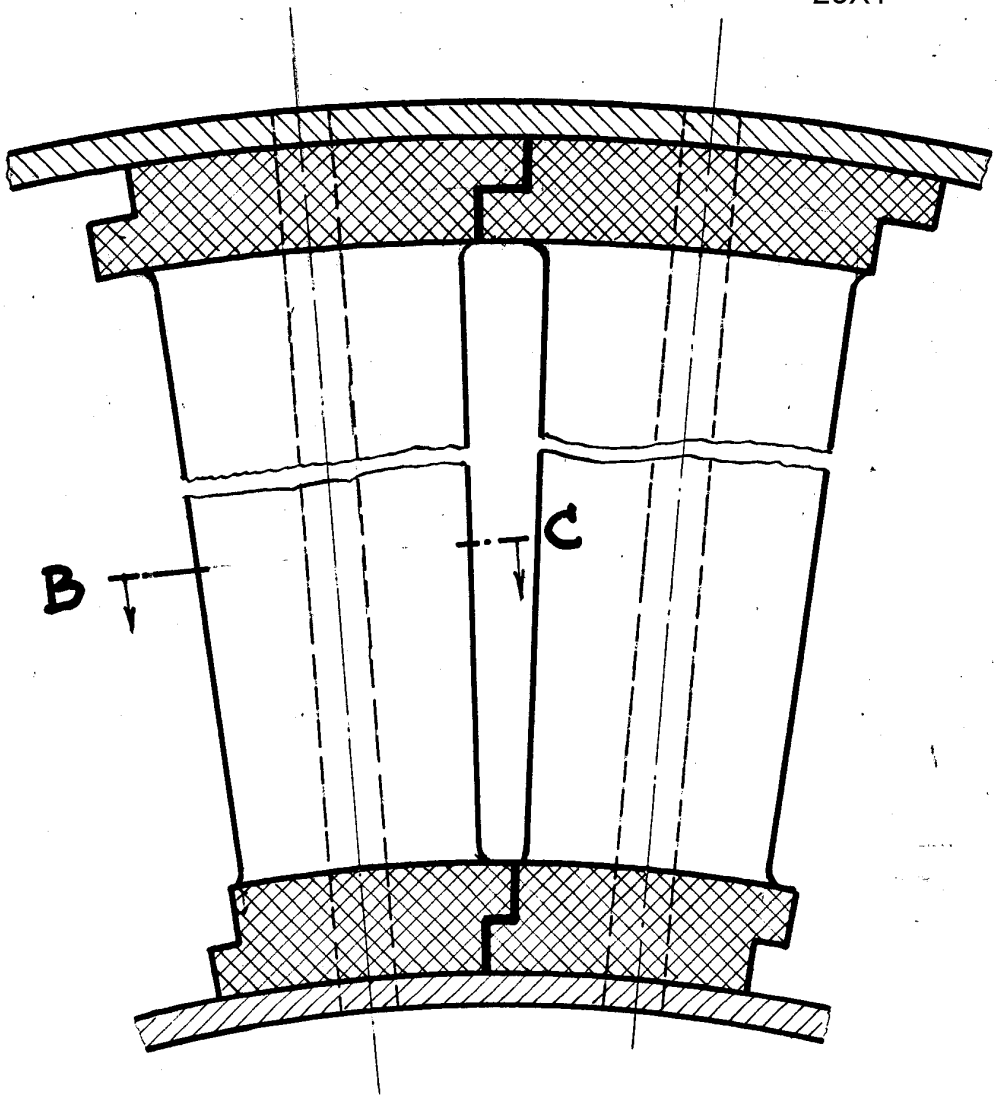
2. TURBINE

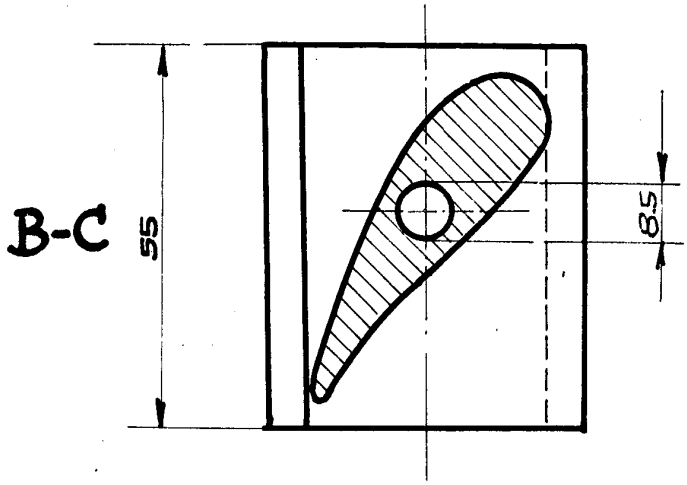
GUIDE VANE AND TURBINE WHEEL

SCALE ABOUT 1:2.5

25X1

25X1





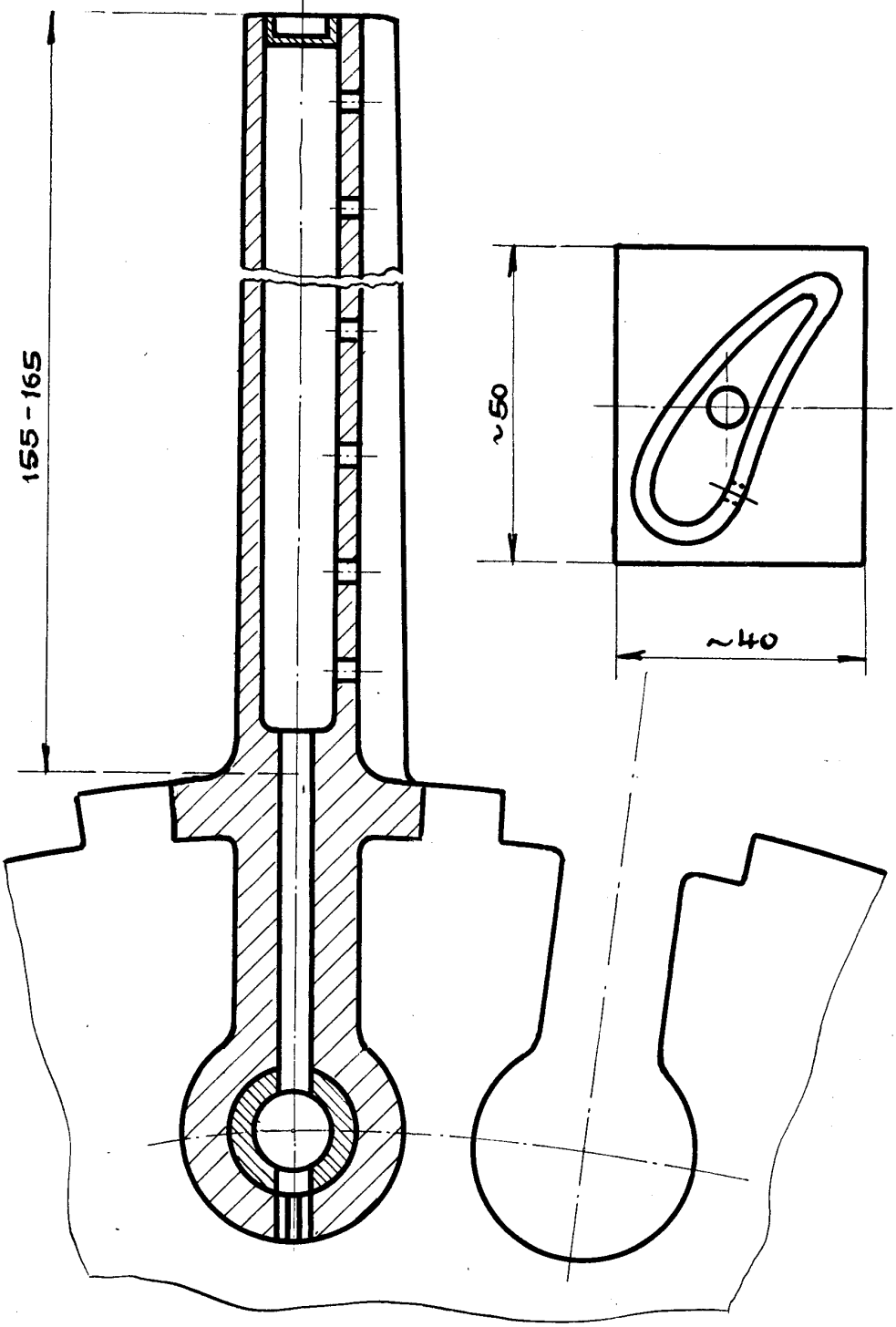
TRDW5, GUIDE VANE OF TURBINE

MATERIAL: CERAMIC

SCALE ABOUT 1:1

25X1

25X1



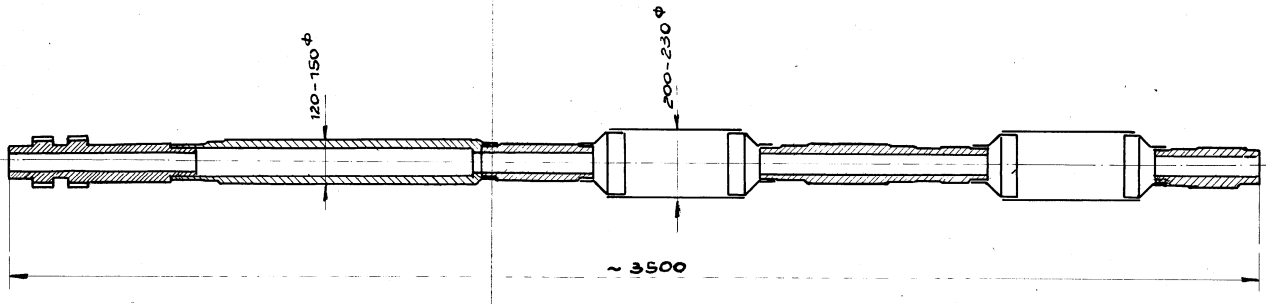
TRDW 5, TURBINE BLADE

SCALE: 1:1

25X1

Annex 13

25X1



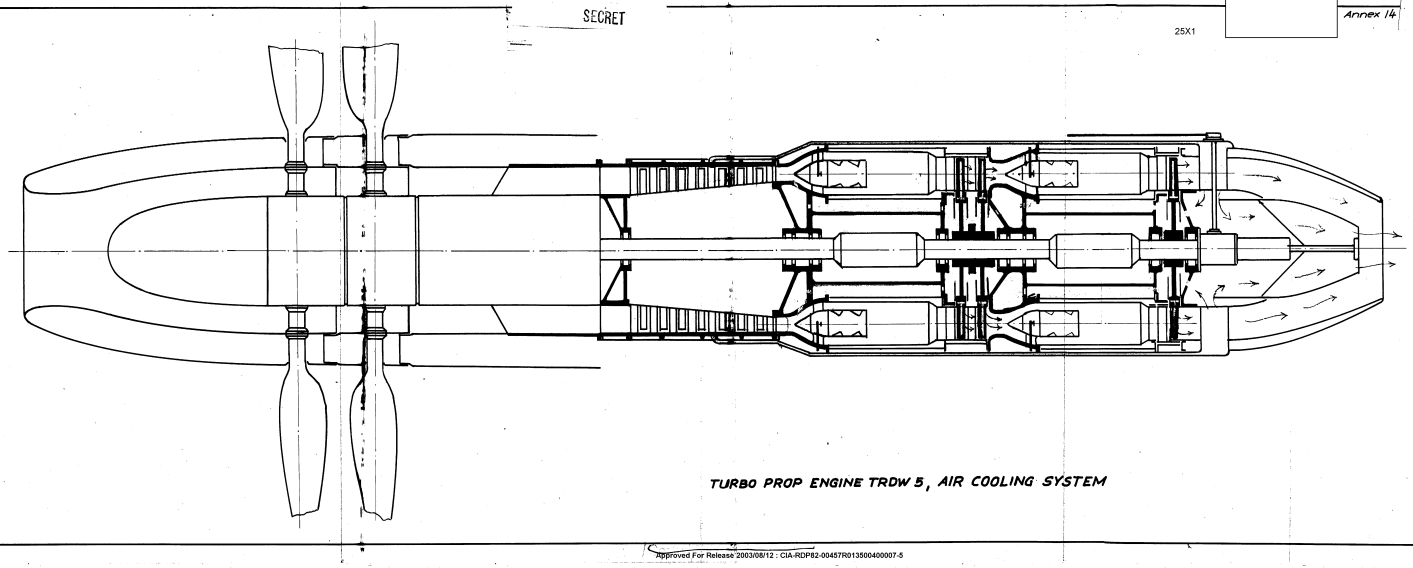
TURBO PROP ENGINE TRDW 5, MAIN SHAFT
(DIAGRAM)

SCALE: ABOUT 1:10

SECRET

25X1

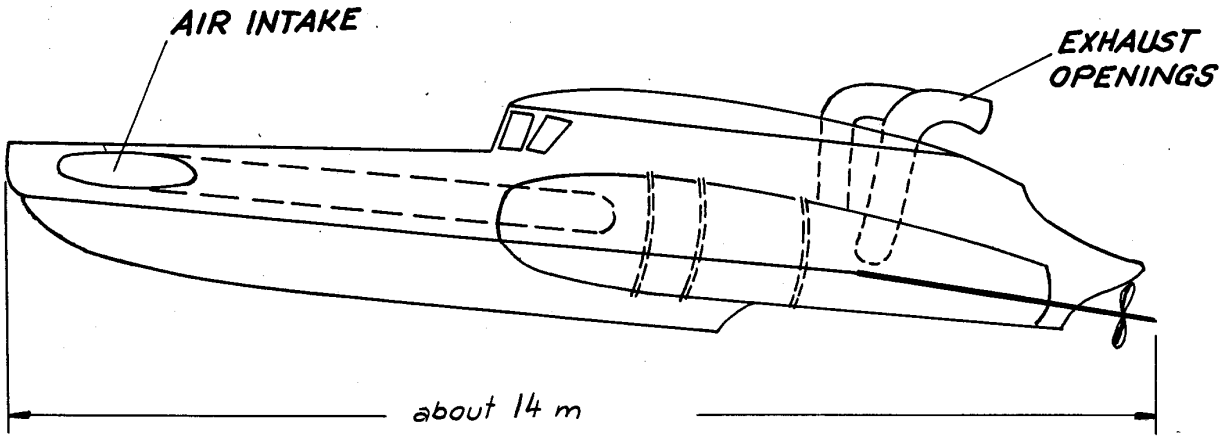
Annex 14



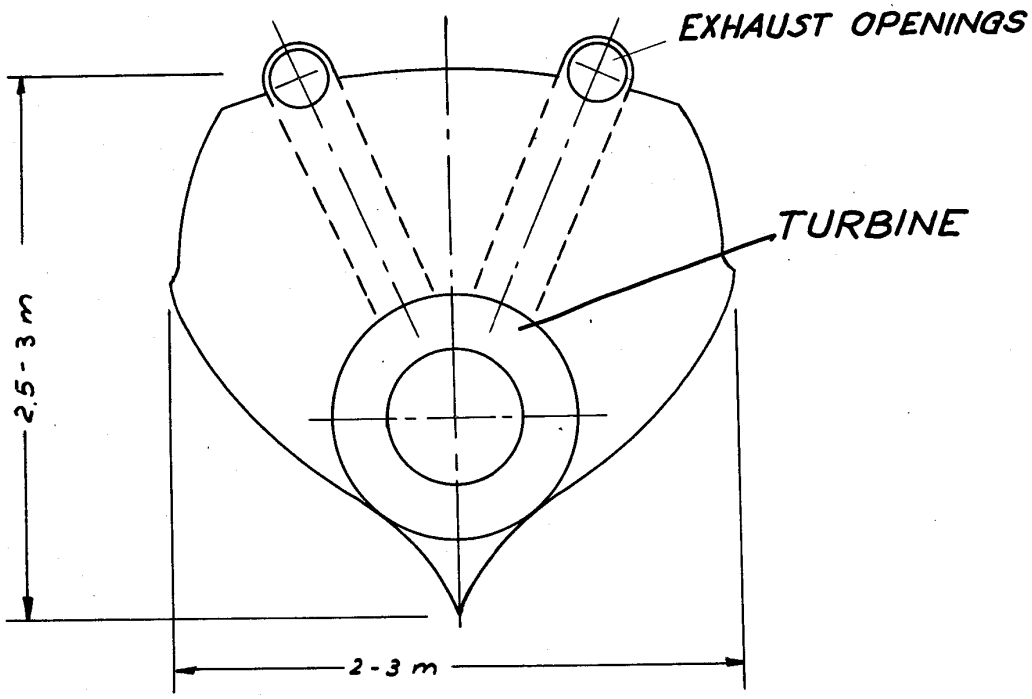
TURBO PROP ENGINE TRDW 5, AIR COOLING SYSTEM

TURBO ENGINE FOR PT BOAT

25X1



CROSS SECTION

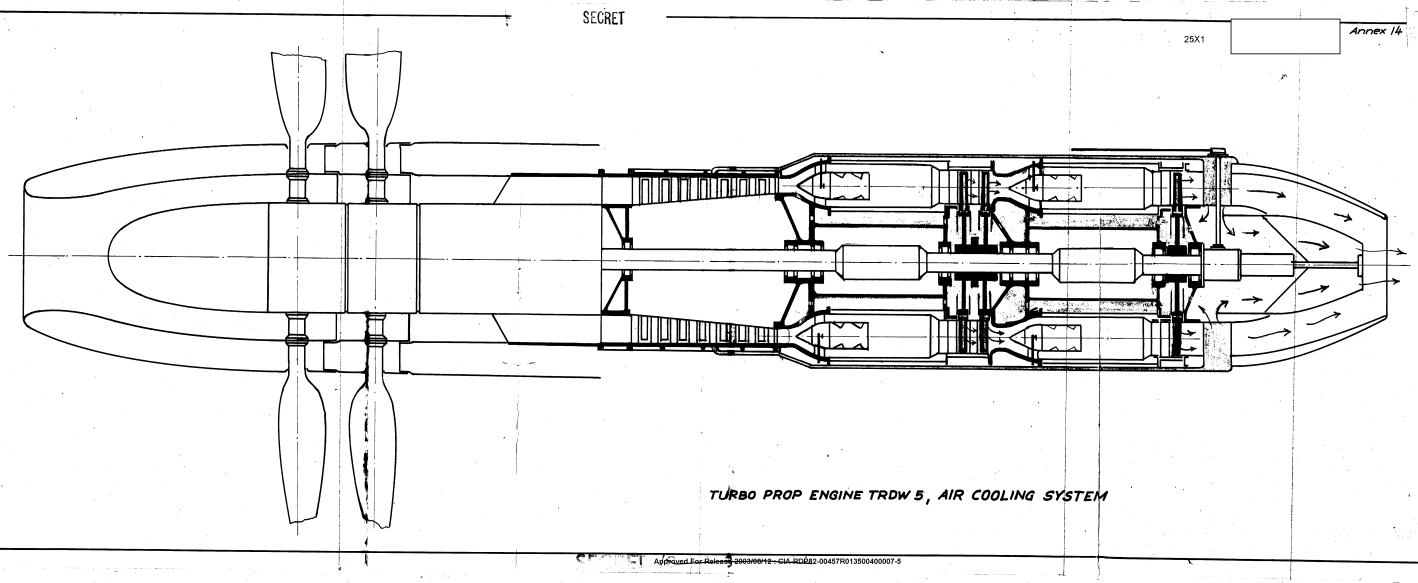


25X1

SECRET

25X1

Annex 14



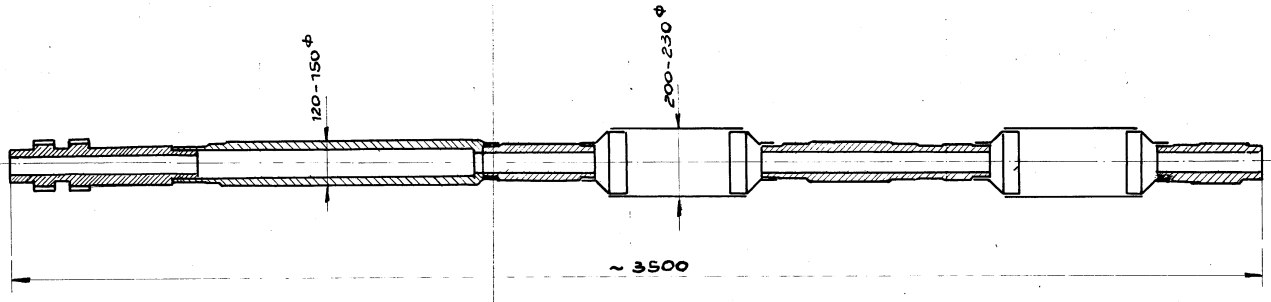
TURBO PROP ENGINE TRDW 5, AIR COOLING SYSTEM

SECRET

25X1

25X1

Annex 13



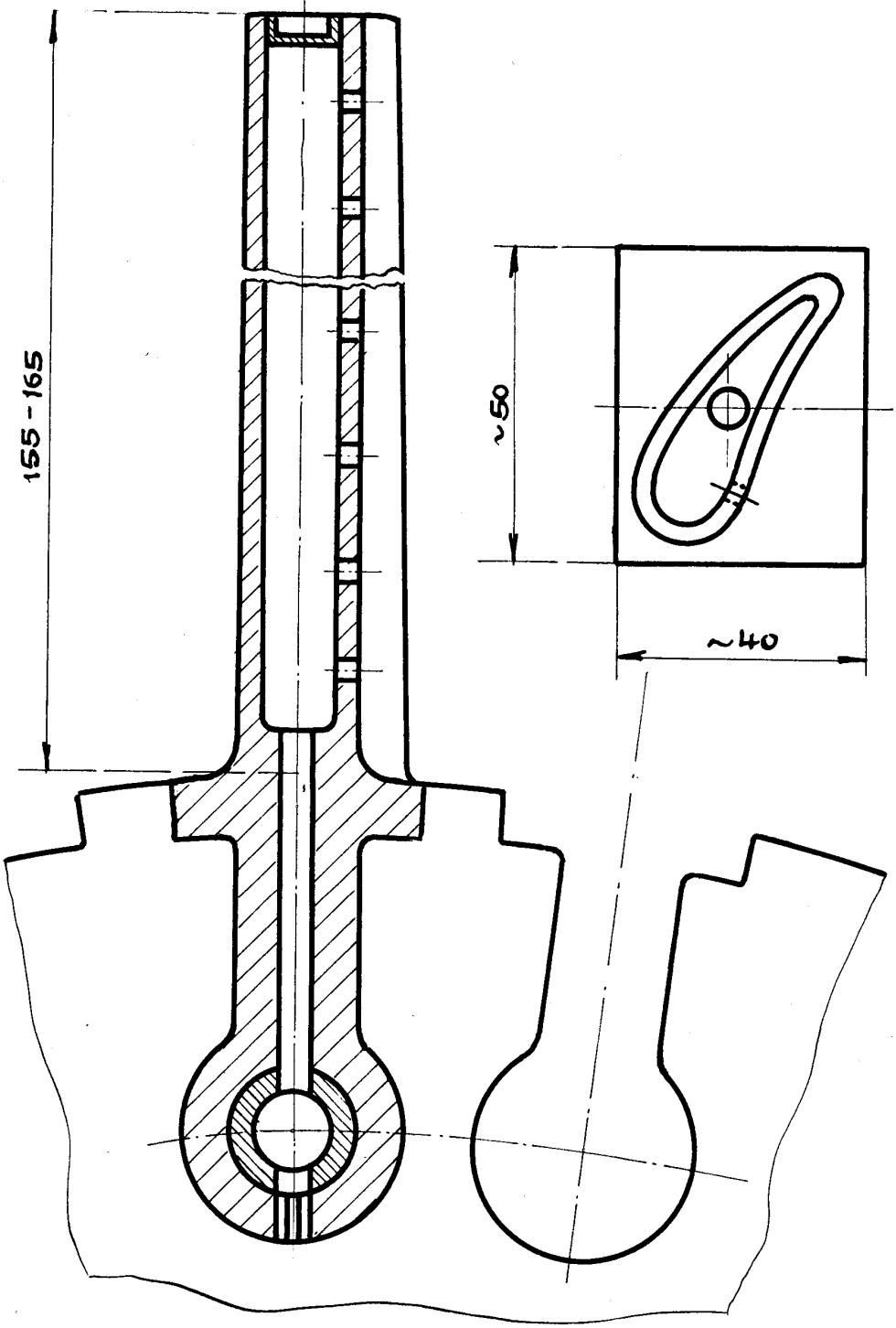
TURBO PROP ENGINE TRDW 5, MAIN SHAFT
(DIAGRAM)

SCALE: ABOUT 1:10

25X1

SECRET

25X1

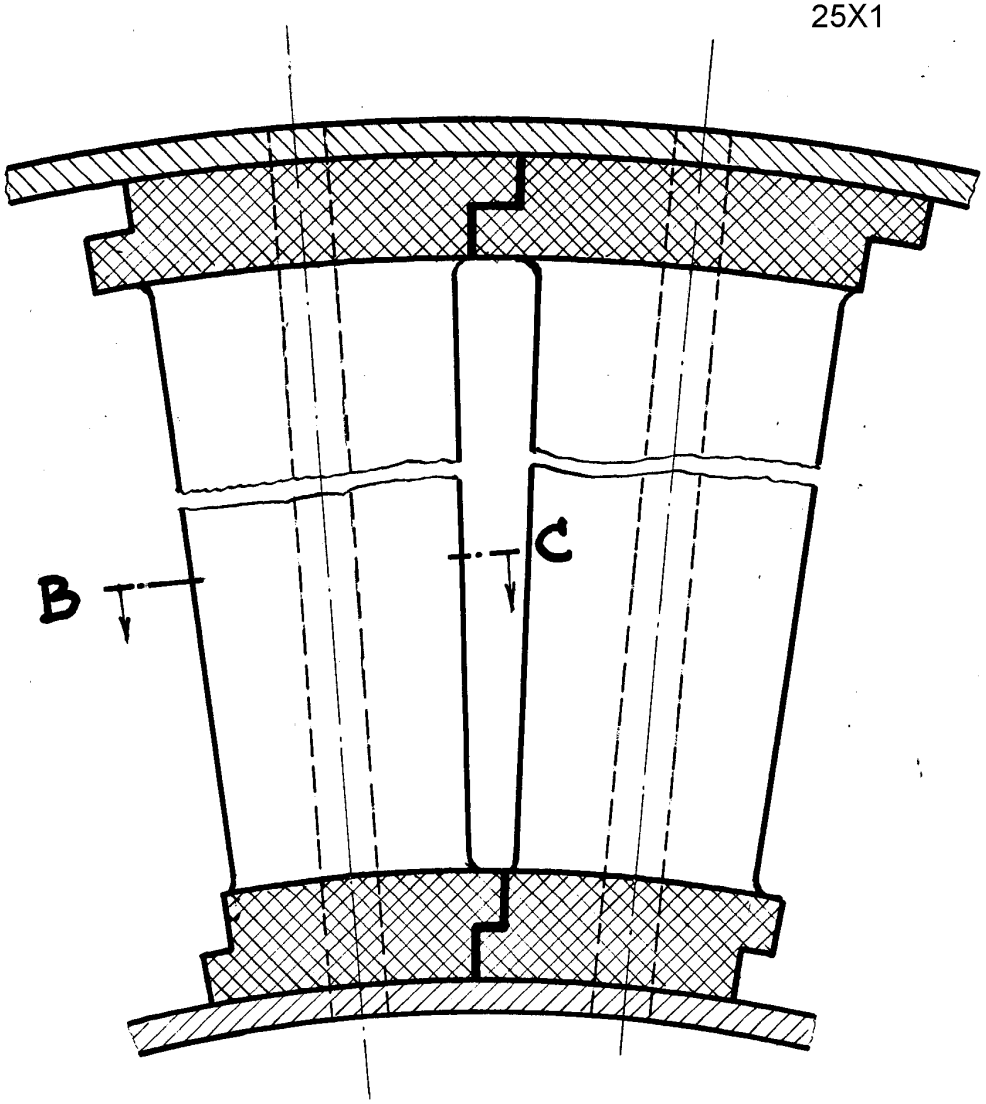


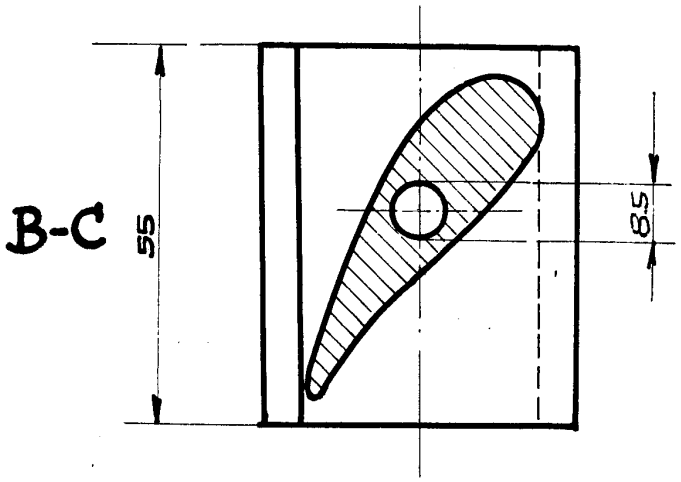
TRDW 5, TURBINE BLADE

SCALE: 1:1

25X1

25X1





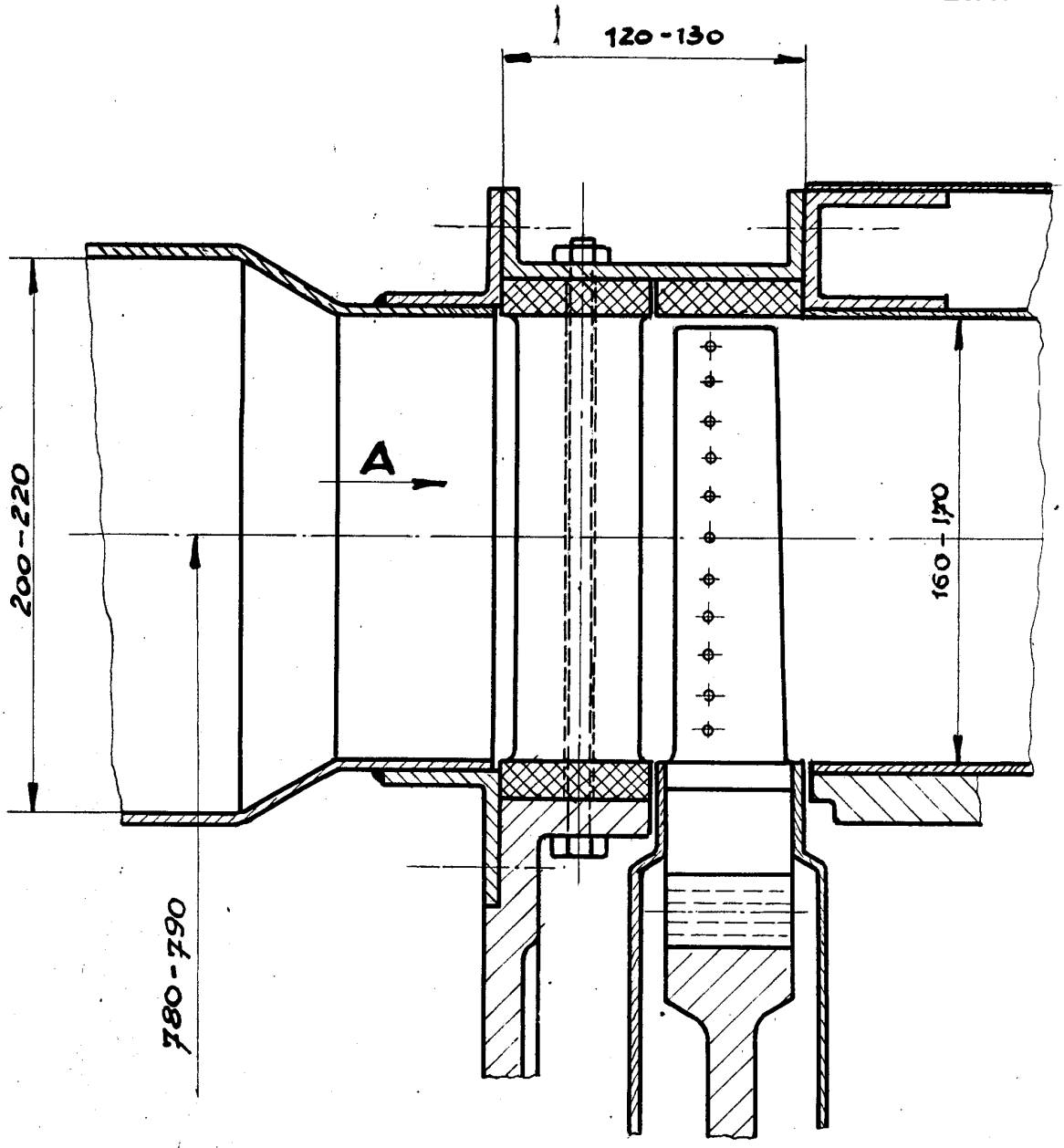
TRDW5, GUIDE VANE OF TURBINE

MATERIAL: CERAMIC

SCALE ABOUT 1:1

25X1

25X1



TUBO PROP ENGINE TRDW 5

2. TURBINE

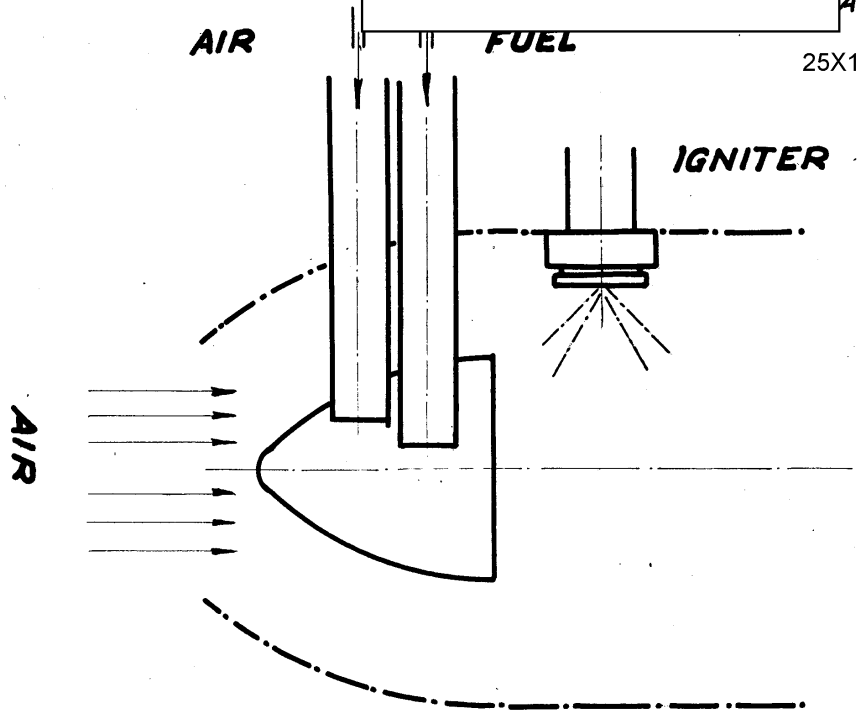
GUIDE VANE AND TURBINE WHEEL

SCALE ABOUT 1:2.5

25X1

SECRET

Annex 9



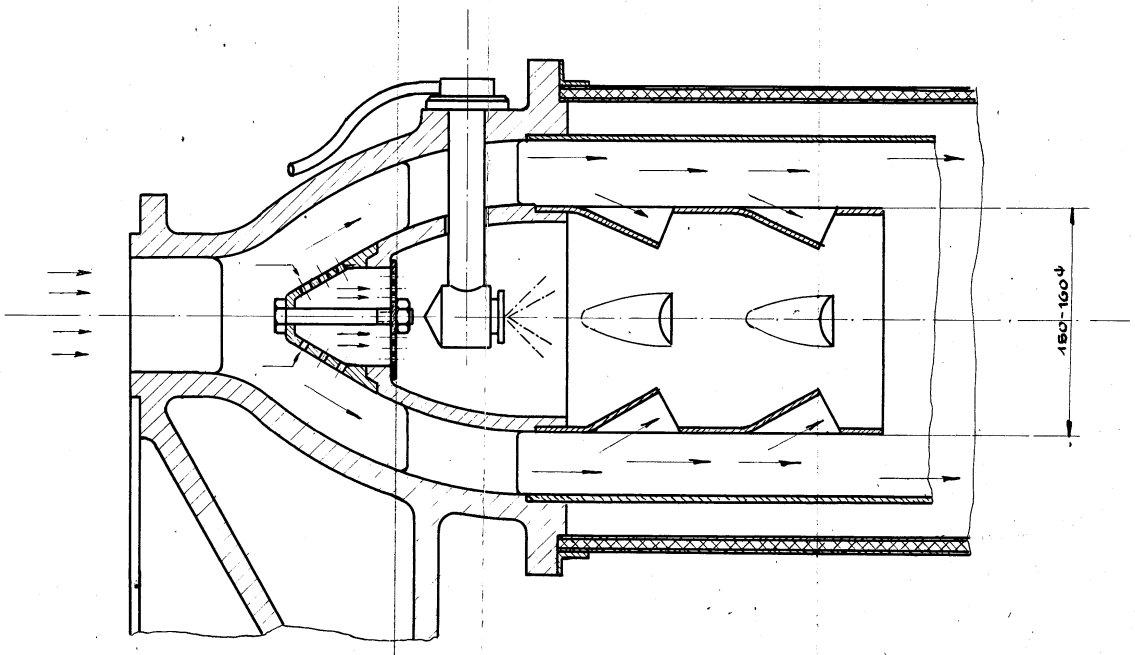
TURBO PROP ENGINE TRDW5, STARTER FUEL NOZZLE
(DIAGRAM)

25X1

SECRET

Annex 8

25X1



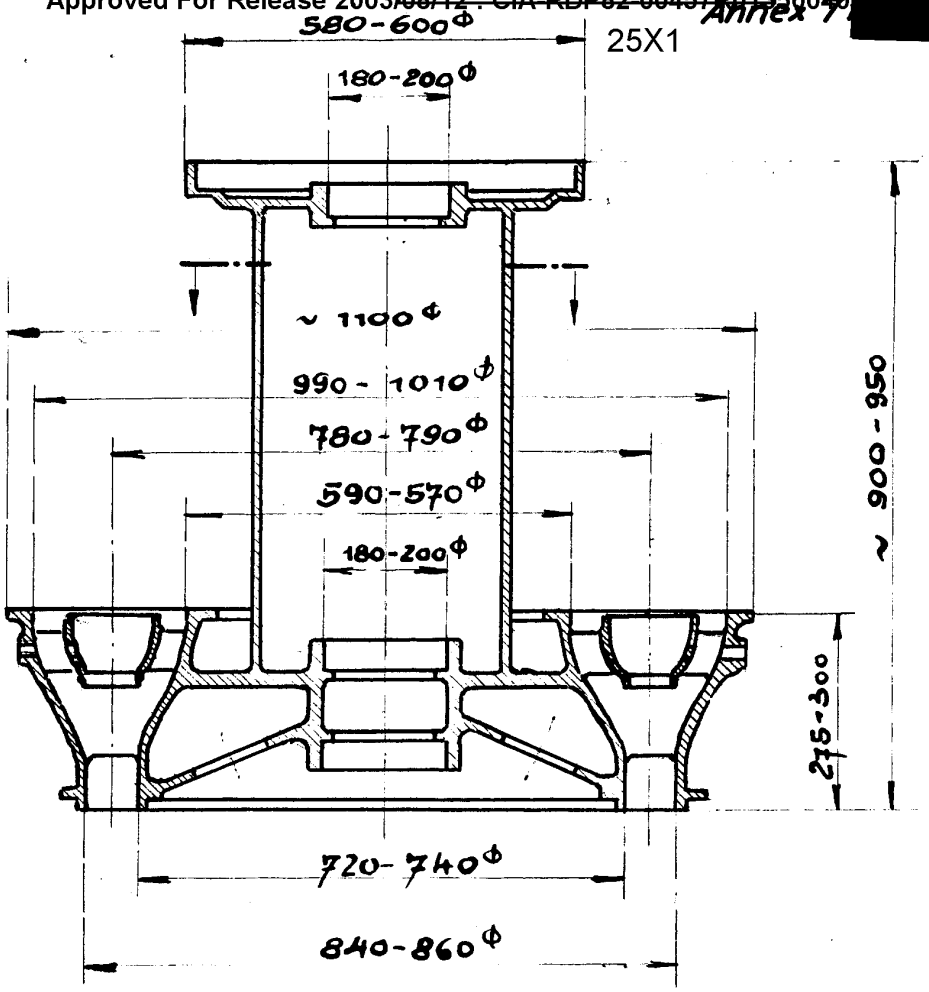
TUBO PROP ENGINE TRDW5, BURNER CAN WITH MIXING CHAMBERS AND FUEL INJECTOR

SCALE: ABOUT 1:2.5

25X1

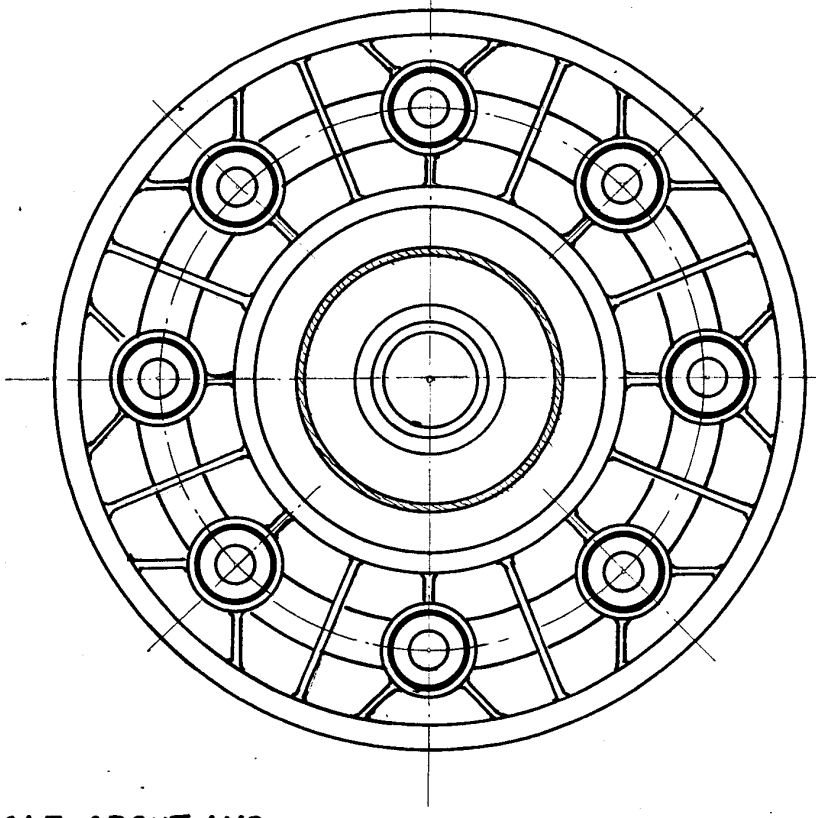
Annex 7

25X1



25X1

25X1



SCALE ABOUT 1:10

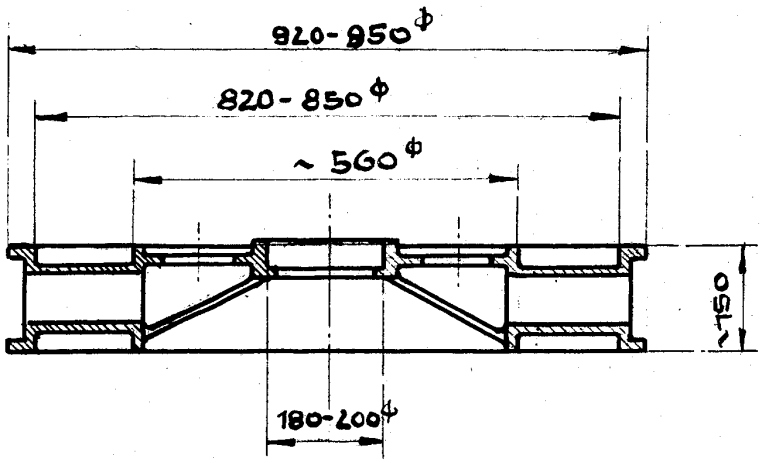
TRDW5, COMBUSTION CHAMBER PORT

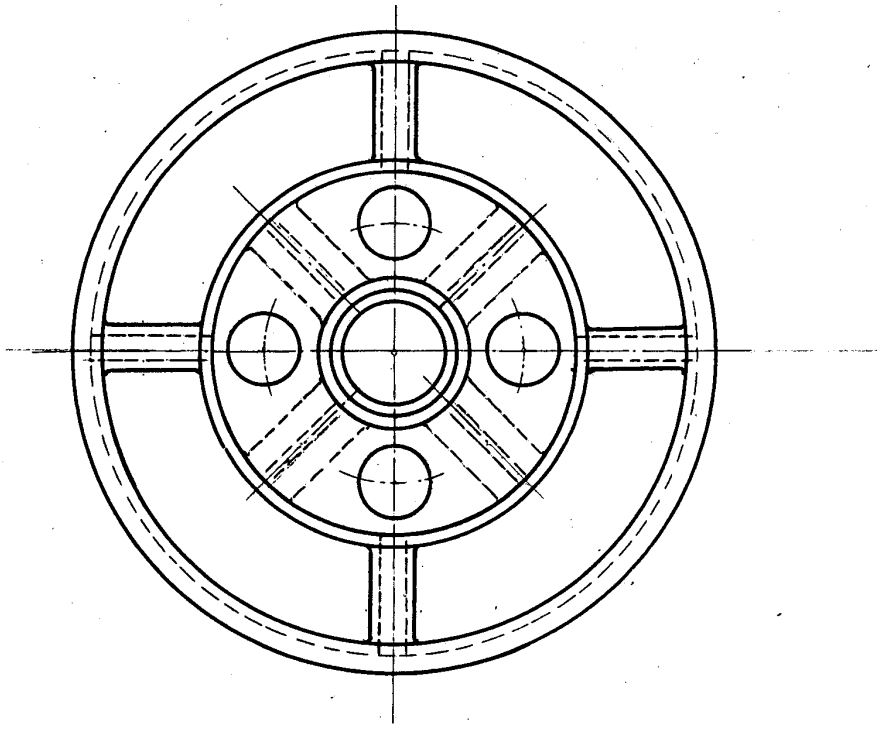
SECRET

SECRET

25X1

TURBO PROP ENGINE TRDW5





GEAR AND COMPRESSOR PORT

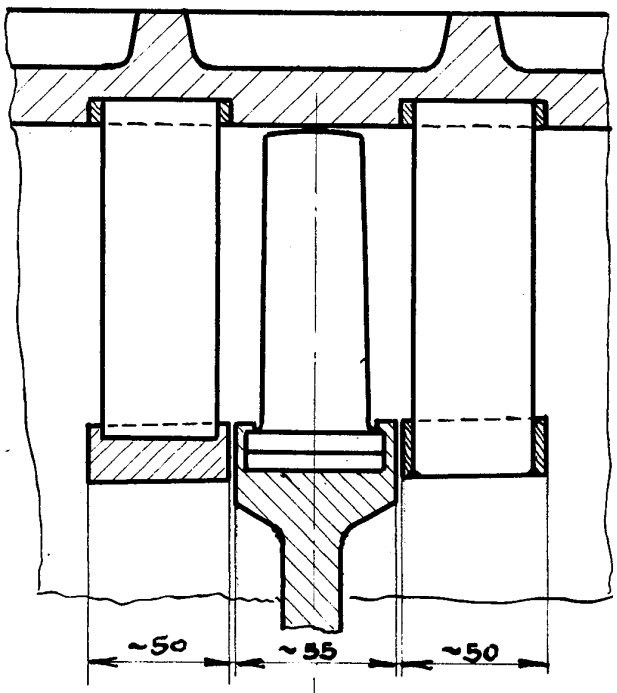
MATERIAL : ALUMINUM

SCALE ABOUT 1:10

25X1

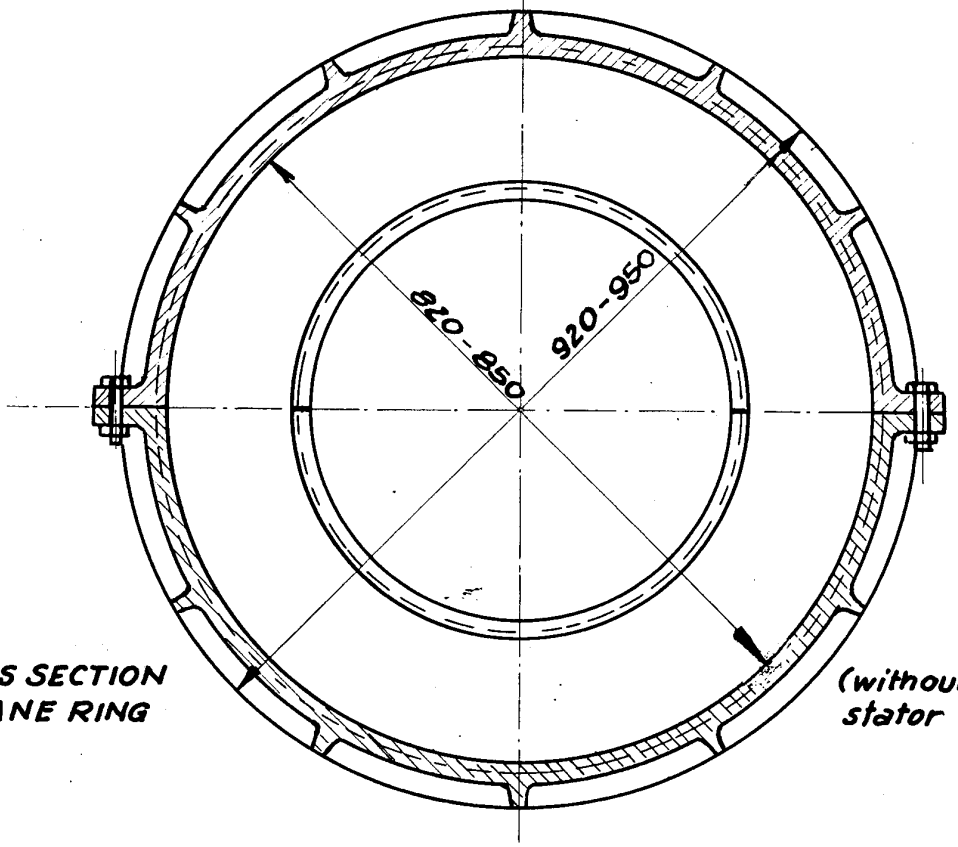
Annex 4

25X1



LONGITUDINAL SECTION

Scale about 1:2.5



CROSS SECTION OF VANE RING

(without stator blades)

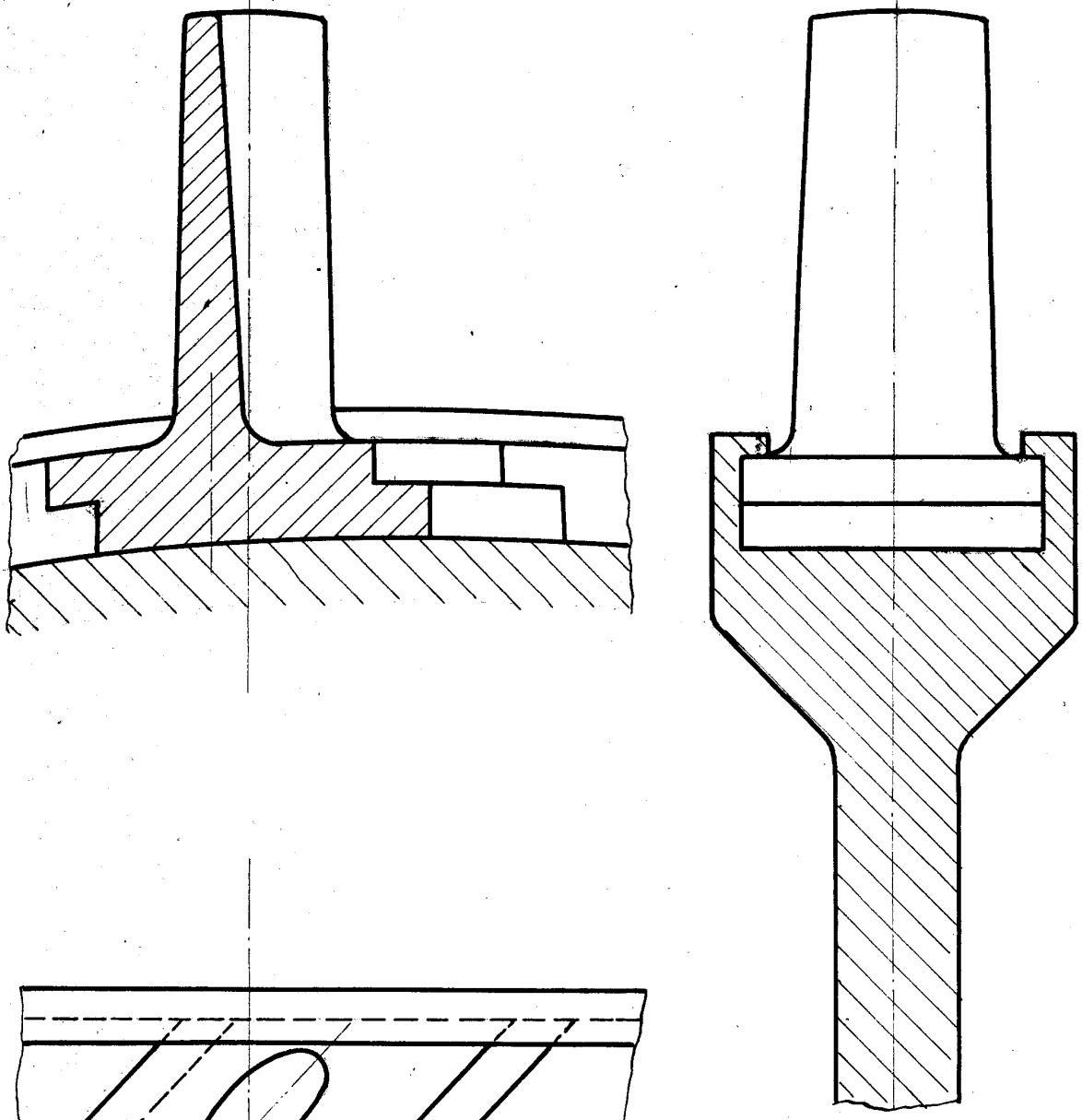
TURBO PROP ENGINE TRDW 5

COMPRESSOR

25X1

TURBO PROP ENGINE TRDW5

25X1



5th STAGE

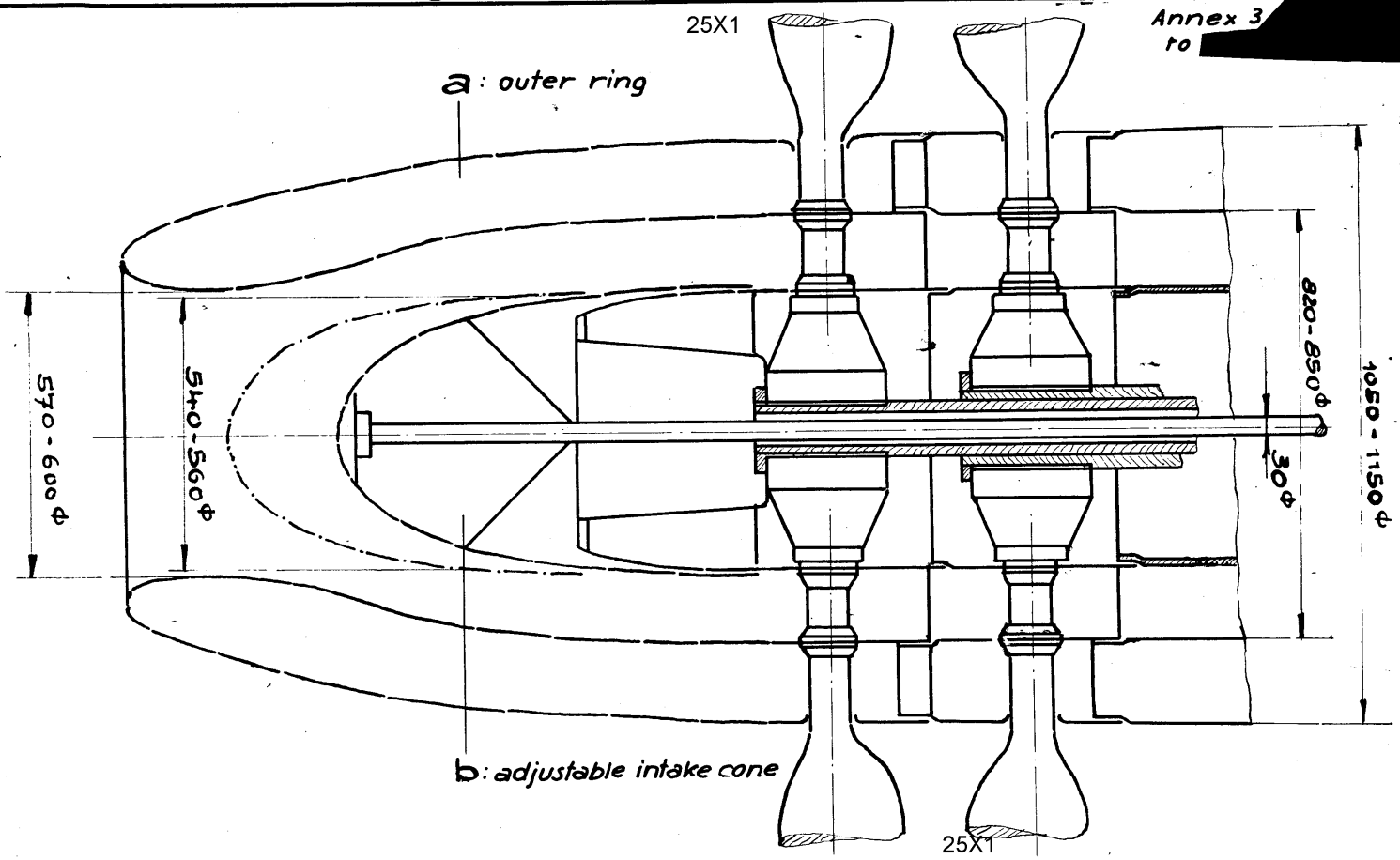
COMPRESSOR ROTOR BLADES

SCALE ABOUT 1:1

25X1

25X1

Annex 3
to



25X1

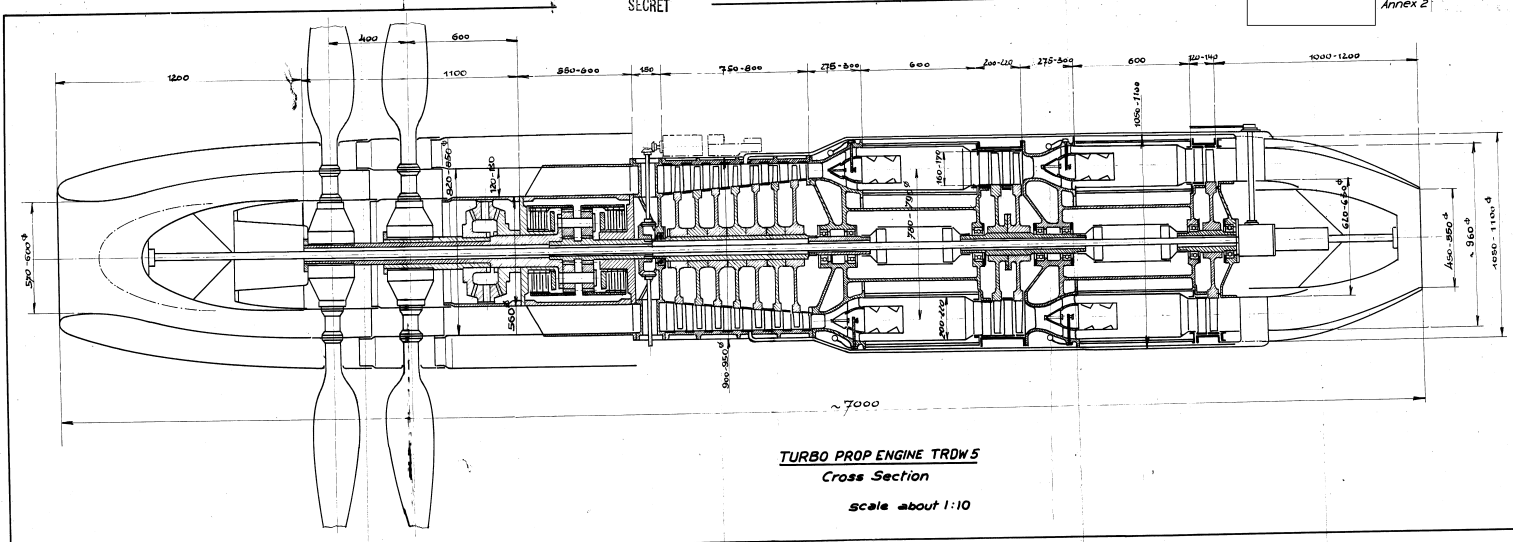
scale : ~ 1:10

TURBO PROP ENGINE TRDW5, DIFFUSER

25X1

SECRET

Annex 2



TURBO PROP ENGINE TRDW 5

Cross Section

scale about 1:10

25X1

Annex 1

Turbo Prop Engine TRDW 5