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CENTRAL INTELLIGENCE AGENCY

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COUNTRY USSR

REPORT

SUBJECT Technical Document on the Soviet
ZSU-57-2 Self-Propelled Antiaircraft
Gun

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A copy of an English-language document entitled Instructions on
and Operation of the ZSU-57-2 Self-Propelled Anti-Aircraft Gun

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The document is a translation of chapter one of the Russian-language document Rukovodstvo
po Materialnoy Chasti i Eksploatatsii Zenitnoy Samokhodno-Artilleriyskoy
Ustanovki ZSU-57-2. Chapter one is devoted to describing the gun mount
and giving its general technical characteristics.

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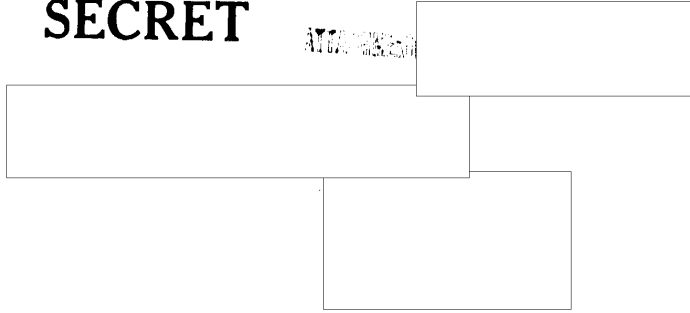
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Supplement

INSTRUCTIONS ON EQUIPMENT AND OPERATION
OF THE ZSU-57-2 SELF-PROPELLED
ANTI-AIRCRAFT GUN

Chapter One

GENERAL DESCRIPTION OF THE SELF-PROPELLED

A/A GUN AND IT'S CHARACTERISTICS

GENERAL DESCRIPTION

The ZSU-57-2 self propelled A/A gun (fig. 1, 2 and 3) - a lightly armoured tracked fighting vehicle with rotating turret ensuring all-round A/A and ground fire from the gun.

(Illustration)

Fig. 1. The ZSU-57-2 self propelled A/A gun (general view)

The vehicle provides effective fire on air targets moving at a height of up to 4,000 m.

The crew of the vehicle consists of 6 men.

The main parts of the vehicle: armoured hull, turret, armament, power installation, transmission, running gear, electrical equipment, communications equipment and fire fighting equipment.

(Illustration)

Fig.2. The ZSU-57-2 self propelled A/A gun (side view)

On each vehicle there is a set of spare parts, tools and accessories (ZIP.).

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The armoured hull divides into three compartments: driving compartment, fighting compartment and power compartment.

(Illustration)

Fig. 3. The ZSU-57-2 self propelled A/A gun (rear view)

The driving compartment (fig. 4) is placed on the left in the forward part of the hull. Accommodated in it - the driver's seat, linkage levers and pedals, louvre linkage, remote gear change mechanism, driver's instrument panel, fuel feed pump and distributing fuel cock, cock for releasing air from the feed system, spherical clinometer, tilt indicator, tank intercom set No.3 (T.P.U), pressure gauge, electro-pneumatic valve, by-pass cock, block for protecting accumulators, battery switch and part spare parts kit (ZIP).

In the hull roof of the driving compartment there is the driver's hatch. The driver's emergency hatch is placed in the upper inclined plate on the left of the hull.

(Illustration)

Fig. 4. The Driving Compartment.

(For key to figures below see fig.4)

1. driver's seat; 2. shock absorber bracket; 3. left epicyclic steering lever (P.M.P); 4. cock; 5. reducer; 6. pressure gauge; 7. electro-pneumatic valve; 8. speedometer; 9. table of control data; 10. accelerator hand control; 11. handle of closing mechanism of driver's hatch; 12. hatch handle of emergency escape 13. hatch bolt bar of emergency escape, 14. handle of vision device; 15. protective glass of vision device; 16. fire fighting equipment (P.P.O.) signal junction box; 17. (driver's) instrument panel; 18. socket for external starting; 19. gear change lever; 20. fuel feed pump hand lever; 21. handle of fuel distributing cock; 22. tilt indicator; 23. drinking (water) tank; 24. right epicyclic steering gear lever (P.M.P.); 25. fire fighting equipment (P.P.O) signal; 26. accelerator pedal; 27. foot brake pedal; 28. main clutch pedal; 29. box of spare parts, tools and accessories (ZIP).

Accommodated on the right side of the length-wise partition in the forward part of the hull - fuel tank, 6 batteries, ammunition storage, voltage control and cut-out RRT-31, filter FG-57-A, two 10 litre cylinders of compressed air starting system.

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The fighting compartment is set in the centre part of the hull and in the turret.

Located in the turret - 57 mm co-axial automatic A/A gun S-68 with sight and aiming mechanisms, main part of ammunition holding, radio set, two KALASHNIKOV SMGs, grenades, veroy pistol, three tank intercom sets (T.P.U.) and part spare parts kit (ZIP).

Also located in the turret are the tank crew's seats; vehicle commander - on right of gun; right loader - in front and below commander's seat; sight setter - on left of gun; layer - in front and to the left of sight setter's seat; left loader - in front and below layer's seat.

Part of the ammunition holding is accommodated under the rotating floor; set in the centre of the floor there is a rotary base junction (V.K.U.). Placed on the left side of the hull there are linkage rods with transmission and power installation assemblies.

(Illustration)

Fig. 5. The Power Compartment

1. Engine air cleaner. 2. (missing) 3. starter; 4. automatic pressure device; 5. compressed air filter; 6. epicyclic steering gear; 7. oil separator; 8. compressor AK. 150 V; 9. fan; 10. gear box; 11. oil radiator; 12. engine.

Installed in the left rear corner of the fighting compartment at the power compartment partition, there are fire fighting equipment (P.P.O) cylinders and the electric motor for the drive of the pre-heater.

The power compartment (Fig.5) is located in the rear part of the vehicle and is separated from the fighting compartment by a partition.

Installed in the power compartment: engine with air cleaner, transfer gears, main clutch, gear box with AK-150 and compressor, epicyclic steering gear (P.M.P.), final drives, fan, central fuel tanks, oil tank. The electric starter is mounted on the bracket of the transfer gear box casing. Placed above the gear box and the epicyclic steering gear, there are the water and oil radiators. Located in the armoured roof above the rear part of the hull there are the entrance and escape louvres and hatches. In the hull floor there are hatches for access to assemblies when servicing. Fastened on the casing of the right hand drive is the oil separator and on the right side - the secondary compressed air filter and automatic pressure device.

Torsion suspension bars pass along the belly of the hull.

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Fastened on the outside of the vehicle: three fuel tanks, filler pump, oil tank, tarpaulin, part of vehicle spare parts kit (Z.I.P), towing cables, beams for self winching out, headlamps, outline and rear lights.

The upper turret slot is covered by a folding tarpaulin tent with vision windows. Located on the outside of the rear part of the turret there is a container for spent shell cases.

Fighting and Technical Characteristics

General Data

Fighting weight	28 T.
Crew	6 men
Unit power rating	18.5 hp./T
Mean specific pressure	0.63 Kg/sq.cm.

Overall Dimensions

Length with gun in front	8480 mm
Length with gun to the rear	7820 mm
Length of hull	6220 mm
Length of bearing surface	3840 mm
Width of vehicle	3270 mm
Width of tracks	2640 mm
Height of tent	2750 mm
Height of line of fire	1900 mm
Ground clearance	425 mm
Inside diameter of turret ring	2100 mm

Speed of Movement

Maximum speed	48-50 Km/hr.
Rated speed (at 1800 rpm of engine crankshaft):	
in I gear	6.78 Km/hr.
in II gear	14.5 "
in III gear	20.0 "
in IV gear	28.5 "
in V gear	45 "
in reverse gear	6.78 "

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on metalled road	35-40 Km/hr.
on dirt roads	25-30 Km/hr.

Operating Data**Fuel consumption per 100 Km of route:**

on dirt road	280-300 l.
on metalled road	220-230 l.

Oil consumption per 100 Km of route,

on dirt road	7 - 10 l.
on metalled road	6 - 8 l.

Rated cruising range on fuel:

on dirt road	300-320 Km
on metalled road	400-420 Km

(Rated cruising range when auxiliary fuel tanks are fitted on self propelled artillery vehicle:

on dirt road	430-460 Km).
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Negotiation of Obstacles

Maximum angle of incline,	30°
Maximum angle of tilt	30°
Width of ditch	2.7 m.
Depth of ford	1.4 m.
Height of step	0.8 m.

Armament**The Gun**

Type, mark	co-axial, automatic, A/A S-68
Calibre	57 mm
Number of automatic pieces	2
Principle of automatic working	use of short recoil of barrel
Muzzle velocity of shell	1000 m/sec.

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Weight of shell (fragmentation-tracer and armour piercing-tracer)	2.8 Kg
Weight of round	6.61 Kg
Weight of gun	4700 Kg
Maximum range of fire,	
Vertical	8,800 m
Horizontal	12,000 m
Fighting height of A/A fire	4000 m
Rate of fire of two SMG's	200-240 rounds/min.
Gun laying angles,	
horizontal	Unrestricted
elevation	85°
depression	5°
Turret traverse drive and elevating gear of gun	Electro-hydraulic and mechanical, by hand
Fluid drives of turret traverse drive and elevating gear of gun	Universal speed Governors (U.R.S.)
Quantity	2
Rated power on fluid drive of shaft	2.5 hp.
Pressure fluid	A.G.M. oil
Laying speed:	
horizontally:	
by electro-hydraulic drive	0.2-30 deg/sec.
manually,	4 deg/swing turn
vertically:	
by electro-hydraulic drive	0,3-20 deg/sec.
manually,	4 deg/swing turn
automatic device (ammo.) feed	clip
number of rounds in clip	4
weight of clip with rounds	28.5 Kg.
length of barrel (with muzzle brake)	4390 mm
number of riflings	24
length of recoil	325-370 mm
quantity of fluid in recoil brake	1.5 l.
fluid used in recoil brake and hydraulic buffer	glycerino, "STEOL.M"

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SECRETThe Sight

Sight	Automatic, A/A, (?) computing on course and speed (POSTROITEL'NYI) type
Working limits of automatic sight:	
Speed of target	Up to 350 m/sec.
Slant range	up to 5500 m
Angle of approach	unrestricted
Angle of dive	from 0° to 90°
Pitching angle (hillock)	from 0° to 70°
Angular height	from -5° to + 85°

Value of Graduation of Sight Scales:

Scale of range	100 m
Scale of course	0-25 thou.
Scale of speed	10 m/sec
Scale of angles of dive and pitching	5°

Tilt Indicator

Type	spherical fluid level
Value of graduation	graduated figures every 1°

S.M.G.

Quantity	2
Mark	AK-47
calibro	7.62 mm

Vorey Pistol

Calibro	26 mm
Quantity	1

Ammunition Holding

Rounds	316
of these, in clips	264

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Rounds for KALASHNIKOV SMG	600
of these, in 12 magazines	360
in special pouches and racks	240
Hand grenades F-1	20
Vorey cartridges	20

Power UnitThe Engine

Typo	Four stroke, diesel without compressor, direct injection with ignition from compression
Mark	V - 54
Maximum power at 2000 r.p.m.	520 hp.
Maximum torque at 1200-1300 r.p.m.	230 ± 10 Kgm
Operating revolutions of engine crankshaft	1600 - 1800 rpm
Maximum stable revolutions of idle running	500 - 600 rpm
Number of cylinders	12
Arrangement of cylinders	V-shape, at an angle of 60°
Diameter of cylinder	150 mm
Piston stroke:	
in left group	180 mm
in right group	186.7 mm
Displacement of all pistons	38.88 l.
Compression rates	14 - 15
Sequence of cylinder firing	11 -6r-5l-2r 3l-4r-6l-1r 2l-5r-4l-3r
Direction of crankshaft rotation	clockwise if locking from the direction of the wheel case gears
Weight of engine	895 Kg.

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The Fuel Feed System

Fuel used	"DL, DZ or DA"
Capacity of internal fuel tanks	640 l
including:-	
front tank	290 l
upper central tank	200 l
lower central tank	150 l
Capacity of external tanks	285 l
Hand fuel feed pump	Diaphragm, mark RNM-1
Fuel filters	primary - wire gauze; secondary - felt, doubled.
Fuel feed from tanks to high pressure pump NK-10	fuel feed by pump mark BNK-12 TK.
Fuel pump	plunger, high pressure, NK-10
Sequence of fuel feed by sections of NK-10 pump	2-11-10-3-6-7-12-1-4-9 -8-5
Angle of advance of fuel feed with NK-10 pump	30°-32° to "VMT" in compression stroke
Governor	centrifugal, variable speed, with corrector of fuel feed
Injector	closed type, with slot filter; initial pressure on lifting needle: 210 Kg/sq.cm

The Air Supply System

Air cleaner	one, two-stage, with automatic dust removal
Method of dust removal from the dust collector	with dust extractors, using the energy of exhaust gases.

The Lubricating System

Type of system	circulating, combined
Oil used	MT - 16 P.

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Capacity of lubricating system	82 l
Filling capacity of oil tank	60 l
Minimum permissible quantity of oil in the tank	20 l
Capacity of supplementary oil tank	35 l
Oil radiator	Tubular
Cooling surface	11.5 sq.m.
Oil pump	geared, three sectional, (one delivery section; two - pumping out.)
Discharge of pump at 1600 rpm of crankshaft	62.5 l/min.
Oil filter	"KIMAF-STZ" with two-stage cleaning: wire mesh section and cardboard element.
Initial Oil pump	MZN-2, geared, with electric drive.

The Cooling System

Type of System	fluid, closed, with forced circulation
Filling capacity of system	75-78 l
Water pump	centrifugal
Radiator	tubular
Fan	centrifugal

The Pro-heating System

Type	fluid, with forced circulation
Pro-heater	injector, with fire-tube boiler
Pro-heater drive	manual and electrical

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SECRETThe Engine Starting System

Main starting system	With compressed air.
Supplementary starting system	With electric starter "ST-16 M."
Number and capacity of cylinders	two, each of 10 l.
Air pressure in a fully charged cylinder	150 Kg/sq.cm.
Type of compressor for filling cylinders	"AK - 15 OS"

Instruments Controlling the Work of the Engine

Thermometers in the cooling, pre-heating and lubricating systems	"TUE-48T"
Pressure gauge	"TEM-15"
Tachometer	TE-3"
Working principle of instruments	Remote (control), with electrical receivers and indicators
Readings of instruments in operation:	
temperature of cooling fluid:	
Normal	75° - 95°
Maximum	105°
temperature of oil:	
Normal	75° - 95°
Maximum	110°
pressure of oil	
in operating condition(s)	6-10 Kg/sq cm.
at minimum stable revolutions of engine idling	not less than 2 Kg/cm.

The Transmission

Transfer gears	stop-up geared reducer
gear ratio	0.7
method of lubrication	spraying

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Oil used	"MT- 16P"
Quantity of oil in casing	6 - 7 l.
Weight of transfer gears	138 Kg.
Main clutch	Multiple disc, dry friction - steel on steel
Number of driving discs	9
Number of driven discs	8
Disengaging mechanism	ball
Clutch linkage	mechanical, with servo spring
Weight of main clutch	105 Kg.
Gear box	with permanent linkage of gear cogs, with synchronizers on 2, 3, 4 and 5 gears
Number of gears	five forward and one reverse
Gear ratios:	
in I gear	6.0
in II gear	2.8
in III gear	2.0
in IV gear	1.43
in V gear	0.9
in reverse gear	6.0
Method of lubrication	spraying
Oil used	"MT - 16 P"
Quantity of oil in casing	13 l
Drive to fan	step-up geared reducer, with clutch.
Drive to compressor	geared
Weight of gear box	557 Kg.
Steering mechanism of vehicle	planetary, two-stage

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Gear ratios:

With engaged clutch	1
With disengaged clutch and engaged steering brake	1.42
Block (?) brakes of steering mechanism	Multiple disc, dry friction - steel on steel
Number of driving discs	7
Number of driven discs	6
Disengaging mechanisms	Ball
Brakes	Band, floating, brake-shoes of cast iron
Linkage of driving mechanisms and main brake	Mechanical
Method of lubrication	Spraying
Lubricant used	Mixture: 30% "UT" grease and 70% MT-16 P Oil
Quantity of lubricant in casing of each steering mechanism	2.5 l.
Weight of one epicyclic steering lever (PMP), assembled, without brake bands	238 Kg.
Final drives	Single stage step-down reducers
Gear ratio	6.78
Method of lubrication	Spraying
Lubricant used	"TSIATIM-208"
Quantity of lubricant in each final drive	4.5 Kg
Weight of final drive	330 Kg.

Running Gear

Running gear	Track, with rear driving sprockets
Tracks	Metal, close-linked

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Number of track plates in each track (now)	90
Width of track	580 mm
Spacing of track	137 mm
Linking of tracks	With stool track link pins
Weight of one track	About 1300 Kg
 Driving sprockets	 Cast, with detachable toothing
Number of tooth	13
Weight of driving sprocket	126 Kg.
Track adjusting idler	Cast, with doubled metal rims
Weight of track adjusting idler, assembled with idler wheel adjustor	160 Kg.
Method of tensing the tracks	By turning the idler wheel adjustor by means of the worm pair
Bogie wheels	Doubled, with rubber tyres, each side having 4.
Weight of roller, assembled	265 Kg.
Suspension	Individual, torsion
Suspension shock absorbers	Hydraulic, joined to front and rear axle arms
Kind of fluid for shock absorbers	Alcohol-glycerino fluid "90/10" or fluid AZH-170
Quantity of fluid in shock absorber	1.3 - 1.5 Kg.
 Electrical Equipment	
Wiring system	Single wire (except for duty lighting)
Voltage of electrical circuit	24-29 V

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Sources of Electric power

Batteries	Starter, acid 6-STEN-140 M or 6-MST-140
Quantity	6
Voltage of one battery	12 V
Capacity of one battery	140 a/h
Connection of batteries	Series-parallel, (in parallel groups between series groups)
General capacity	420 a/h
Weight of one battery with electrode	64 Kg.
Generator	Direct current, with parallel excitation
Power	3000 W.
Rated voltage	28 V
Maximum current	108-130 a.
Weight of generator	48 Kg.
Voltage control and cut-out	RRT-31
Electric filter	FG-57 AB

Consumption of Electric Power

Starter	Series, St-16 M
Power	15 hp
Voltage	24 V
Adenoid shift	RST-15a
Weight of starter	45 Kg.
Electric motors of turret electro- hydraulic drive and of elevating gear of gun	Shunt, G-731 (Generator G-731 in motor performance, on one shaft)
Quantity	2
Power of one motor	2 KW.
Rated voltage	24 V
Maximum current used by drives	300 a.

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Connection between electric motors and with fluid drive	Parallel, chain
Method of switching on	by means of the starting switch
Electric motors of conveyor of spent shell cases and pro- heater drive	Shunt, MPB-55
Quantity	2
Power	500 W
Voltage	24 V
* Current used	40-100 a
* { Electric motor of initial oil pump MN-1 { current used (remainder missing)	}

Electrical firing gear of guns

Mark	RP-2
Quantity	2
Relay	2

Lighting and Signalling

External lighting	Head lamps FG-101, Fg-102, front and rear outline lights
Internal lighting	KLST lamps PT-37 coiling lamps, lamps for lighting instruments and signalling lamp
Signalling	External sound signal-vibrating, S-58 - one; PPO sound signal - vibrating S-58 - one.

Auxiliary Gear

Rotary base junction	VKU - 27
Battery switch	VB-404
Switch of safety signal system of drivers hatch	PS-3
Socket for external starting	One, for starting motor of starter from outside source of current.

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Instruments

Voltamperemeter

One, electro-
magnetic VA-180 for
measuring voltage
within limits of
0-30 V; current -
within limits of
60-0-180 a

Communications Equipment

Radio set

Receiver-transmitter,
simplex, RT-WT

Mark

10 RT - 26 E

Range of action, at night,
by RT, operating on rod
aerial 4 m high:

parked

9-20 Km

on the move

7-15 Km

Range of action by day on selected
wave lengths, operating on rod
aerial 4 m high:

parked

Up to 35-40 Km

on the move

Up to 23-25 Km

Feed

From electrical
circuit of vehicle

Voltage

26 V

Current used:

for reception

Up to 4 a

for transmission

Up to 10 a

Internal intercom set

TPU-4-47

Feed

From electrical
circuit of vehicle

Location of sets:

set No. 2

With vehicle
commander

set No. 1

With sight setter

set No. 3

With the layer

set No. 3

With the driver

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Fire Fighting Equipment

Type of installation	Semi-automatic, carbonic acid
Number of cylinders with carbonic acid	3
Weight of carbonic acid in each cylinder	1.8 - 2.0 Kg
Notification of driver about fire	By signal lamps and sound signal
Quantity of flam detector switches	6
Method of switching installation into action	By buttons: two with the driver
Hand fire extinguisher	One, carbonic acid OU-2

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