HEADQUARTERS
UNITED STATES ARMY, EUROPE
AND SEVENTH ARMY
APO New York 09403

USAREUR PAM
No. 30-60-1

15 January 1973

IDENTIFICATION GUIDE

PART ONE

WEAPONS AND EQUIPMENT
EAST EUROPEAN COMMUNIST ARMIES

VOLUME II

ARTILLERY

HEADQUARTERS
UNITED STATES ARMY, EUROPE and SEVENTH ARMY
APO New York 09403

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FOR THE COMMANDER IN CHIEF:

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Adjutant General

NOT USED

FOREWORD

The purpose of this guide is to present the essential tactical, technical and recognition data on weapons and equipment presently employed in the armies and security forces of the Communist countries of Eastern Europe.

Every effort has been made to make this guide comprehensive, within the limits of an unclassified publication. Any discrepancies noted or any information on new or modified weapons or equipment should be forwarded to this headquarters for inclusion in future change sheets.

Part One of this guide supersedes the weapons and armored vehicles sections of the Identification Guide (Ordnance Equipment) Warsaw Pact Countries, USAREUR Pam 30-60-1, Seventh Revised Edition, 31 July 1968; and it also replaces the same section that appeared in the rescinded (6 Oct 69) Identification Handbook, Yugoslav Army Weapons and Equipment, USAREUR Pam 30-60-5, 31 March 1965.

Part Two of this guide (to be published at a future date) will replace the truck and tractor sections of the above mentioned publications and of the Identification Guide (Engineer Equipment) Warsaw Pact Countries, USAREUR Pam 30-60-8, Fifth Edition, 27 February 1970.

Part Three of this guide (also to be published at a future date) will cover all other equipment, thus completing the replacement of the older guides mentioned.

The date of information for Part One, Volume Two of the new guide is October 1972.

HAROLD R. AARON
Brigadier General, GS
Deputy Chief of Staff, Intelligence

TABLE OF CONTENTS

FOREWORD iii
TABLE OF CONTENTS iv
INTRODUCTION volume one
METRIC ABBREVIATIONS
CONVERSION TABLES
SIGNIFICANT TECHNICAL WORDS
DEFINITIONS
NOTE ON NOMENCLATURE AND MODEL DESIGNATIONS
AMMUNITION
INFRARED DEVICES
SMALL ARMS
- Soviet Pistols and Machine Pistols
- Czechoslovak Pistols and Machine Pistols
- Hungarian and Polish Pistols and Machine Pistols
- Yugoslav Pistols
- Soviet and Polish Submachineguns
- Czechoslovak and Romanian Submachineguns
- Yugoslav Submachineguns
- Bolt Action Rifles and Carbines
- Semiautomatic Rifles and Carbines
- Sniper Rifles
- Kalashnikov Assault Rifles
- Czechoslovak and German Assault Rifles
- Soviet Light Machineguns
- Czechoslovak and Yugoslav Light Machineguns
- General-Purpose Machineguns
- Soviet and Czechoslovak Medium Machineguns
- 12.7mm and 14.5mm Heavy Machineguns

GRENADES
- Soviet Hand Grenades
- Czechoslovak, Hungarian and Yugoslav Hand Grenades
- Polish and Yugoslav Rifle Grenades
- Smoke Grenades

PYROTECHNICS
- Signal Pistols, Hand Launchers, Illuminating Rockets and Related Ammunition

RECOILLESS ANTITANK WEAPONS
- Antitank Grenade Launchers
- Antitank Rocket Launchers
- Soviet Recoilless Guns
- Czechoslovak Recoilless Guns
- Yugoslav Recoilless Guns and Rifles

ANTITANK GUIDED MISSILES
- Antitank Guided Missiles AT-1 "SNAPPER" and AT-2 "SWATTER"
- Antitank Guided Missile AT-3 "SAGGER"

MORTARS
50mm, 60mm and 81mm Mortars
82mm Mortars
107mm and 120mm Mortars
160mm and 240mm Mortars

VOLUME II

ARTILLERY

FIELD AND COAST ARTILLERY CANNON....9
Fire Control....11
45mm and 57mm Antitank Guns....21
76mm Field and Mountain Guns....27
85mm Field Guns....33
100mm Field Guns....39
105mm Howitzers....51
122mm Howitzers....57
122mm Field Guns....65
130mm Field and Coastal Guns....71
152mm Howitzers....79
152mm Gun-Howitzers....85
155mm Howitzers and Guns....91
203mm Howitzers and Gun-Howitzers....97
FIELD ARTILLERY ROCKET LAUNCHERS....103
Towed Multiround Rocket Launchers....105
Truck-Mounted 122mm Multiround Rocket Launchers....113
Truck-Mounted 130mm Multiround Rocket Launchers....119
Truck-Mounted 132mm and 140mm Multiround Rocket Launchers....125
Truck-Mounted 200mm and 250mm Multiround Rocket Launchers....131
Truck and Tractor-Mounted 240mm Multiround Rocket Launchers....137
SURFACE-TO-SURFACE FREE ROCKETS AND GUIDED MISSILES....143
Surface-to-Surface Free Rockets Over Ground....145
Surface-to-Surface Guided Ballistic Missiles....159
Surface-to-Surface Guided Cruise Missiles....165
AIR DEFENSE ARTILLERY MACHINEGUNS AND CANNON....173
Fire Control....174
Rifle Caliber Antiaircraft Machineguns....177
12.7mm Antiaircraft Machineguns....181
14.5mm Antiaircraft Heavy Machineguns....185
20mm Automatic Antiaircraft Guns....191
23mm and 30mm Automatic Antiaircraft Guns....197
37mm and 57mm Automatic Antiaircraft Guns....203
40mm Automatic Antiaircraft Guns....211
85mm and 88mm Antiaircraft Guns....215
90mm and 94mm Antiaircraft Guns....221
100mm and 130mm Antiaircraft Guns....225

SURFACE-TO-AIR GUIDED MISSILES.....231
Surface-To-Air Guided Missile SA-2 "GUIDELINE".....233
Surface-To-Air Guided Missile SA-3 "GOA".....241
Surface-To-Air Guided Missile SA-4 "GANEF".....243
Surface-To-Air Guided Missile SA-6 "GAINFUL".....247
Surface-To-Air Guided Missile SA-7 "GRAIL".....248

VOLUME III

ARMORED VEHICLES: TANKS AND SELF-PROPELLED ARTILLERY

ARMORED VEHICLES, GENERAL
General
Uniforms for Tank Crews
Navigation Equipment
Fire Control Equipment
Training
Crew Duties
Tank-Mounted Engineer Equipment
Water Jet Systems
Tank Guns
Other Armored Vehicle Cannon (Except Antiaircraft)
Antiaircraft Guns on Self-Propelled Mounts
Tank Machineguns
TANKS
New Tanks
Light Tanks
Medium Tanks T-34 and T-44 Series
Medium Tanks T-54 and T-55 Series
Medium Tanks T-62 Series
Medium Tanks M4 and M47 Series
Heavy Tanks JS Series
Heavy Tanks T-10 Series
ASSAULT GUNS AND SELF-PROPELLED CANNON
Airborne Assault Guns
Light and Medium Assault Guns
Heavy Assault Guns
Yugoslav Self-Propelled Cannon
Super-Heavy Self-Propelled Cannon
SELF-PROPELLED ANTIAIRCRAFT AUTOMATIC WEAPONS
Wheeled Self-Propelled Antiaircraft Automatic Weapons
Half-Track Self-Propelled Antiaircraft Automatic Weapons
Tracked Self-Propelled Antiaircraft Automatic Weapons

VOLUME IV

ARMORED VEHICLES
(SCOUT CARS, APC'S AND TANK RECOVERY VEHICLES)

ARMORED RECONNAISSANCE VEHICLES
- Soviet and East German Armored Cars and Water Cannon
- Yugoslav Armored Cars
- Soviet Amphibious Wheeled Reconnaissance Vehicles
- Hungarian Amphibious Wheeled Reconnaissance Vehicles

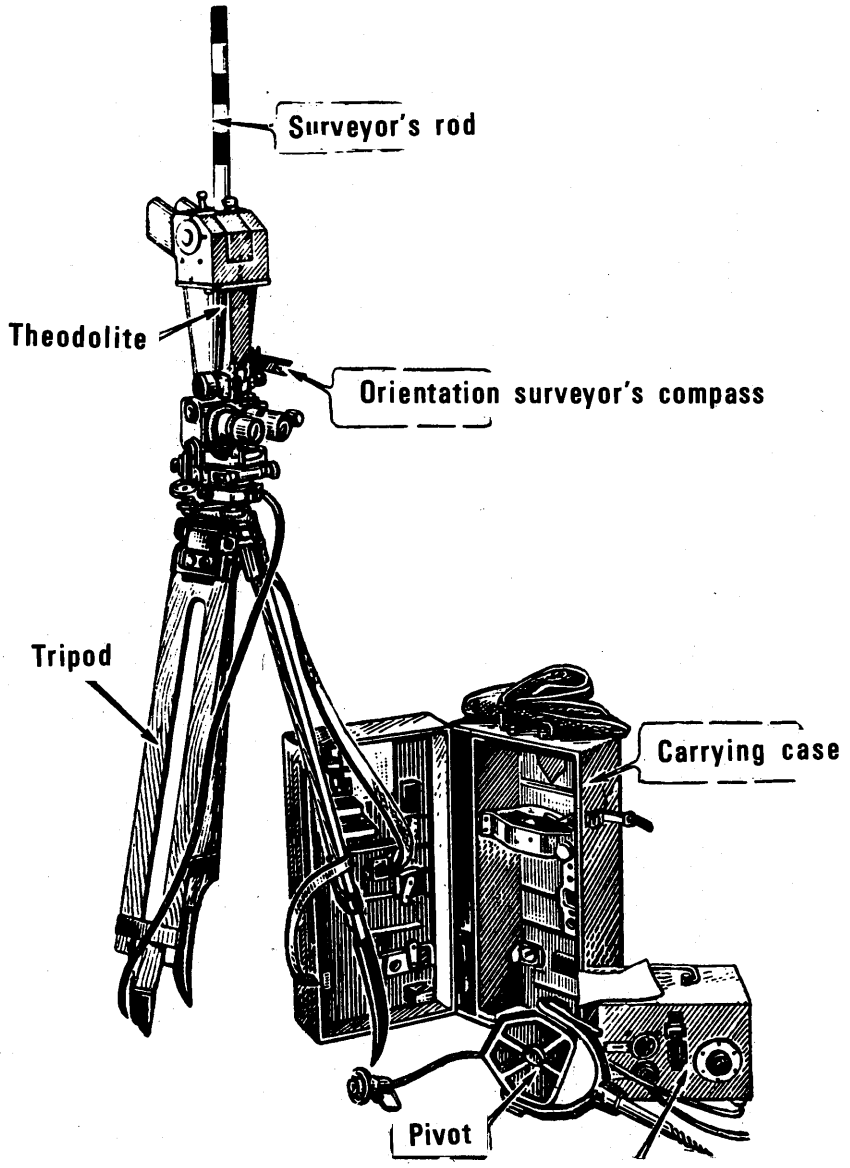
ARMORED PERSONNEL CARRIERS AND INFANTRY COMBAT VEHICLES
- Soviet Non-Amphibious Wheeled Armored Personnel Carriers
- Soviet Amphibious Wheeled Armored Personnel Carriers
- Czechoslovak Amphibious Wheeled Armored Personnel Carriers
- Half-Track Armored Personnel Carriers
- Soviet and Czechoslovak Amphibious Tracked Armored Personnel Carriers
- Yugoslav and Chinese Communist Amphibious Tracked Armored Personnel Carriers
- Infantry Combat Vehicles

TANK RECOVERY VEHICLES
- Medium Tank Recovery Vehicles T-34 Chassis
- Medium Tank Recovery Vehicles T-54 and T-55 Chassis
- Medium Tank Recovery Vehicles M4 Chassis
- Heavy Tank Recovery Vehicles JS Chassis

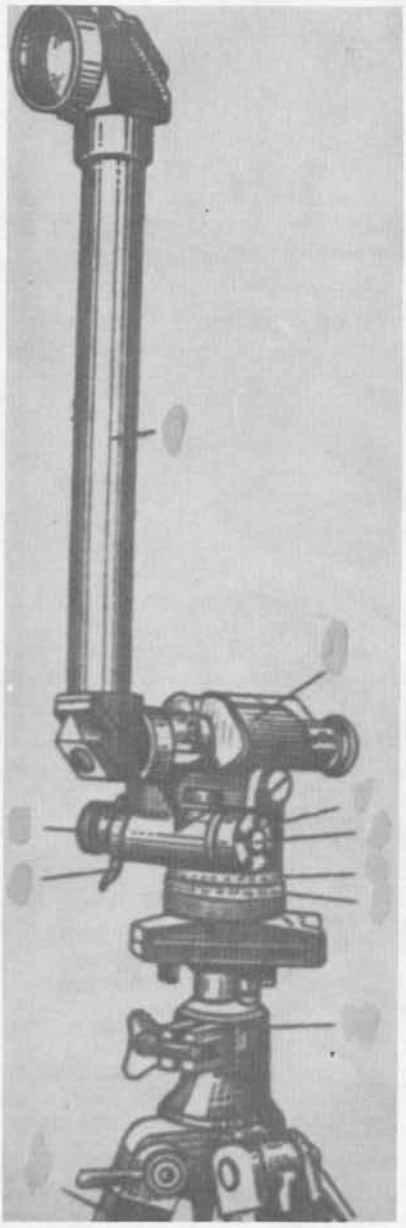
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FIELD AND COAST ARTILLERY CANNON

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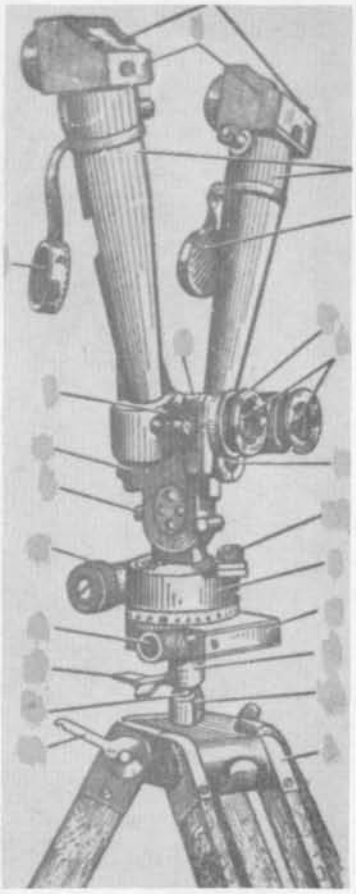


Reconnaissance theodolite RT–2

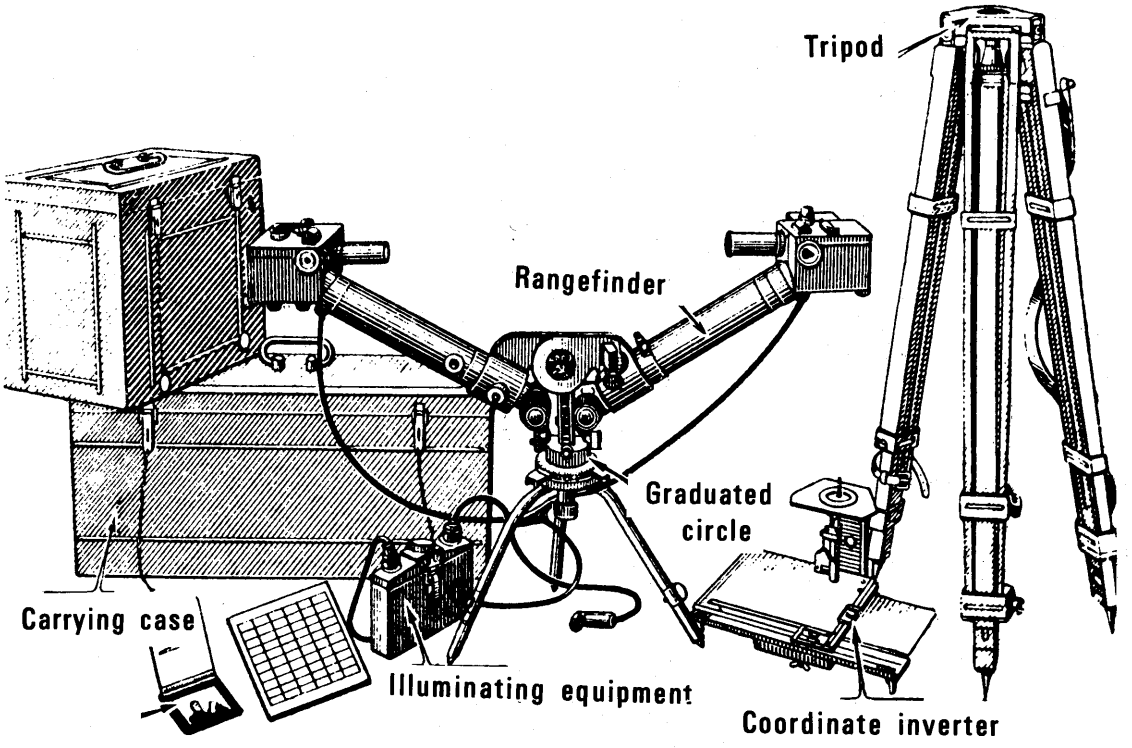


Periscopic artillery compass PAB–2

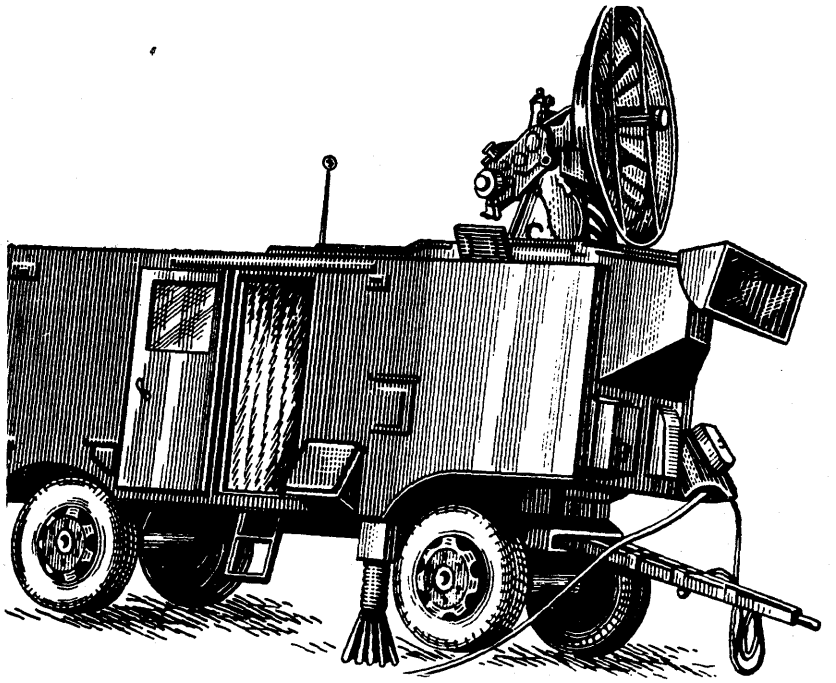
(aiming circle)



Battery commander's telescope AST

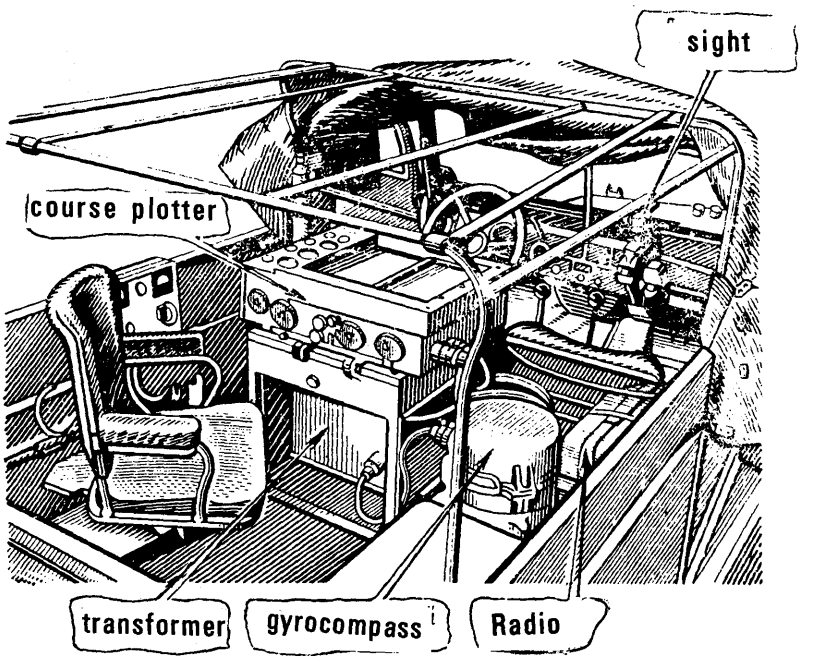


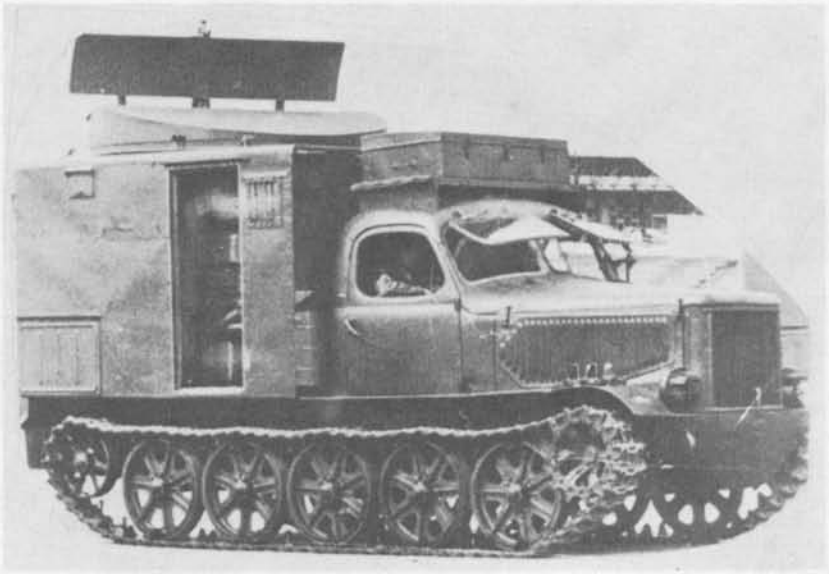
Stereoscopic rangefinder DS–0,9



Radar meteorological station RMS–1

Topographic survey vehicle GAZ–69TM

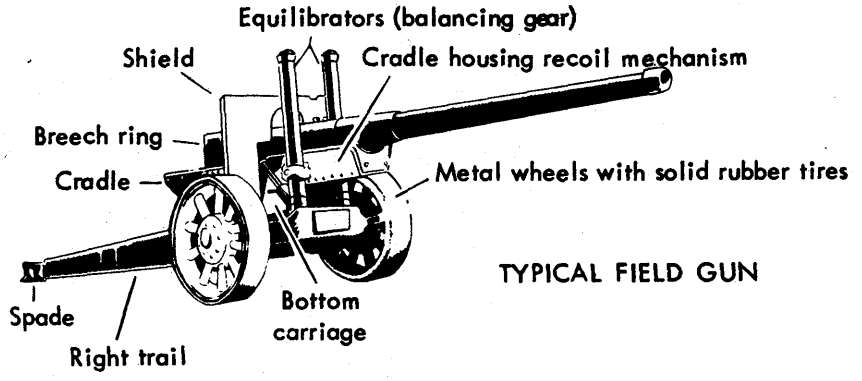




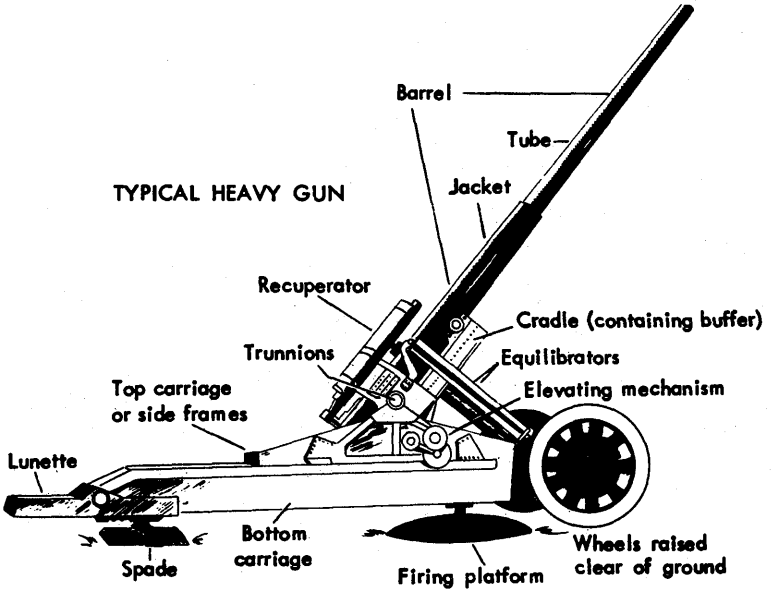
Artillery reconnaissance radar SNAR–2



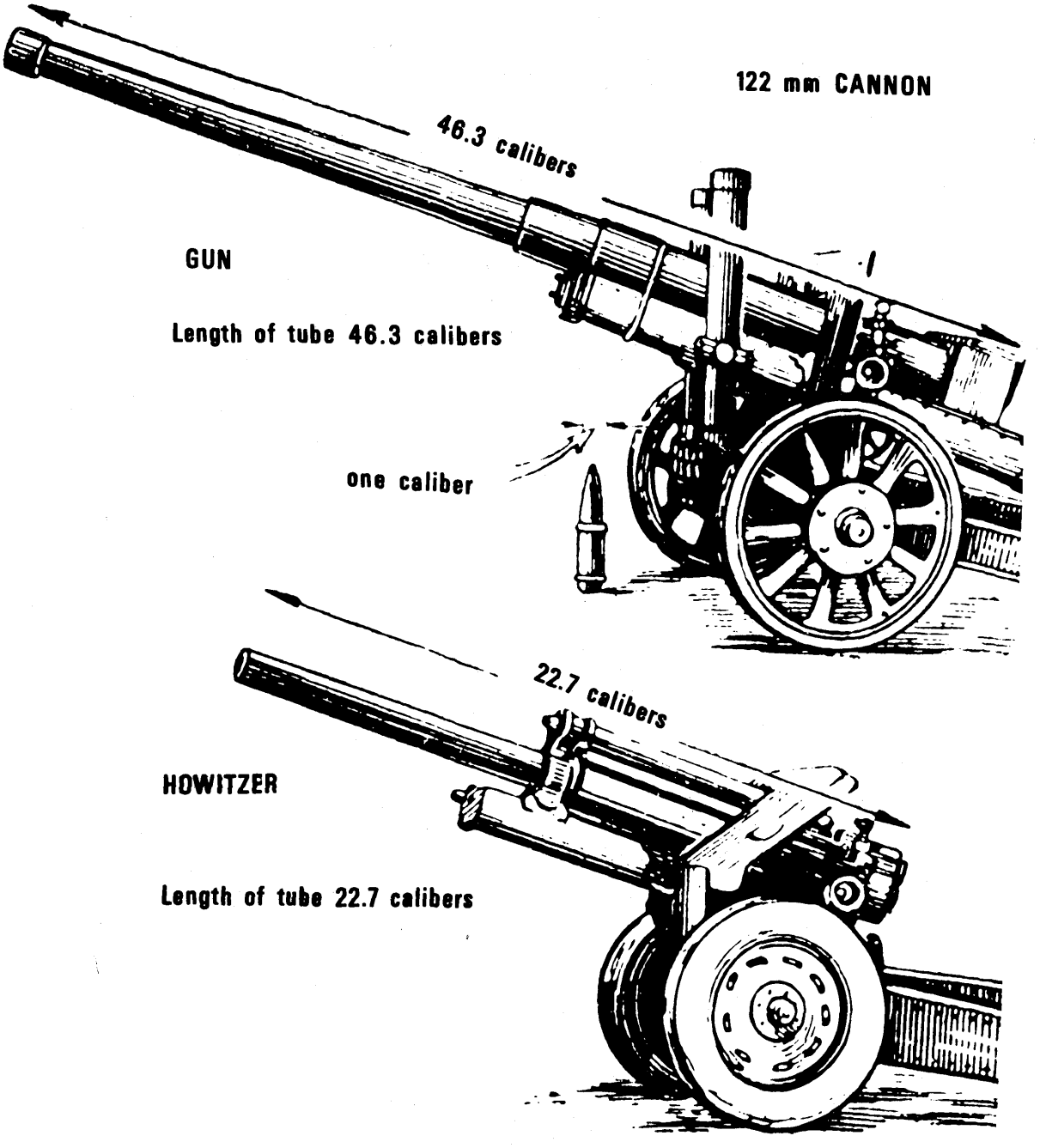
Artillery and mortar position locating radar ARSOM

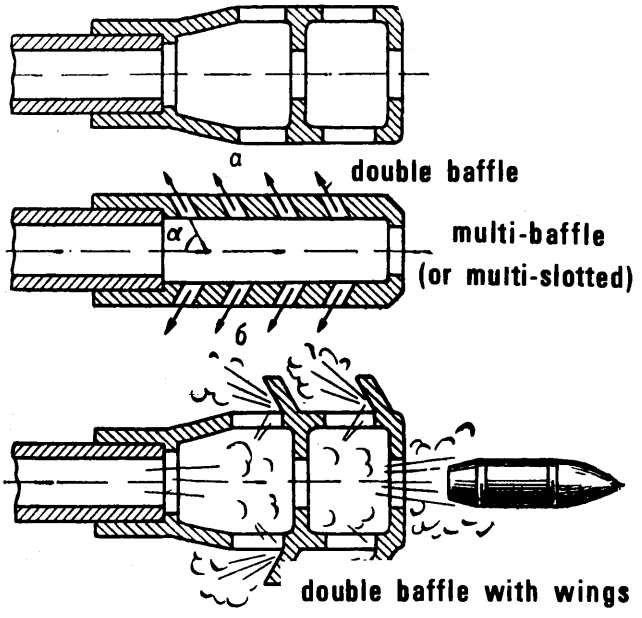


TYPICAL FIELD GUN

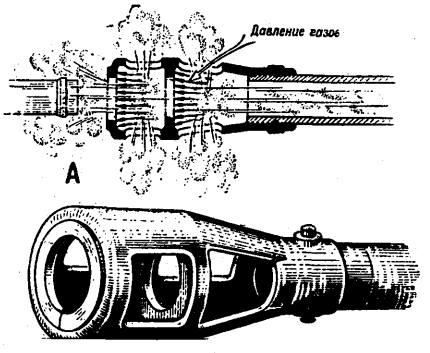


TYPICAL HEAVY GUN

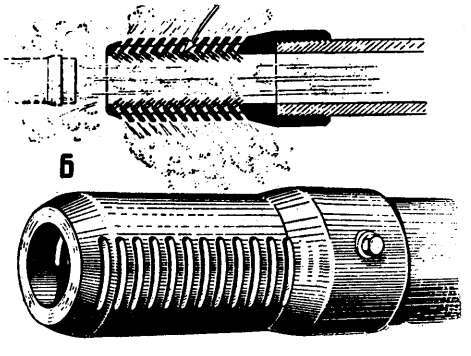

122 mm CANNON
46.3 calibers
GUN
Length of tube 46.3 calibers
one caliber
22.7 calibers
HOWITZER
Length of tube 22.7 calibers



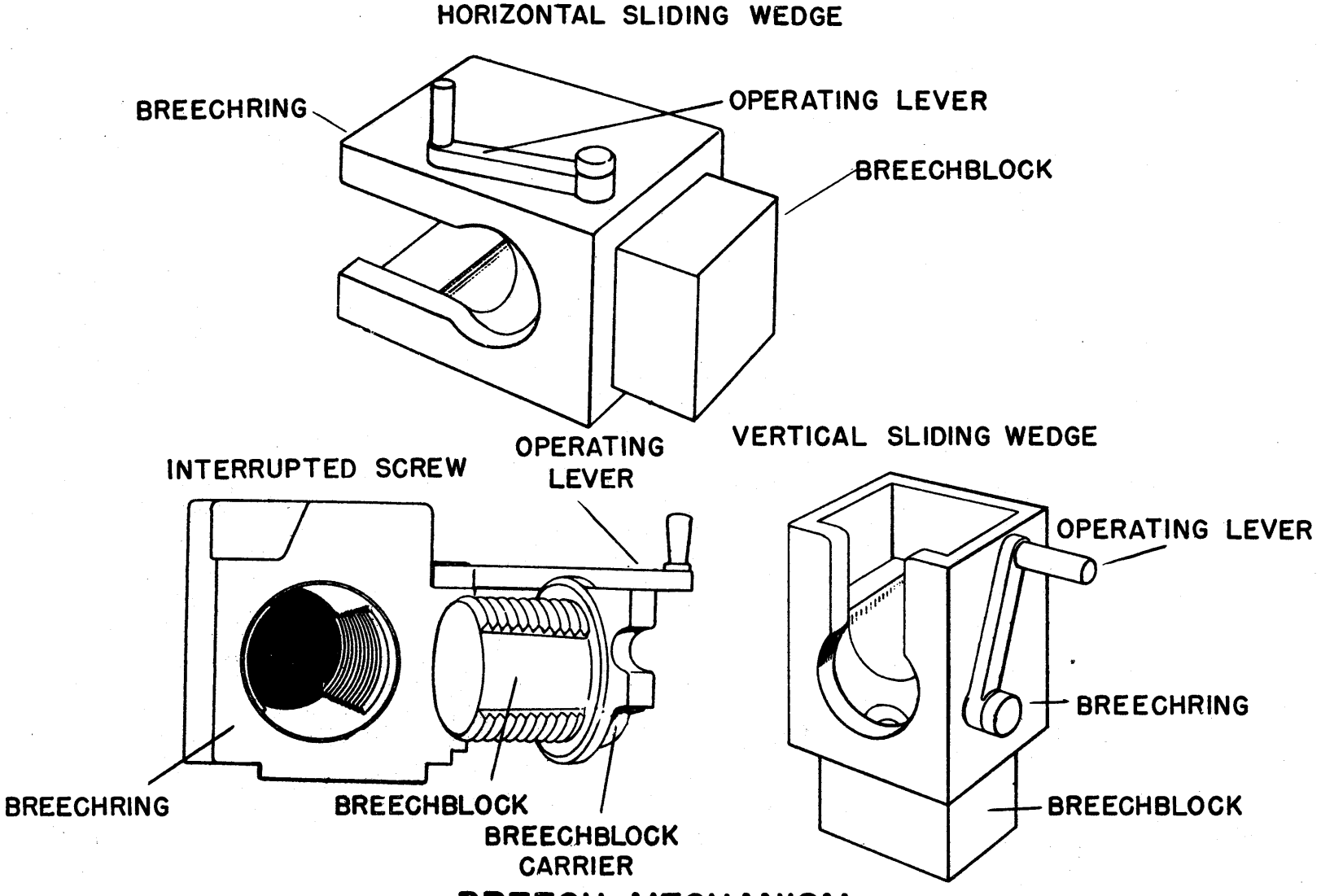
MUZZLE BRAKES



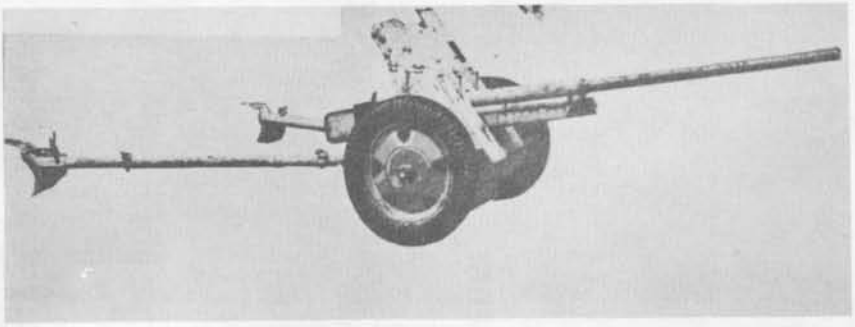
double baffle as on 76 mm divisional gun M1942



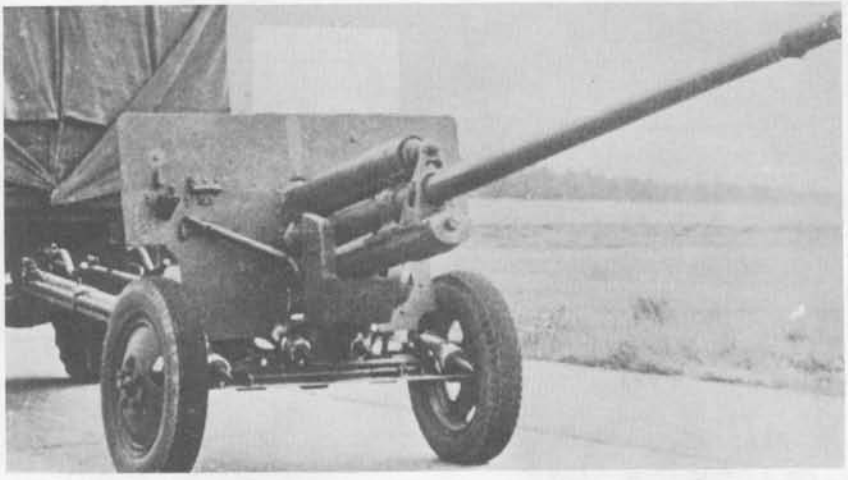
multi-baffle as on 152 mm gun howitzer M1937



BREECH MECHANISM



45 mm antitank gun M1942



57 mm antitank gun M1943 (ZIS–2)



57 mm auxiliary-propelled antitank gun Ch–26

45mm AND 57mm ANTITANK GUNS

45mm antitank gun M1942
57mm antitank gun M1943 (ZIS-2)
57mm auxiliary-propelled antitank gun Ch-26

The 45mm antitank gun M1942, which was based on the earlier M1932 and M1937 models, was introduced during World War II as a stopgap weapon pending the mass production of the newly developed 57mm antitank gun. Although the 45mm gun has long since been replaced in the armies of the Warsaw Pact countries and Yugoslavia, it is still found in certain security forces and militia units. The M1942 is basically the same gun as the M1937, but it has a longer tube and a strengthened breechring to enable it to fire a more powerful APHE round. The wheels are plain or slotted disc instead of the earlier wire spoke type. The recoil system has a hydraulic buffer and a spring recuperator. The breechblock is of the semiautomatic vertical sliding wedge variety.

The 57mm antitank gun M1943 (ZIS-2) has the same tube and recoil system as the earlier M1941, but is mounted on the improved carriage of the 76mm divisional gun M1942 (ZIS-3). It can be distinguished from the 76mm gun by the long thin tube and the absence of a muzzle brake. The recoil system has a hydraulic buffer and a hydropneumatic recuperator. The breechblock is of the semi-automatic vertical sliding wedge type. The original shield has often been replaced by one with a wavy top, especially for those guns which have infrared night sighting equipment. The M1943 is also found in Communist China where it is known as the Type 55.

The 57mm auxiliary-propelled gun Ch-26 is a shortened version of the Ch-51M gun mounted on the ASU-57 airborne assault gun. It is notably shorter than the M1943 and is fitted with a double baffle muzzle brake. The ballistic performance, nevertheless, is almost identical. The Ch-26 has a hydraulic buffer and a spring recuperator. The breechblock is of the semiautomatic vertical sliding wedge type. It should be noted that the 57mm auxiliary-propelled gun differs from the 85mm SD-44 in that the engine is on the right side of the shield and the trail wheel is in front of the spades in the auxiliary travel position. Infrared night sighting equipment is standard.

The ammunition for the various 57mm antitank guns and the guns on the ASU-57 is interchangeable, but not with that of the various 57mm antiaircraft guns.

		M1942	M1943	Ch-26*
Caliber	mm	45	57	57
Length of tube in cals		68	73	66
Length of tube overall	mm	3087	4160	4070
Weight in firing position	kg	570	1150	1250
Weight in travel position	kg	570	1150	1250
Length in travel position	mm	4885	6795	6112
Width in travel position	mm	1634	1700	1800
Height in travel position	mm	1200	1370	1220
Track	mm	1400	1400	1400
Clearance	mm	254	315	225
Tire size			6.50x20	
Height of axis of bore 0°	mm	701	875	740
Elevation	°	+25	+25	+15
Depression	°	-8	-5	-5
Traverse	°	60	56	56
Rate of fire	rpm	25-30	25	12
Projectile weight: HE	kg	2.1	2.8	2.8
APHE	kg	1.4	3.1	3.1
HVAP	kg	0.9	1.8	1.8
Muzzle velocity: HE	m/s	343	706	685
APHE	m/s	820	990	970
HVAP	m/s	1070	1270	1240
Maximum range	m	4400	8400	6700**
Pointblank range: APHE	m	1000	1150	1100
2m high target HVAP	m		1250	1200
Armor penetration: APHE	mm	61	106	106
0°/500m HVAP	mm	66	140	140
Crew		6	7	5
Unit of fire	rds	200	200	120

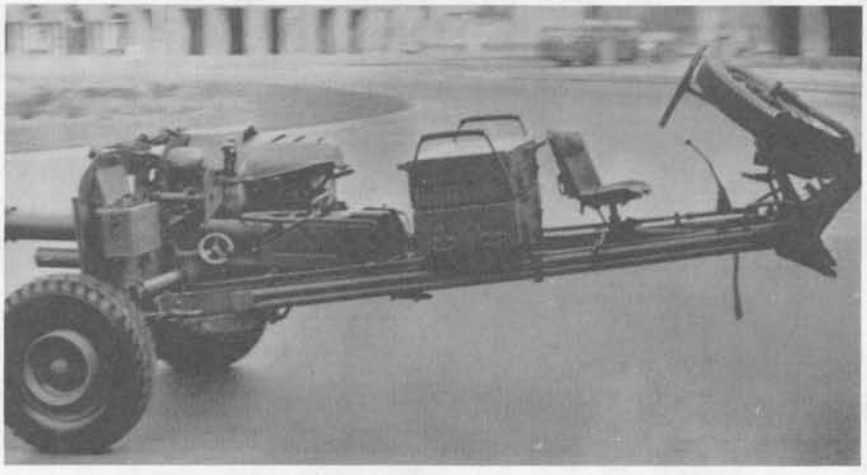
*The Ch-26 has an auxiliary propulsion unit consisting of one M-72 two-cylinder 14 HP gasoline engine. It is capable of a top speed of 40 km/h. The fuel supply is kept in the hollow trails.
**limited by carriage elevation





57 mm antitank gun M1943 (ZIS–2)

with wavy shield and mount for infrared searchlight



57 mm auxiliary-propelled antitank gun Ch–26



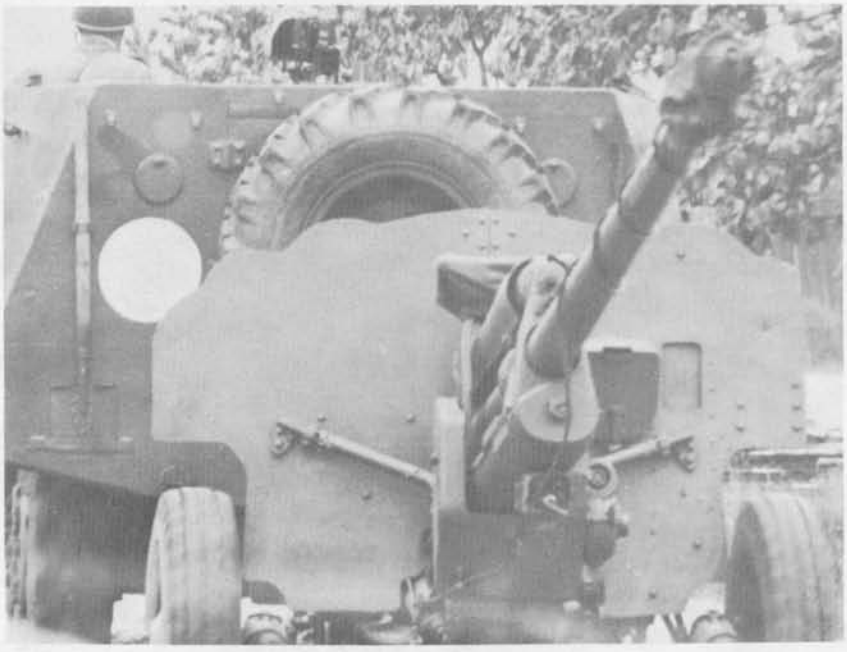
57 mm auxiliary-propelled antitank gun Ch–26



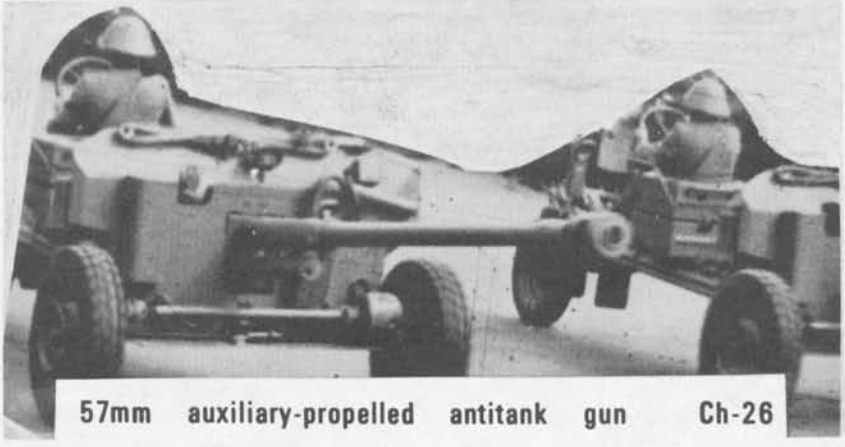




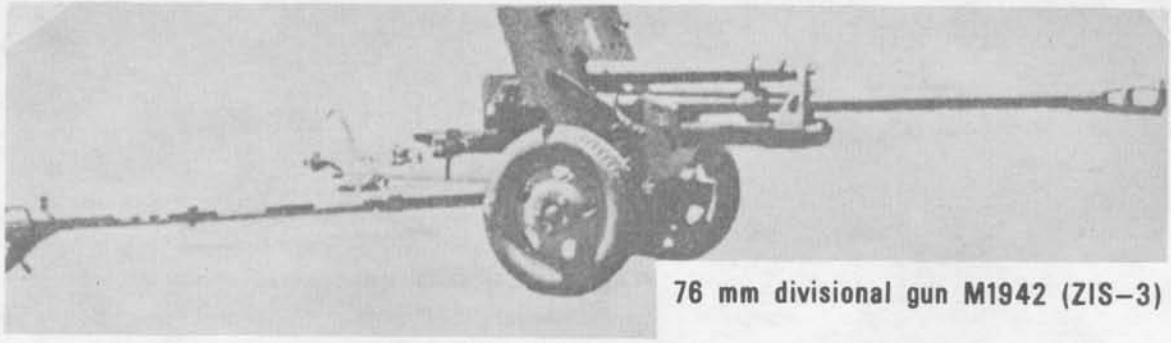
57 mm antitank gun M1943 (ZIS–2)



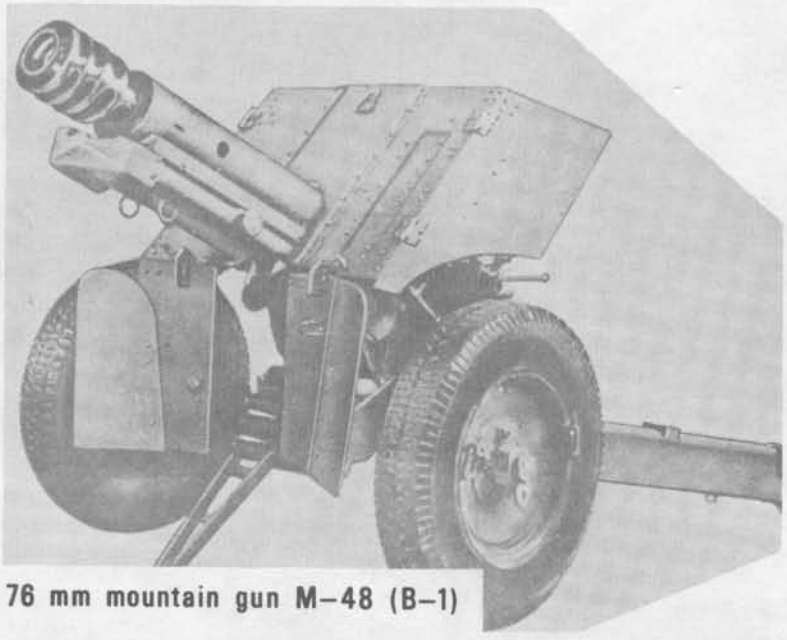
57 mm antitank gun M1943 (ZIS–2)
with wavy shield and mount for infrared searchlight



57mm auxiliary-propelled antitank gun Ch-26



76 mm divisional gun M1942 (ZIS–3)



76 mm mountain gun M–48 (B–1)



76 mm mountain gun M1966

76mm FIELD AND MOUNTAIN GUNS

76mm divisional gun M1942 (ZIS-3)
76mm mountain gun M1966
76mm mountain gun M-48 (B-1)
76mm mountain gun M-48 (B-1A1-I)
76mm mountain gun M-48 (B-1A2)
76mm mountain gun M-48 (B-2)

The 76mm divisional gun M1942 (ZIS-3) is the last of a long line of Russian and Soviet 76mm field guns which was originally introduced at the turn of the century. These guns, in turn, formed the basis on which the main armament of the KV-1 heavy, the T-34 (76) medium, and the PT-76 light amphibious tanks was developed. All of these pieces used the same basic fixed ammunition.

The M1942 has been replaced in most line units, but is still encountered in security and militia forces and in a training role. Using the same carriage as the 57mm antitank gun M1943 (ZIS-2), it can be recognized by the shorter tube and the double-baffle muzzle brake. The recoil system located both above and below the tube features a hydraulic buffer and a hydropneumatic recuperator. The breechblock is of the semiautomatic vertical sliding wedge type. Minor differences may be encountered in certain M1942's depending on the year of manufacture. The gun is known in Communist China as the Type 54.

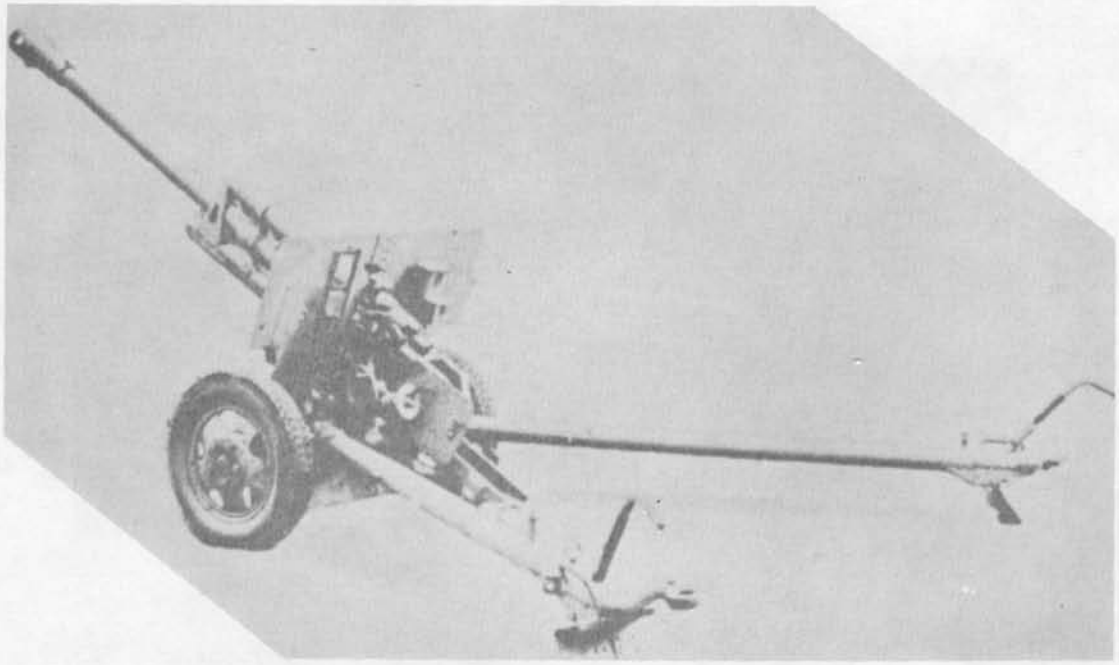
The 76mm mountain guns have an equally long history in the Russian and Soviet armies. The 76mm mountain gun M1966 is the latest model, replacing the pre-World War II M1938. The mountain guns fire fixed ammunition which is related to the field and tank ammunition, but is not interchangeable. The guns themselves can be towed either by motor vehicle or animals, or can be broken down into several loads for pack animals.

The Yugoslav 76mm mountain gun M-48, also known as the "Tito gun", is one of several artillery pieces produced in Yugoslavia. Although primarily designed as a mountain gun, the M-48 also serves as a light field piece. There are four variants, the B-1, the B-1A1-I, the B-1A2, and the B-2. The B-1 has pneumatic tires and can be towed either by a motor vehicle at speeds up to 60 km/h or by animals in tandem, or broken down into eight pack loads. The B-1A2 has light alloy wheels with solid rubber tires, and minor suspension modifications. Its towing speed is only 30 km/h. The B-1A1-I has the pneumatic tires and wheels of the B-1, plus some of the suspension features of the B-1A2. It is strictly a field

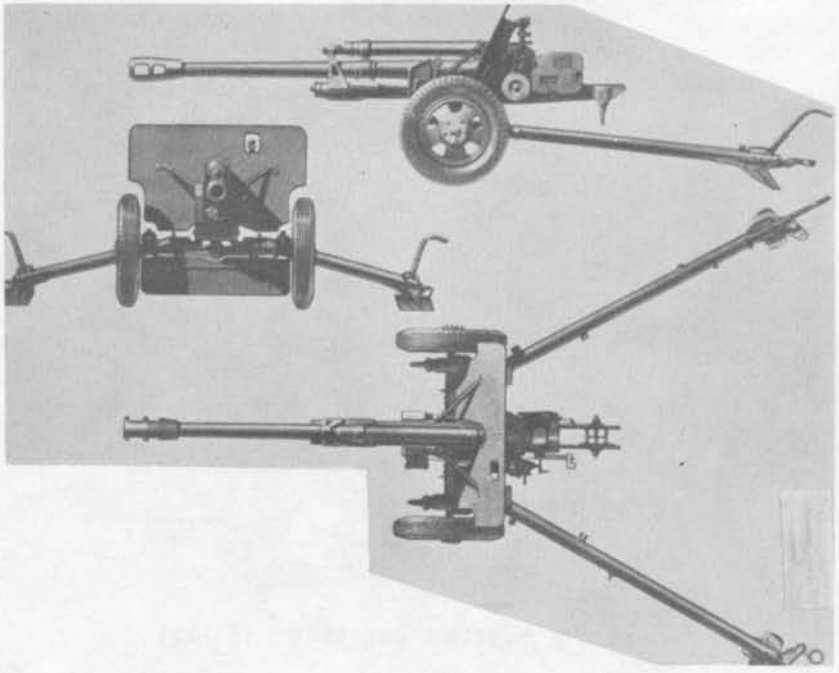
piece and is not suitable for either tandem animal towing or pack transport. The B-2 is a new variant about which little is known. All models of the M-48 gun have the same semiautomatic sliding wedge breechblock, hydraulic recoil system, folding split trails, and multi-baffle muzzle brake. The ammunition is based on that of the Soviet 76mm regimental gun M1927, but is semifixed instead of fixed.

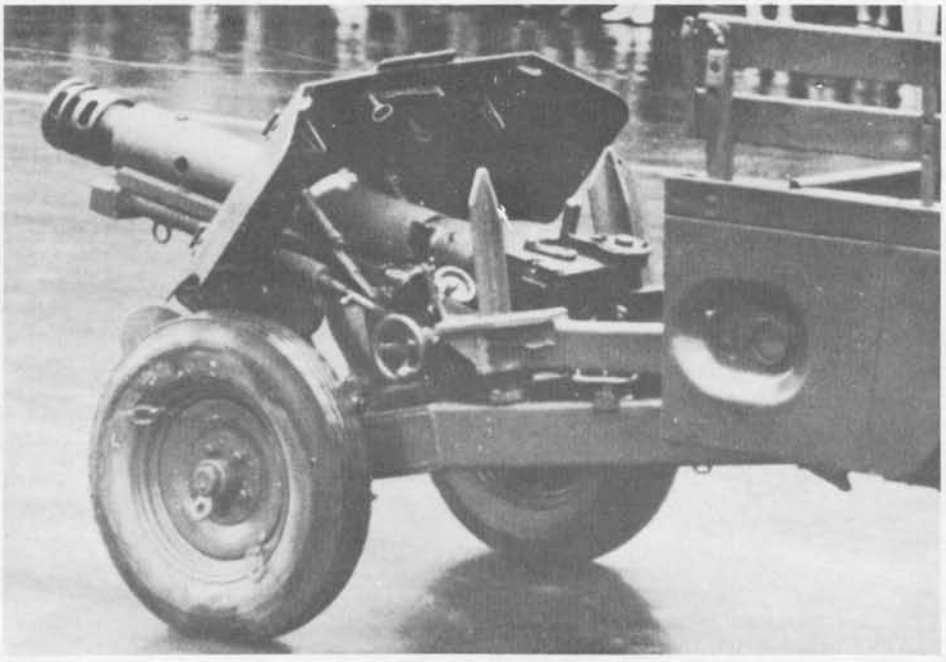
			M1942	M-48 (B-1)
Caliber		mm	76.2	76.2
Length of tube in cals			42	15.6
Length of tube overall		mm	3455	1178*
Weight in firing position		kg	1116	720
Weight in travel position		kg	1116	720**
Length in travel position		mm	6095	2420
Width in travel position		mm	1645	1460
Height in travel position		mm	1375	1220
Track		mm	1400	1300
Clearance		mm	360	180
Tire size			6.50x20	6.00x16
Height of axis of bore 0°		mm	900	730
Elevation		°	+37	+45
Depression		°	-5	-15
Traverse		°	54	50
Rate of fire		rpm	15-20	25
Projectile weight:	HE	kg	6.2	6.2
	APHE	kg	6.5	---
	HVAP	kg	3.1	---
	HEAT	kg	4.0	5.1
Muzzle velocity:	HE	m/s	680	398
	APHE	m/s	655	---
	HVAP	m/s	965	---
	HEAT	m/s	325	
Maximum range		m	13290	8750
Pointblank range:	APHE	m	820	---
2m high target	HVAP	m	1000	---
	HEAT	m	500	450
Armor penetration:	APHE	mm	69	---
0°/500m	HVAP	mm	92	---
0°/any range	HEAT	mm	120	100
Crew			7	6
Unit of fire		rds	140	70

*without breechring
**towed

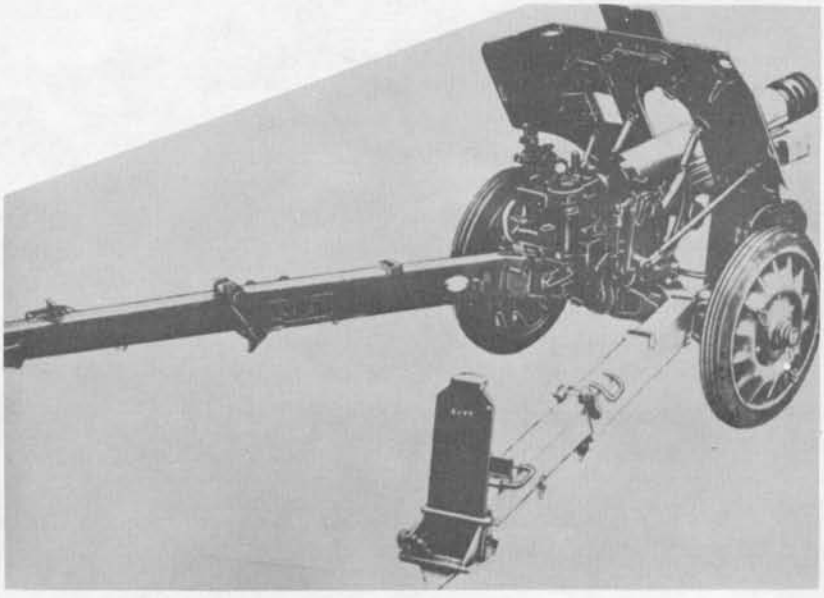


76 mm divisional gun M1942 (ZIS–3)

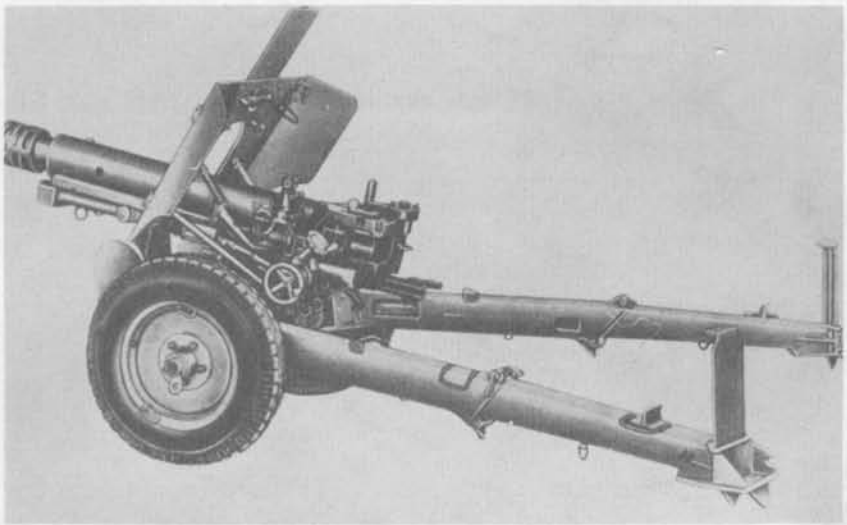




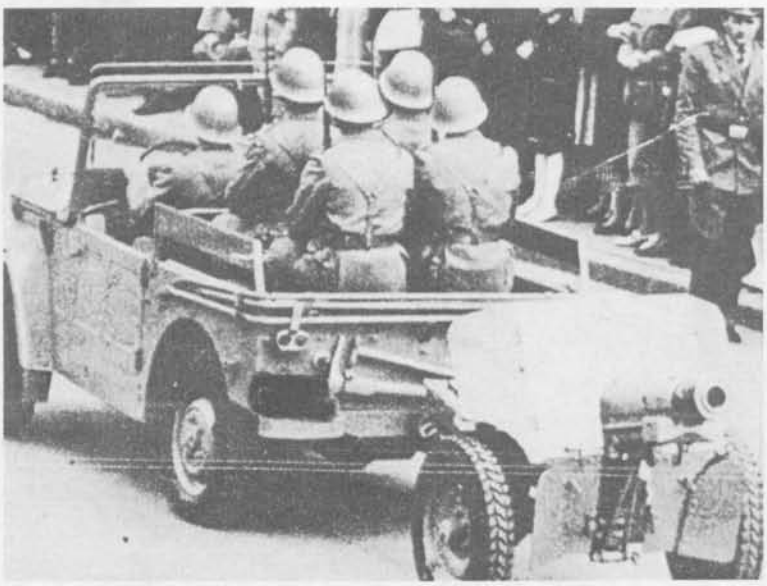
76 mm mountain gun M–48 (B–1)



76 mm mountain gun M–48 (B-1A2)



76 mm mountain gun M–48 (B–1)



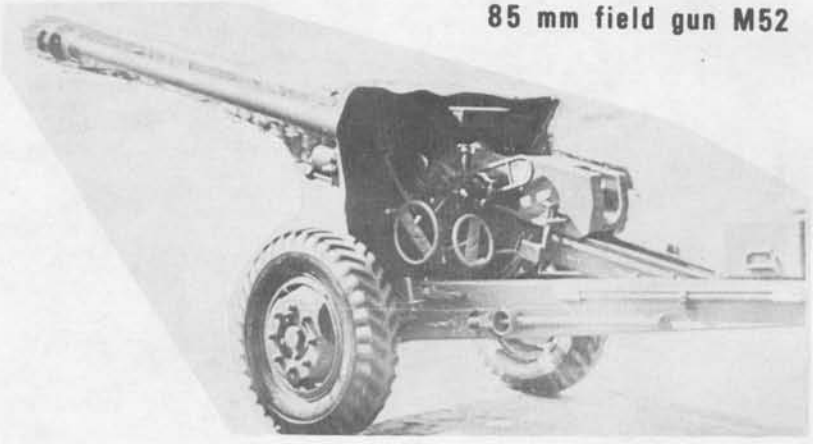


85 mm auxiliary–propelled field gun SD–44



85 mm divisional gun D–44

85 mm field gun M52



85mm divisional gun D-44
85mm divisional gun D-44-N
85mm auxiliary-propelled field gun SD-44
85mm field gun M52
85mm gield gun M52/55

The Soviet 85mm field guns are all adaptations of the main armament of the T-34(85) tank to a towed carriage. They are ballistically identical to the tank and assault guns and the 85mm antiaircraft gun M1939 (KS-12) from which they were ultimately developed. Like the armored vehicle guns, the 85mm field pieces have a hydraulic recoil buffer and a hydropneumatic recuperator. The breechblock is of the semiautomatic vertical sliding wedge type. In contrast to most 85mm armored vehicle guns the field pieces have a double-baffle muzzle brake.

The 85mm D-44, developed toward the end of World War II, replaced the 76mm divisional guns in the immediate postwar period. The auxiliary-propelled SD-44 was used as the regimental antitank gun in many armies until replaced by other weapons. However, both guns are still used in many Warsaw Pact countries both as field pieces and specialized antitank weapons. Other countries too have received these weapons. Care must be taken to distinguish these Soviet 85mm guns from the various 100mm guns and from both the 85mm and 100mm Czechoslovak field guns. The Soviet guns in 85mm caliber all have tubular trails. The D-44 is also found in Communist China where it is known as the Type 56.

In contrast to the smaller 57mm auxiliary-propelled antitank gun the larger SD-44 has its propulsion engine mounted on the left trail, while the right trail carries the ready ammunition. The trail wheel (used for steering) is behind the spades in the travel position. A further recognition feature of the SD-44 is the presence of the two-part folded rammer staff on either side of the front of the shield.

The Czechoslovak 85mm field gun M52, and its slightly modified version the M52/55, fire the same ammunition as the Soviet guns, but they differ in appearance and design details. Within the Warsaw Pact the only country to use this gun outside of Czechoslovakia is East Germany. Recently the Austrian Army has acquired a large number of the M52 guns for home defense antitank roles. Like the Soviet gun

the M52 has a hydraulic recoil buffer and a hydropneumatic recuperator. The breechblock is also of the semiautomatic vertical sliding wedge type. Care must be taken to distinguish the M52 from the very similar appearing Czechoslovak 100mm field gun M53.

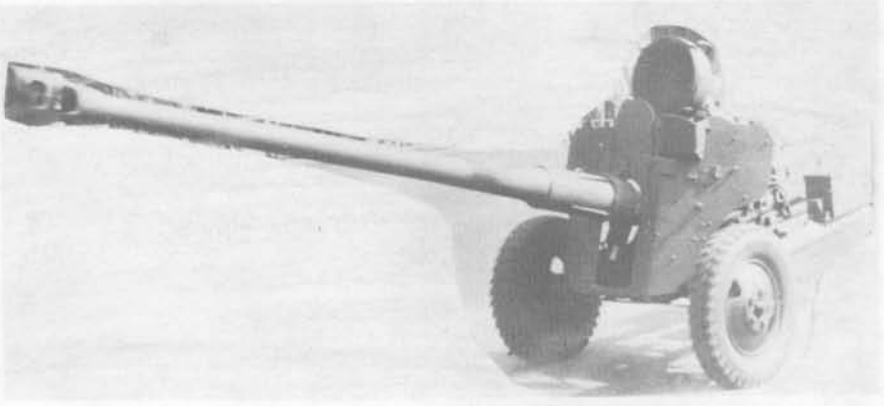
All of these 85mm guns may come equipped with infrared night sighting equipment. When so modified the D-44 is then known as the D-44-N.

		D-44	SD-44*	M52 (M52/55)
Caliber	mm	85	85	85
Length of tube in cals		52	52	56.2
Length of tube overall	mm	4693	4693	5070
Weight in firing position	kg	1725	2250	2095 (2111)
Weight in travel position	kg	1725	2250	2130 (2168)
Length in travel position	mm	8340	8220	7520
Width in travel position	mm	1780	1780	1980
Height in travel position	mm	1420	1420	1515
Track	mm	1434	1434	1630
Clearance	mm	350	350	350
Tire size		6.50x20	6.25x20	8.25x20
Height of axis of bore 0°	mm	825	825	1135
Elevation	°	+35	+35	+38
Depression	°	-7	-7	-6
Traverse	°	54	54	60
Rate of fire	rpm	15-20	10-15	20
Projectile weight: HE	kg	9.5	9.5	9.5
APHE	kg	9.3	9.3	9.3
HVAP	kg	5.0	5.0	5.0
Muzzle velocity: HE	m/s	792	792	805
APHE	m/s	792	792	820
HVAP	m/s	1030	1030	1070
Maximum range	m	15650	15650	16160
Pointblank range: APHE	m	950	950	925
2m high target HVAP	m	1150	1150	1150
Armor penetration: APHE	mm	102	102	123
0°/1000m HVAP	mm	130	130	115
Crew		8	7	7
Unit of fire	rds	140	140	140

*The SD-44 has an auxiliary-propulsion unit consisting of one 14 HP two-cylinder M-72 gasoline engine. It is capable of a top speed of 25 Km/h and can climb a 25° slope. The fuel supply is stored in the hollow trails.



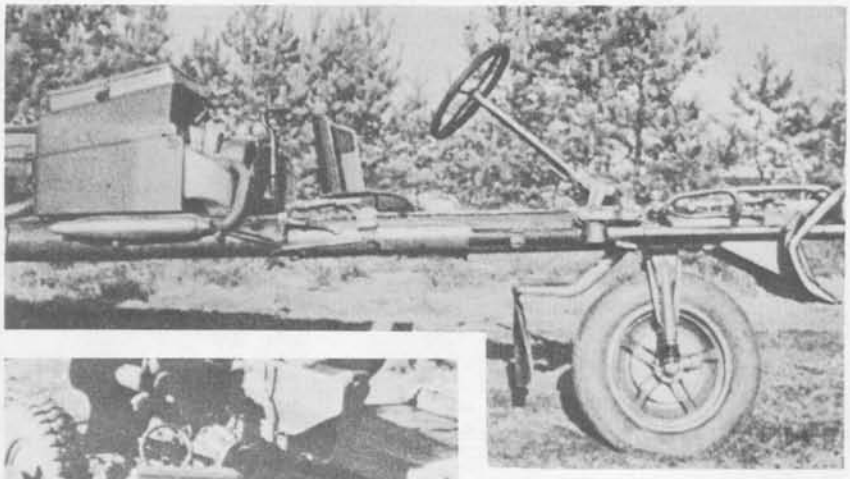
85 mm divisional gun D–44

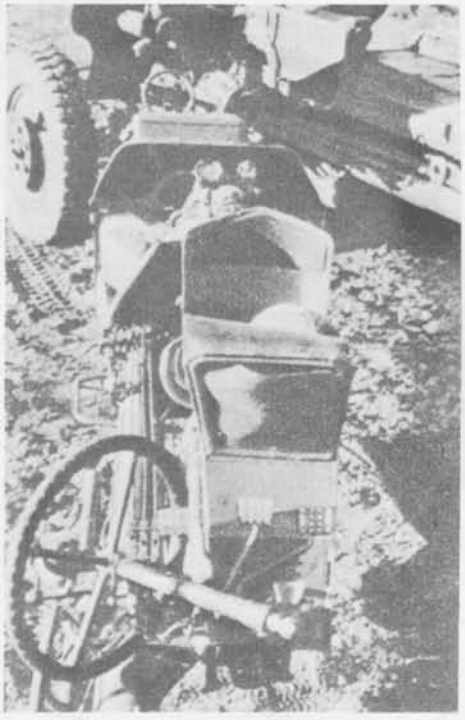


85 mm divisional gun D–44–N



85 mm auxiliary-propelled field gun SD–44

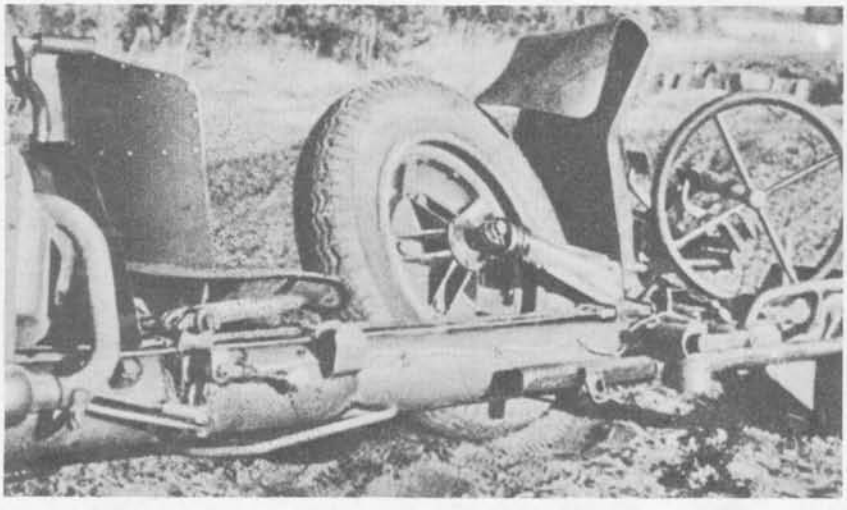




Details of propulsion system

85 mm auxiliary–propelled

field gun SD–44

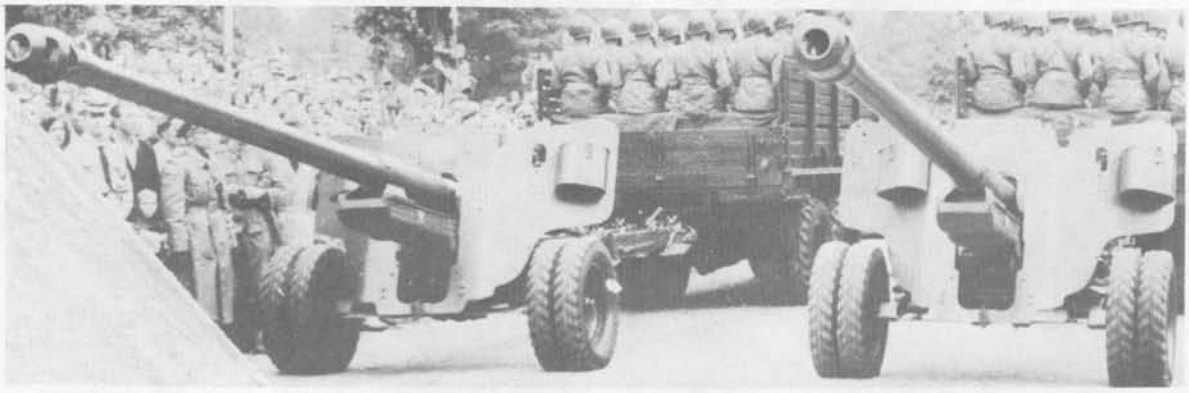




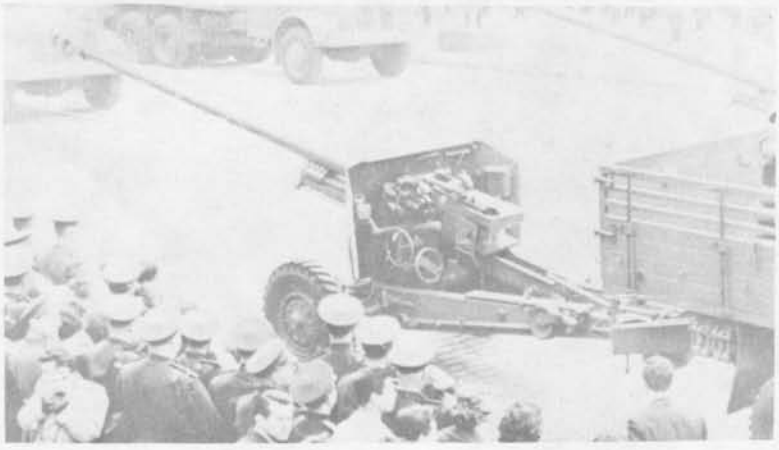


85 mm field gun M–52





100 mm field gun M1944(BS–3)



100 mm field gun M–53

100mm field gun M1944 (BS-3)
100mm field gun M1955
100mm antitank gun T-12
100mm field gun M53

The 100mm field gun M1944 (BS-3) is a dual-purpose field and antitank weapon which made its appearance towards the end of World War II. Developed originally from a Soviet naval gun, the M1944 fires the same ammunition as do the other 100mm rifled guns mounted on field and antiaircraft carriages, tanks and self-propelled mounts. It can be distinguished from other 100mm field guns by the dual tires on the carriage wheels. Although it resembles the Czechoslovak M53, it is lower in silhouette. The recoil system has a hydraulic buffer and a hydropneumatic recuperator. The breechblock is of the semiautomatic vertical sliding wedge type. A number of Warsaw Pact and non-Warsaw Pact armies have employed this gun in the past decades.

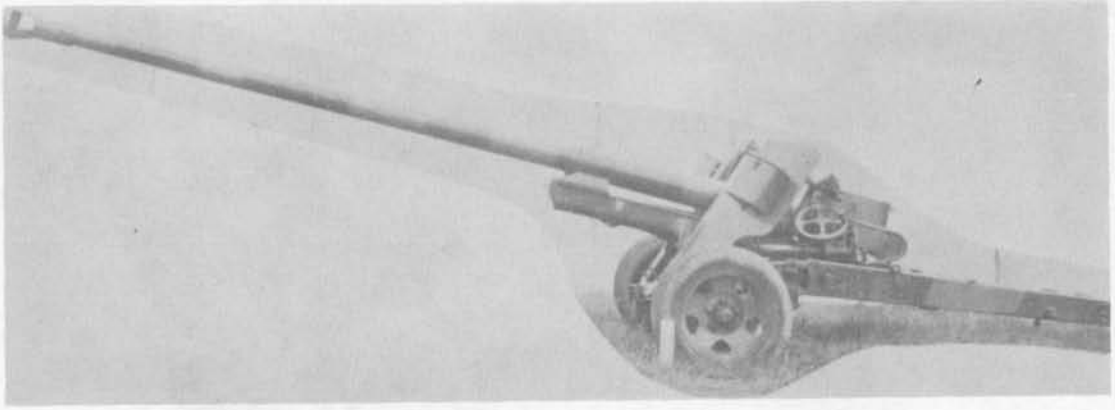
The Czechoslovak 100mm field gun M53 was a national development designed to fire the same ammunition as the Soviet 100mm rifled guns. It can be distinguished from the Soviet M1944 by the single tires on the carriage wheels and the different shield. Care, however, must be taken to distinguish the M53 from the very similar appearing Czechoslovak 85mm M52 which has a wavy top shield. The recoil system of the M53 is similar to that of the 1944, but the breechblock has a horizontal sliding wedge.

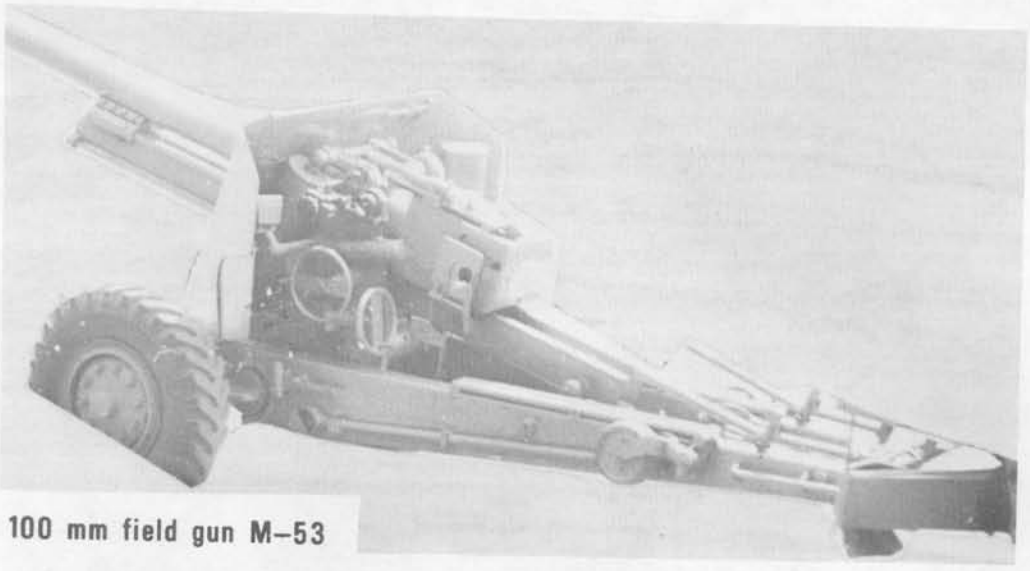
Both the M1944 and the M53 are often equipped with a large-diameter infrared searchlight and an infrared night-sighting device. The model used on the Czechoslovak gun is the APN-3-5. The M1944 has been superseded largely by the newer M1955 and T-12 guns, but the M53 is still used in the Czechoslovak Army, although not elsewhere.

		M1944	M53
Caliber	mm	100	100
Length of tube in cals		56	64.1
Length of tube overall	mm	6069	6735
Weight in firing position	kg	3650	4280
Weight in travel position	kg	3650	4420
Length in travel position	mm	9370	9100
Width in travel position	mm	2150	2360
Height in travel position	mm	1500	2606
Track	mm	1800	1980
Clearance	mm	330	350
Tire size		6.50x20	11.00x22
Height of axis of bore 0°	mm	1010	1250
Elevation	°	+45	+42
Depression	°	-5	-6
Traverse	°	58	60
Rate of fire	rpm	8-10	8-10
Projectile weight: HE	kg	15.7	15.7
APHE	kg	15.9	15.9
HEAT	kg	12.2	12.2
Muzzle velocity: HE	m/s	900	930
APHE	m/s	1000	955
HEAT	m/s	900	995
Maximum range	m	21000	21000
Pointblank range: APHE	m	1080	1230
2m high target HEAT	m	1000	1070
Armor penetration: APHE	mm	185	170
0°/1000 m-any rg HEAT	mm	380	380
Crew		6	6
Unit of fire	rds	80	80



100 mm field gun M1944 (BS–3)





100 mm field gun M–53





100 mm field gun M–53 with infrared searchlight



100 mm field gun M53



100 mm field gun M1944 (BS–3)



100 mm field gun M1955



100 mm field gun M1955 with bracket for infrared searchlight



100 mm antitank gun T–12

The rifled 100mm field gun M1955 was the first of two very similar appearing post-World War II antitank guns to be used by the Soviet Army. Although it fires the same ammunition as do the other 100mm rifled guns, the piece is lighter in weight than either the Soviet M1944 or the Czechoslovak M53. For all practical purposes the M1955 is a 100mm tank gun placed on a field carriage and provided with a multi-perforated muzzle brake. Care must be taken to distinguish the M1955 from both the 85mm D-44 and the 100mm T-12. The D-44 has tubular trails, a somewhat differently shaped shield, and recoil cylinders located on the top of the breechring. It also has a double-baffle muzzle brake. The T-12 is most easily recognized by the smaller-size muzzle brake.

The smoothbore 100mm antitank gun T-12 is the newest Soviet 100mm gun. It fires fin-stabilized, non-rotating projectiles resembling those of the 115mm gun of the T-62 tank. Due to its limited maximum carriage elevation the T-12 can be used as a normal field piece only under limited circumstances. Although it closely resembles the M1955 it can be distinguished by the larger breechring, the somewhat differently shaped shield and the smaller-diameter muzzle brake.

Like earlier weapons both the M1955 and the T-12 are frequently fitted with infrared night sighting equipment.

		M1955	T-12
Caliber	mm	100	100
Length of tube in cals		56	63
Length of tube overall	mm	6126	8484
Weight in firing position	kg	3000	3000
Weight in travel position	kg	3000	3000
Length in travel position	mm	8717	9162
Width in travel position	mm	1585	1700
Height in travel position	mm	1890	1448
Track	mm	1200	1585
Clearance	mm	350	350
Tire size		6.50x20	6.50x20
Height of axis of bore 0°	mm	825	800
Elevation	°	+20	+20
Depression	°	-10	-10
Traverse	°	27	27
Rate of fire	rpm	7	10
Projectile weight: HE	kg	15.7	---
APHE	kg	15.9	---
APDS	kg		5.5
HEAT	kg	12.2	9.5
Muzzle velocity: HE	m/s	900	---
APHE	m/s	1000	---
APDS	m/s		1500
HEAT	m/s	900	900
Maximum range	m	15400	8500
Pointblank range: APHE	m	1080	---
2m high target APDS	m		
HEAT	m	1000	1000
Armor penetration: APHE	mm	185	---
0°/1000m APDS	mm		
0°/any range HEAT	mm	380	
Crew		6	6
Unit of fire	rds	60	60



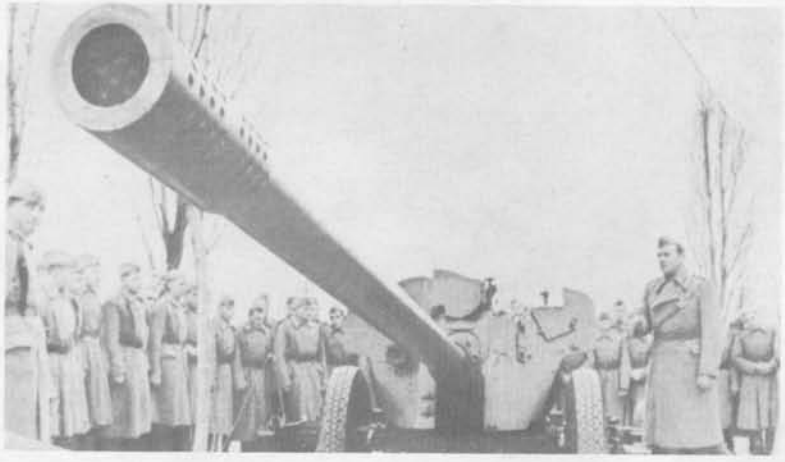
100 mm field gun M1955

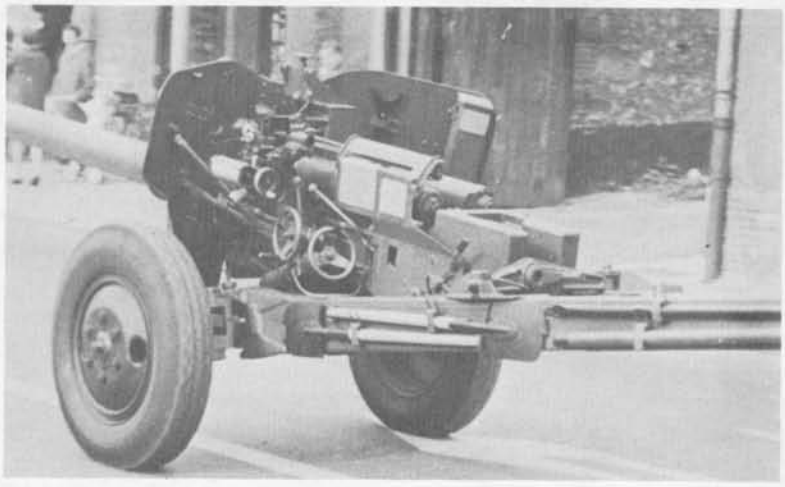


100 mm antitank gun T–12



100 mm antitank gun T–12

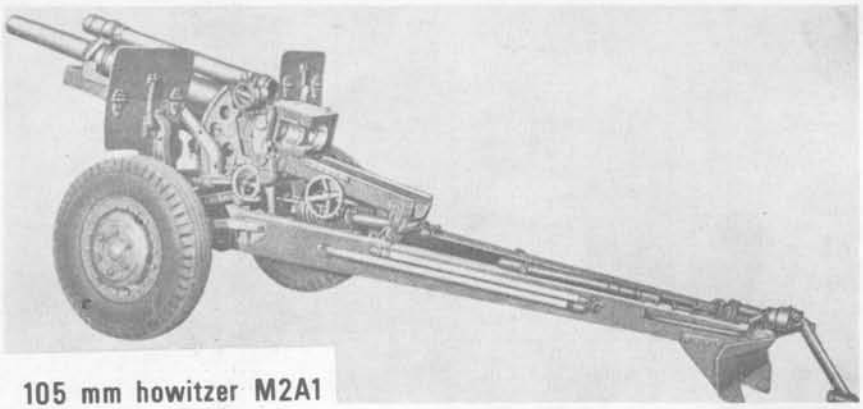




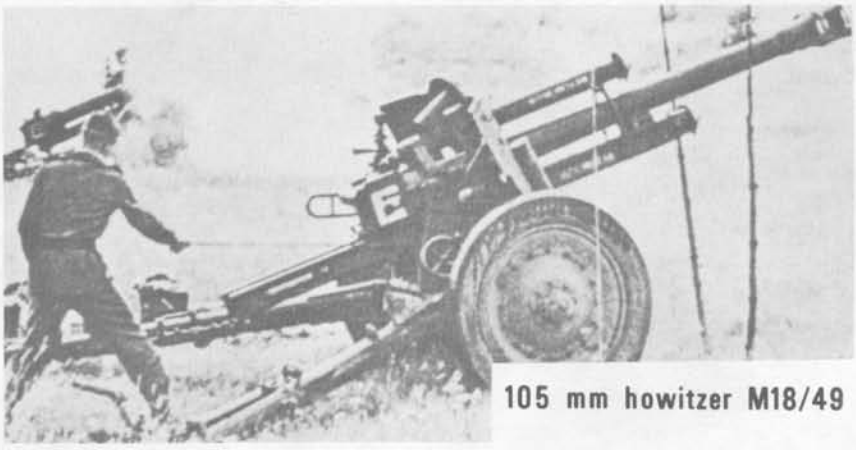


100 mm antitank gun T–12

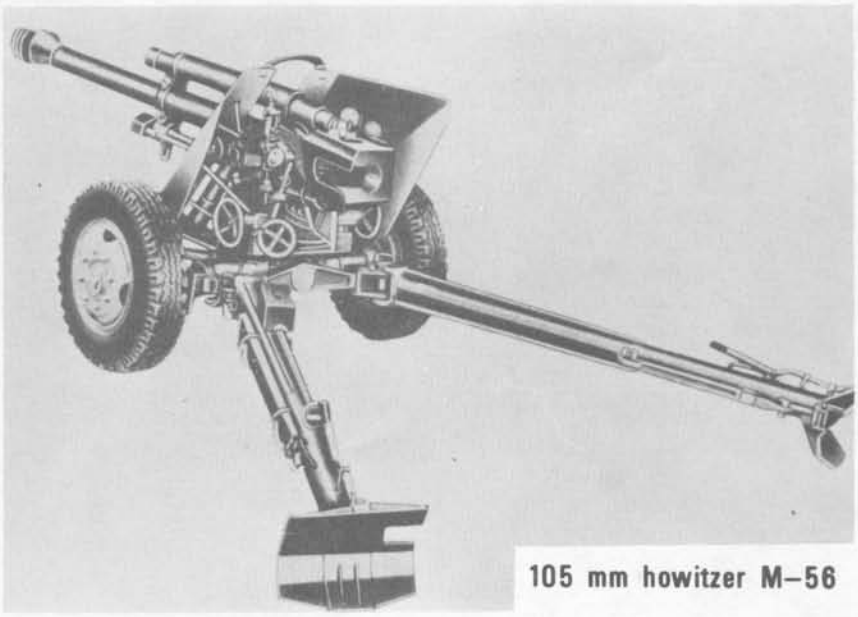




105 mm howitzer M2A1



105 mm howitzer M18/49



105 mm howitzer M–56

105mm HOWITZERS

105mm howitzer M2A1
105mm howitzer M18
105mm howitzer M18M
105mm howitzer M18/40
105mm howitzer M18/49
105mm howitzer M-56

Three different 105mm howitzers are employed by the Yugoslav Army. One is a United States model, the second a German World War II model, and the third a Yugoslav-produced weapon. In addition a variant of the German howitzer has been produced in Czechoslovakia.

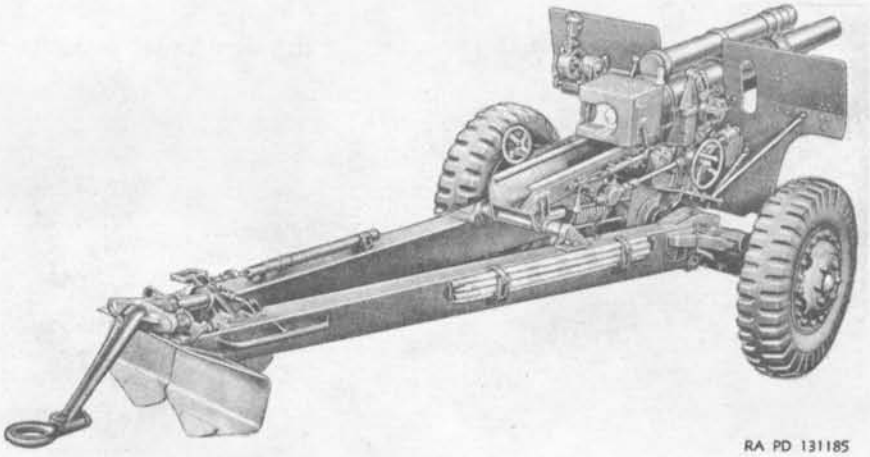
The United States 105mm howitzer M2A1 was the standard light field howitzer of the United States Army during World War II. It is still used in some US artillery units and is known as the M102. The M2A1 has a split-trail carriage (box section) with pneumatic tires. The piece has a hand-operated horizontal sliding wedge breechblock and a hydropneumatic recoil system. It fires semifixed ammunition. The same basic artillery piece is also mounted on the M7 and M7B1 self-propelled carriages which are also used in the Yugoslav army.

The German 105mm howitzers M18 series, which are used by the Yugoslav Army, are all basically the same piece, but differ in detail. All have hand-operated horizontal sliding wedge breechblocks, hydraulic recoil buffers, and hydropneumatic recuperators. The M18 and M18M employ a box-section,split-trail carriage with either pressed alloy disc wheels or spoked wheels fitted with solid rubber tires. The M18M has a double-baffle muzzle brake permitting firing of ammunition with a greater maximum range than that of the M18. The M18/40, which was the standard German light field howitzer during the latter part of the war, consists of the tube, cradle, and recoil system of the M18 mounted on a modified tubular section split-trail carriage of the German 75mm antitank gun M40. An improved double-baffle muzzle brake and somewhat larger wheels were also fitted. The result was a lighter piece with the range performance of the M18M. It formed the basis of the two postwar models. The ammunition for these German howitzers was of the separate-loading case type in contrast to the semifixed rounds of the United States cannon.

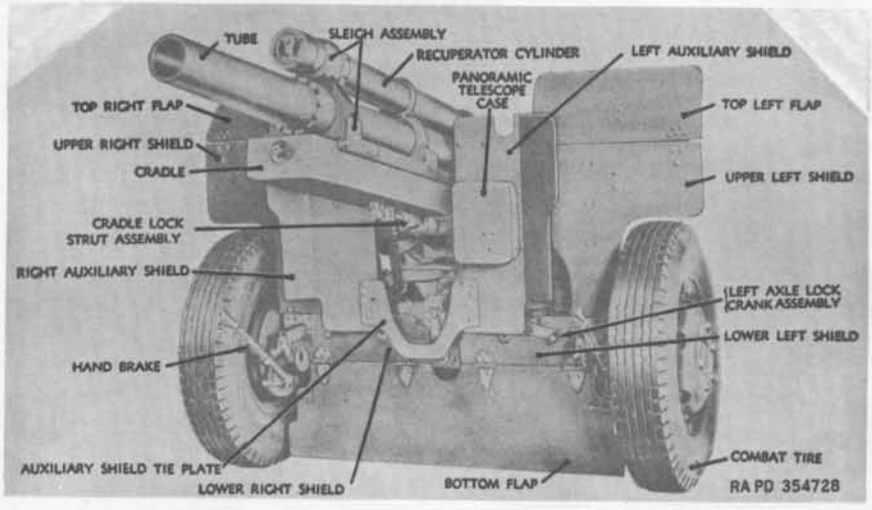
The Czechoslovak-produced 105mm howitzer M18/49 is essentially a German M18/40, although the wheels differ. It was once used in line units, but today is found only in the training role.

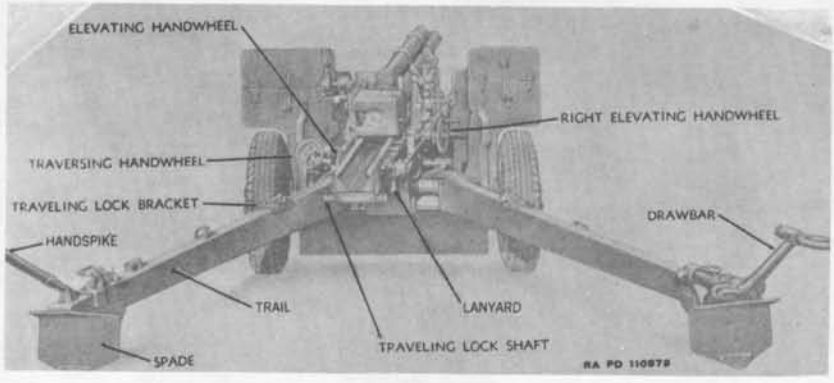
The Yugoslav-designed 105mm howitzer M-56 in many ways resembles the German M18/40, however, it fires semifixed ammunition of United States pattern rather than the separate loading case-type of the German howitzers. The HEAT round, however, is fixed. The M-56 has a horizontal sliding wedge breechblock, a hydraulic recoil buffer, a hydropneumatic recuperator, and is fitted with a multi-baffle muzzle brake. It is mounted on a tubular section split-trail carriage fitted with a large slanting shield. The normal carriage has pressed alloy disc wheels fitted with solid rubber tires, but some pieces have appeared with the wheels and pneumatic tires of the United States M2A1 howitzer.

		M2A1	M18	M18/40	M-56
Caliber	mm	105	104.9	104.9	105
Length of tube in cals		24.5	28	28	27.9
Length of tube overall	mm	2574	2941	3308	3480
Weight in firing position	kg	1920	1985	1800	2060
Weight in travel position	kg	2261	1985	1800	2100
Length in travel position	mm	5991	6100	6150	6170
Width in travel position	mm	2146	1977	2110	2150
Height in travel position	mm	1575	1880	1830	1560
Track	mm	1985	1562	1800	1800
Clearance	mm	356	368	300	335
Tire size		9.00x20			
Height of axis of bore 0°	mm	1300	1181	1280	1130
Elevation	°	+66.2	+42	+42	+68
Depression	°	-4.5	-5	-5	-12
Traverse	°	46	56	56	52
Rate of fire	rpm	8	6-8	6-8	16
Projectile weight: HE	kg	15.0	14.8	14.8	15.0
HEAT	kg	13.6	---	---	13.3
Muzzle velocity: HE	m/s	473	470	540	570
HEAT	m/s	381	---	---	395
Maximum range	m	11155	10675	12325	13000
Pointblank range: HEAT 2m high target	m	500	---	---	
Armor penetration: HEAT 0°/any range	mm	102	---	---	100
Crew		8			6
Unit of fire	rds	100	100	100	100

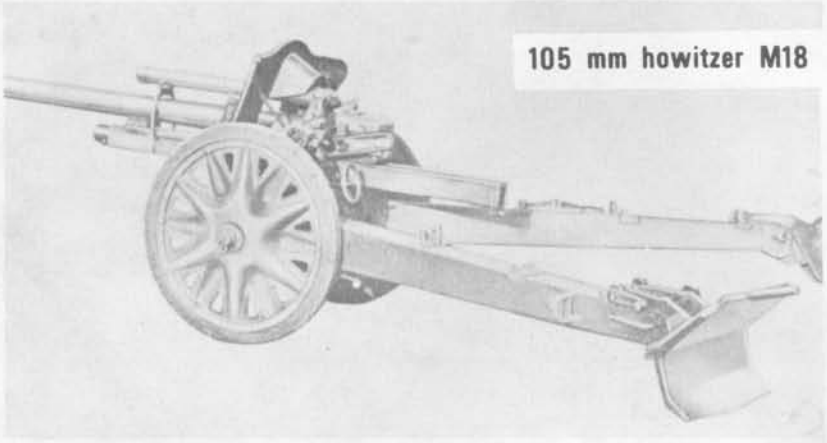


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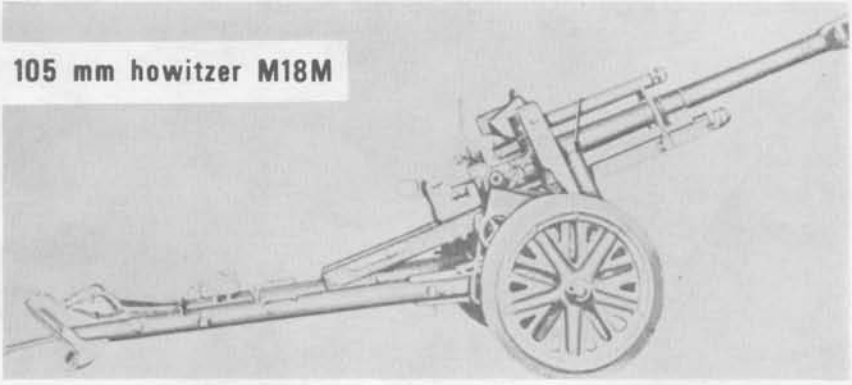




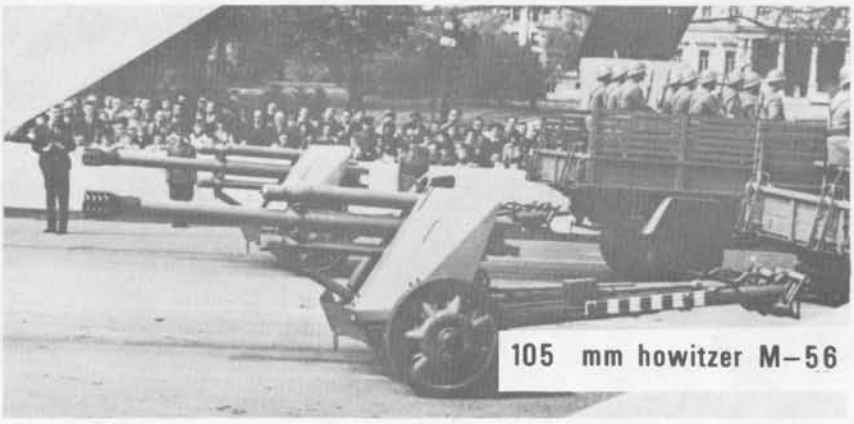
105 mm howitzer M2A1



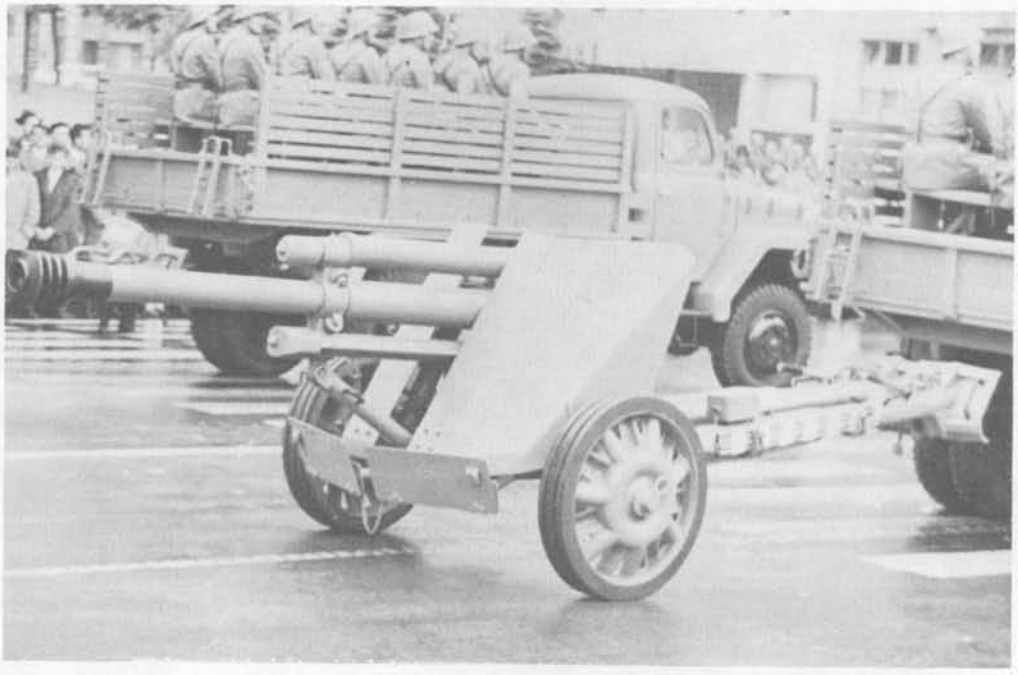
105 mm howitzer M18



105 mm howitzer M18M

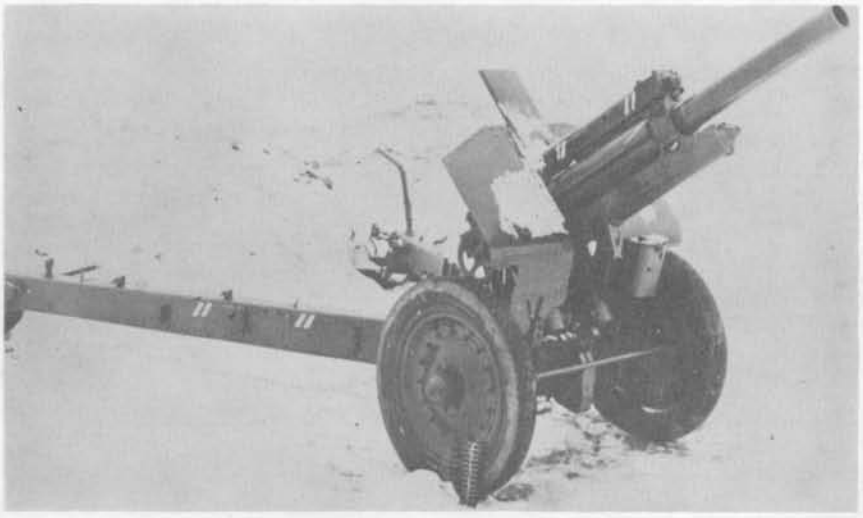


105 mm howitzer M–56

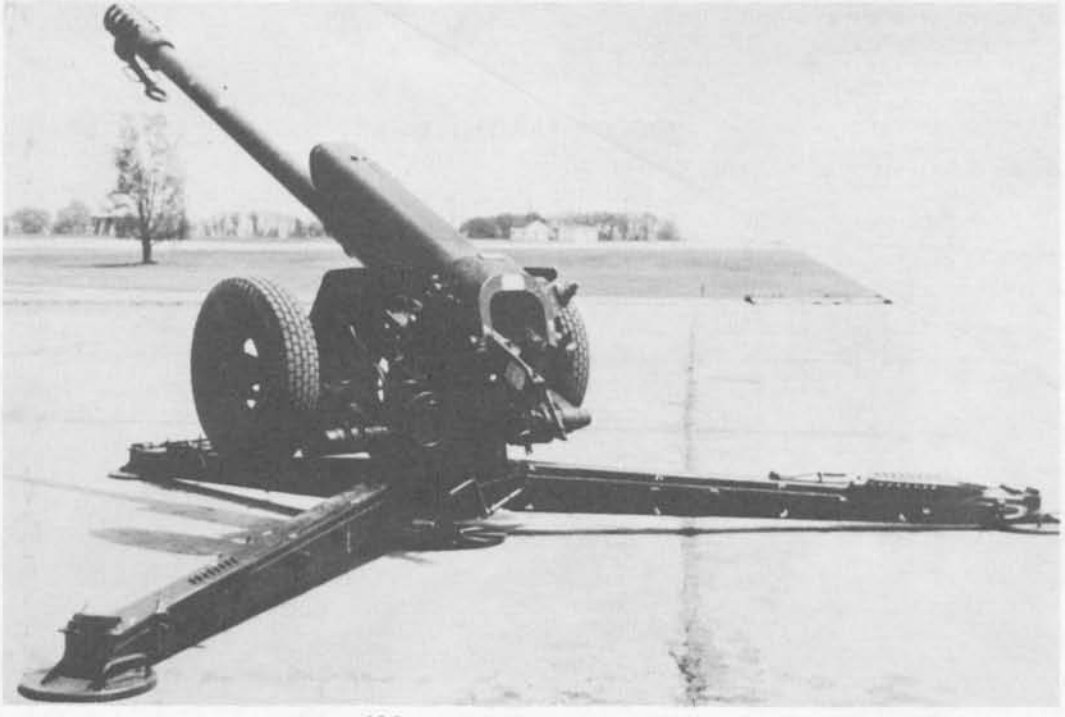


105 mm howitzer M–56





122 mm howitzer M1938 (M–30)



122 mm howitzer D–30

122mm howitzer M1938 (M-30)
122mm howitzer D-30

The 122mm howitzer M1938 (M-30) was introduced into the Soviet Army shortly before World War II to replace the obsolescent World War I models. After the war the M1938 became the standard divisional howitzer of the other Warsaw Pact armies and was introduced into the Yugoslav Army. It also was sold to armies in other parts of the world. The M1938 is mounted on a box-section, split-trail carriage fitted with a shield. The recoil system consists of a hydraulic buffer above the tube, and a hydropneumatic recuperator below it. The breechblock is a hinged screw type. Care must be taken to distinguish the M1938 from the 152mm howitzer M1943 (D-1) which uses the same basic carriage. The larger weapon can be recognized by the thicker tube and the presence of a large double-baffle muzzle brake.

In recent years modified disc wheels have been fitted to the 122mm howitzers in the Bulgarian Army, but the sponge rubber filled tires of the Soviet howitzers have been retained. On the other hand the East German forces have developed a new wheel with a pneumatic tire for higher towing speed. The East German modification results in a reduction of the overall height of the piece in travel position to 1735mm and of the height of the axis of the bore at 0 degrees elevation to 1185mm. In Communist China the M1938 is known as the Type 54.

The 122mm howitzer D-30 is a more modern weapon introduced in the early 1960s. It has a three-trail carriage which permits all-around traverse. The weapon is towed muzzle first by a large lunette which was originally fixed to the muzzle brake, but now is placed just behind it. When the D-30 is placed in firing position the crew lowers the central firing jack, the wheels are raised off the ground, and the two outer trails are spread 120 degrees each into firing position. Other distinctive features are the small shield, the conspicious recoil system entirely above the tube, and the multibaffle muzzle brake. In contrast to the earlier howitzer the D-30 has a semiautomatic vertical sliding wedge breechblock.

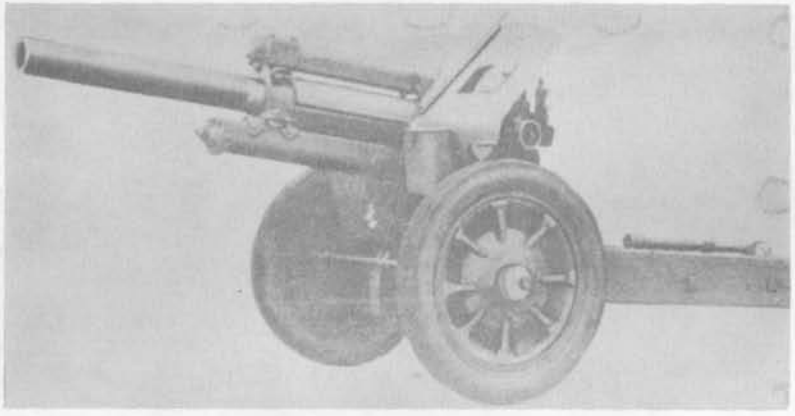
Both howitzers fire variable-charge, case-type, separate-loading ammunition. Although some of the projectiles are interchangeable, the cases differ in length, thus providing the D-30 with a larger maximum propelling charge. Of great significance is the provision of a special non-rotating, fin-stabilized HEAT projectile for the D-30.

		M1938	D-30
Caliber	mm	121.92	121.92
Length of tube in cals		22.7	35.5
Length of tube overall	mm	2800	4875
Weight in firing position	kg	2450	3150
Weight in travel position	kg	2450	3210
Length in travel position	mm	5900	5400
Width in travel position	mm	1975	1950
Height in travel position	mm	1820	1660
Track	mm	1600	1850
Clearance	mm	330	325-345
Tire size		11.80x35	9.00x20
Height of axis of bore 0°	mm	1200	900
Elevation	°	+63.5	+70
Depression	°	-3	-7
Traverse	°	49	360
Rate of fire	rpm	5-6	7-8
Projectile weight: HE	kg	21.8	21.8
HEAT	kg	13.3	14.1
Muzzle velocity: HE	m/s	515	690
HEAT	m/s	335	740
Maximum range	m	11800	15300
Pointblank range: HEAT 2m high target	m	630	800
Armor penetration: HEAT 0°/any range	mm	200	460
Crew		8	7
Unit of fire	rds	80	80



122 mm howitzer M1938 (M–30)





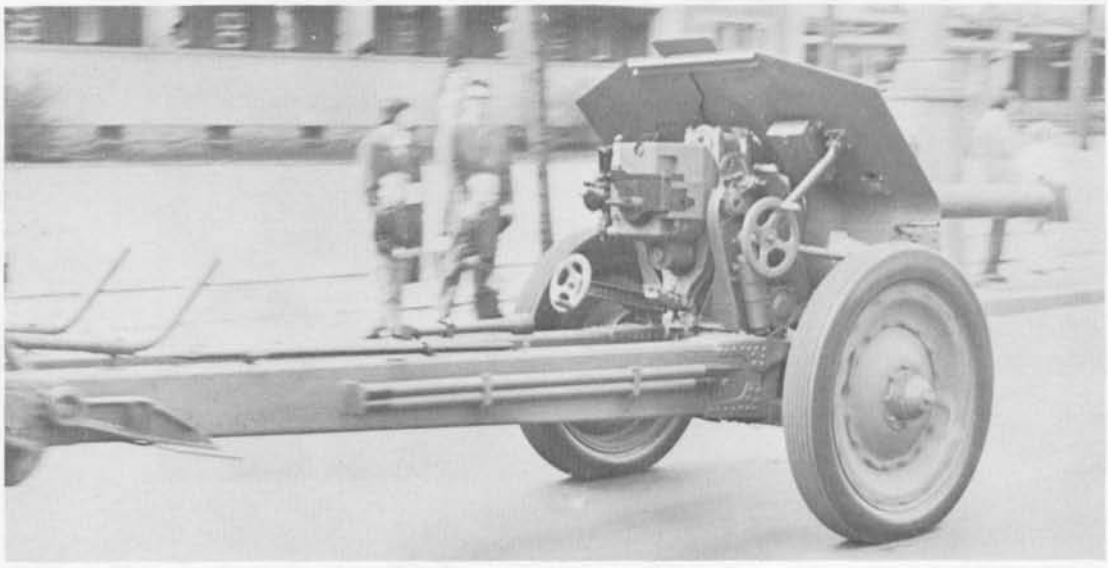
122 mm howitzer M1938 (M–30) with Bulgarian wheels



122 mm howitzer M1938 (M–30) with East German pneumatic tires

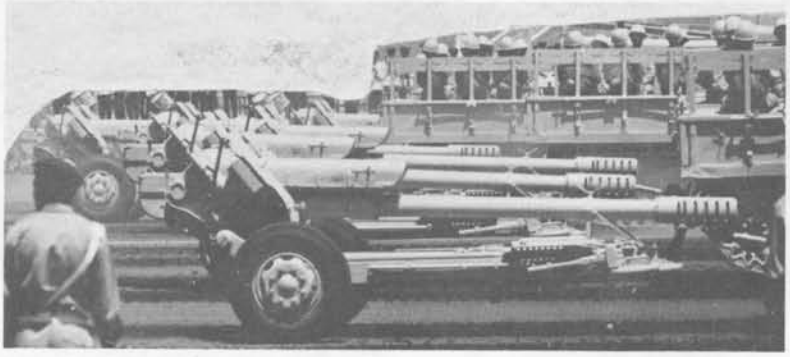


122 mm howitzer M1938 (M–30)

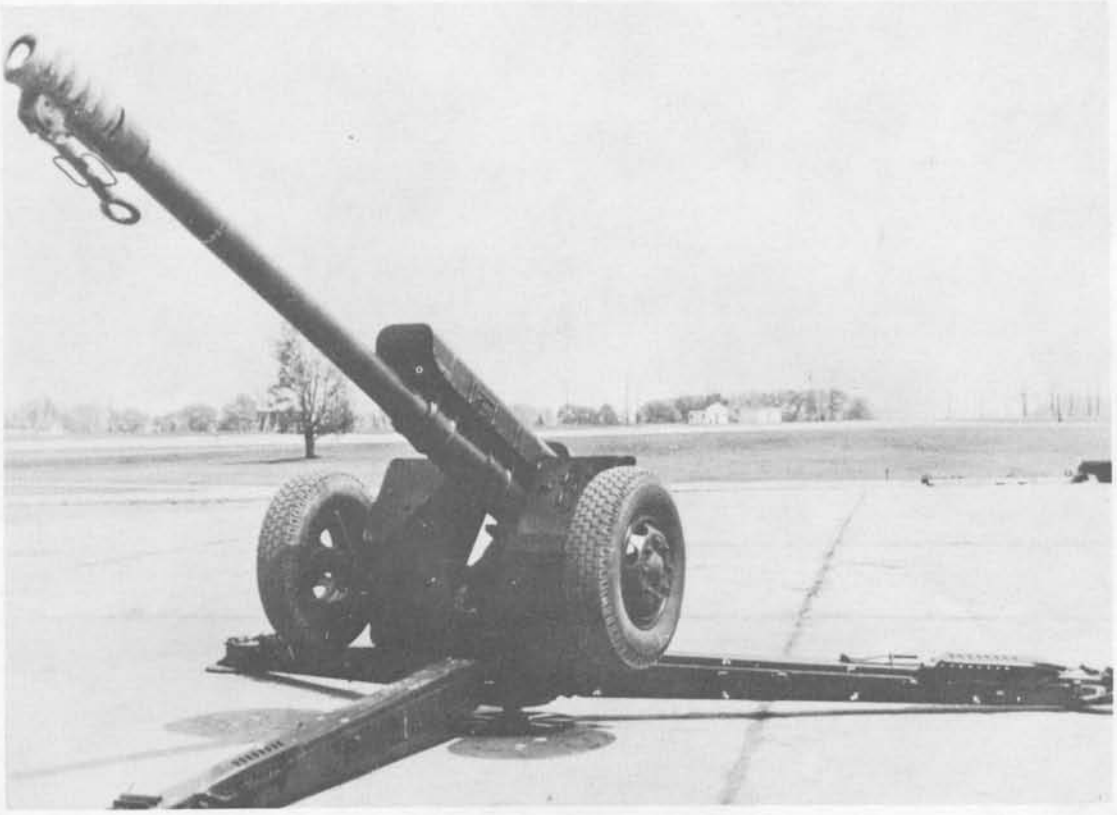


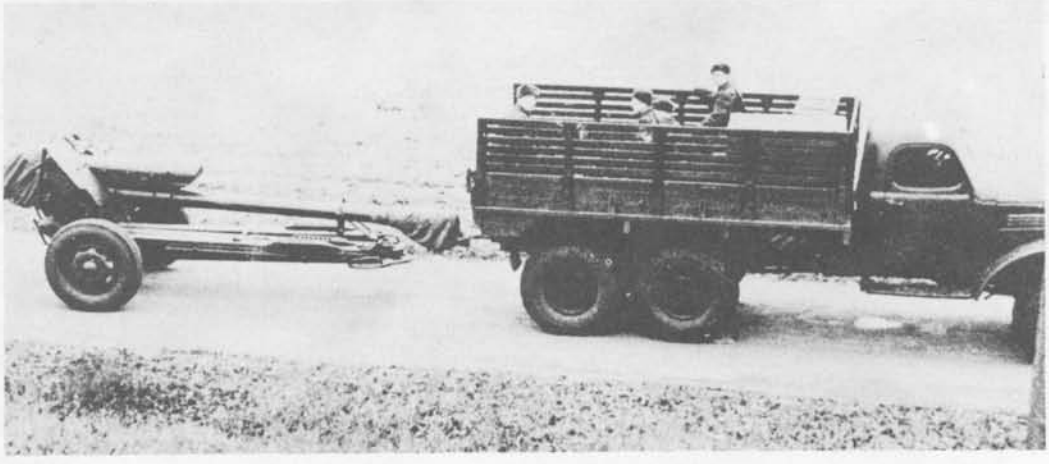






122 mm howitzer D–30





122 mm howitzer D–30



122 mm corps gun M1931/37 (A–19)



122 mm field gun D–74

122mm corps gun M1931/37 (A-19)
122mm field gun D-74

The 122mm corps gun M1931/37 (A-19) was developed just prior to World War II by placing the tube and recoil system of the M1931 gun on an improved carriage which permitted greater tube elevation. The new carriage can be identified by the backward slant of the small shield and of the large equilibrators. Both carriages have box-section split trails, and in travel position the tube is withdrawn from battery. Originally spoked wheels with hard rubber tires were employed, but since World War II dual disc wheels with sponge-rubber filled tires became standard. The recoil system for both guns is located below the tube and consists of a hydraulic buffer and a hydropneumatic recuperator. The breechblock is of the hinged-screw type. Since the same carriage is used for the 152mm gun-howitzer M1937 (ML-20) care must be taken to distinguish the M1931/37. This can be done by noting the long, thin tube without muzzle brake in the case of the 122mm gun.

A slightly modified version of this gun, the M1931/44(A-195) was mounted on the early JSU-122 assault guns. Later JSU-122's were armed with a variant of the 122mm tank gun which had been developed from the field piece. The M1931/37 is rarely encountered today, having been replaced by more modern and powerful guns.

Replacement of the 122mm corps gun began in the early 1950s with the introduction of the 122mm field gun D-74 and the 130mm field gun M-46. The D-74, which was first displayed in public in Moscow on 1 May 1955, is a lighter and more powerful gun than the M1931/37 and has a greater rate of fire. Its carriage is identical to that of the 152mm gun-howitzer D-20, however the D-74 can be distinguished by the thinner tube and smaller muzzle brake. In contrast to the earlier models, the D-74 remains in battery when in the travel position. Also it has its recoil system above the tube and uses a semiautomatic vertical sliding wedge breechblock. A distinctive feature of this carriage is the presence of a circular firing jack which allows shifting of the gun through a 360-degree arc without changing the firing position.

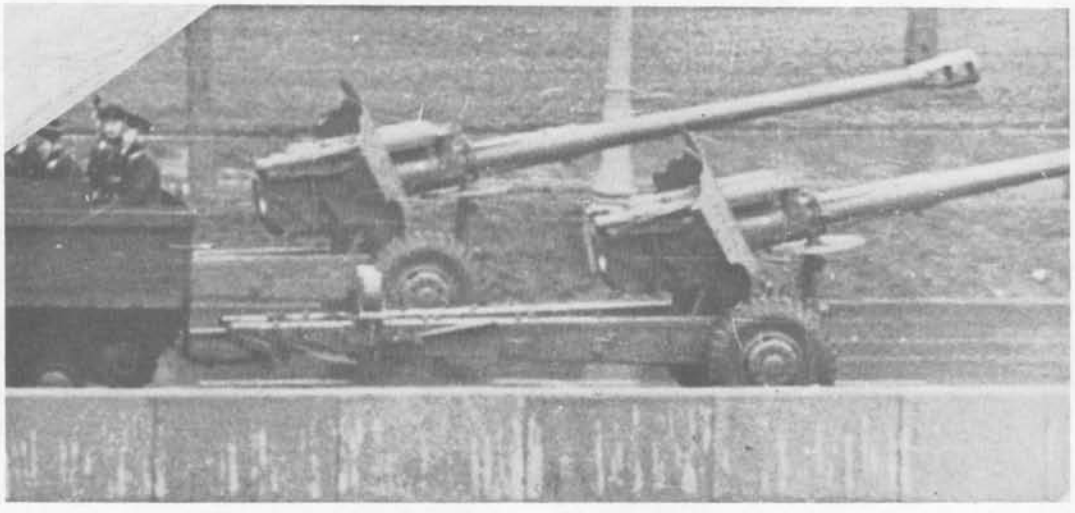
The ammunition for both 122mm guns is of the variable-charge, case-type, designed for separate loading. It is not interchangeable due to the different projectile design and the larger bottlenecked case of the D-74.

		M1931/37	D-74
Caliber	mm	121.92	121.92
Length of tube in cals		46.3	47
Length of tube overall	mm	5645	6450
Weight in firing position	kg	7250	5500
Weight in travel position	kg	8050	5550
Length in travel position	mm	7870	9875
Width in travel position	mm	2460	2350
Height in travel position	mm	2270	2745
Track	mm	1900	2030
Clearance	mm	335	400
Tire size		12.50x20	12.00x20
Height of axis of bore 0°	mm	1437	1668
Elevation	°	+65	+45
Depression	°	-2	-5
Traverse	°	58	58
Rate of fire	rpm	5-6	6-7
Projectile weight: HE	kg	25.5	27.3
APHE	kg	25.0	25.0
Muzzle velocity: HE	m/s	800	885
APHE	m/s	800	885
Maximum range	m	20800	24000
Pointblank range: APHE 2m high target	m	900	1070
Armor penetration: APHE 0°/1000m	mm	160	185
Crew		8	10
Unit of fire	rds	80	80

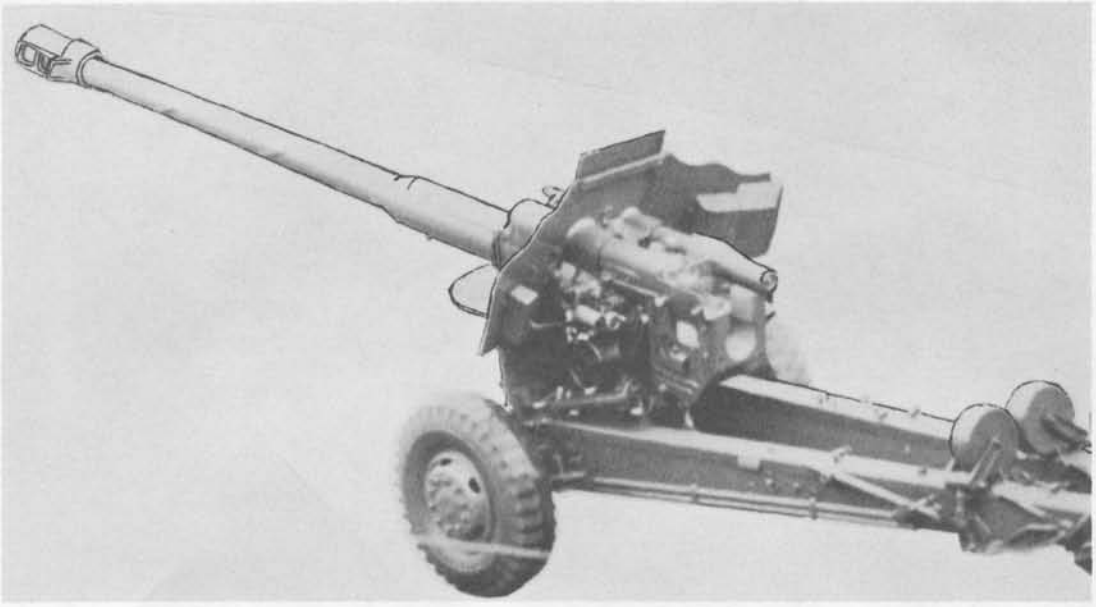


122 mm corps gun
M1931/37



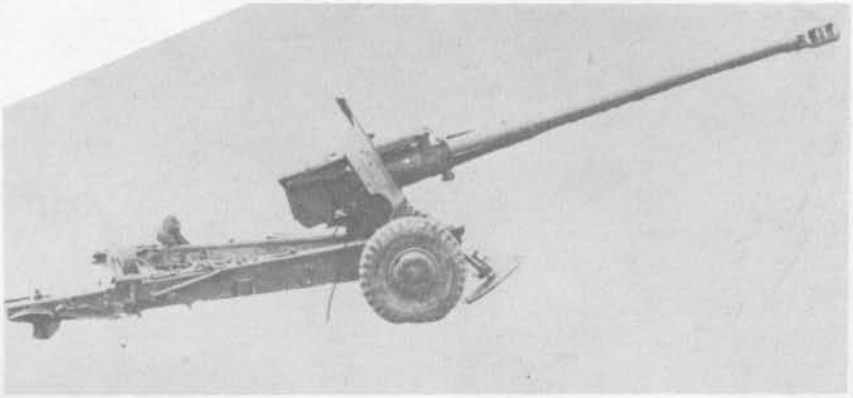


122 mm field gun D–74

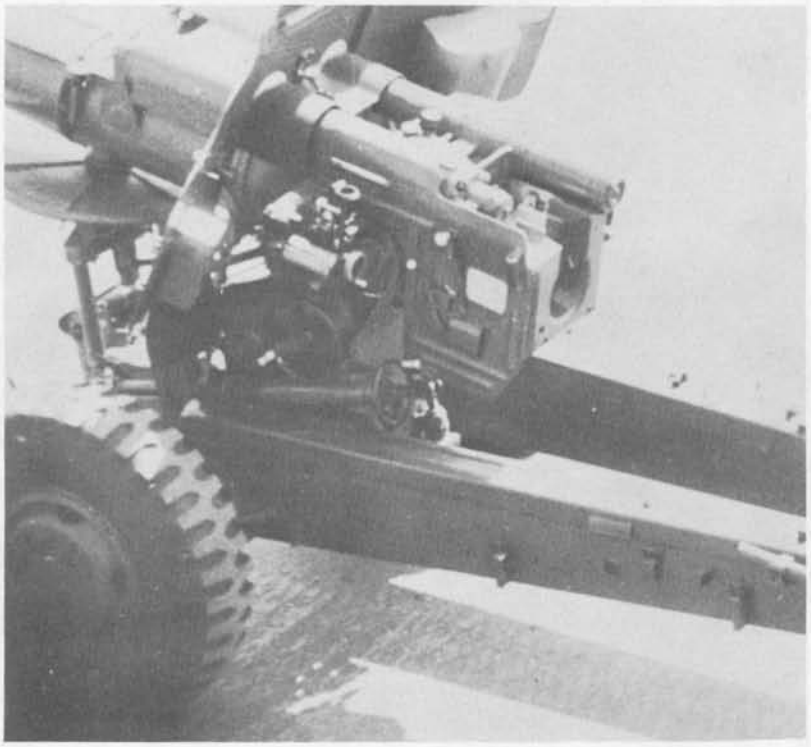


122 mm field gun D–74



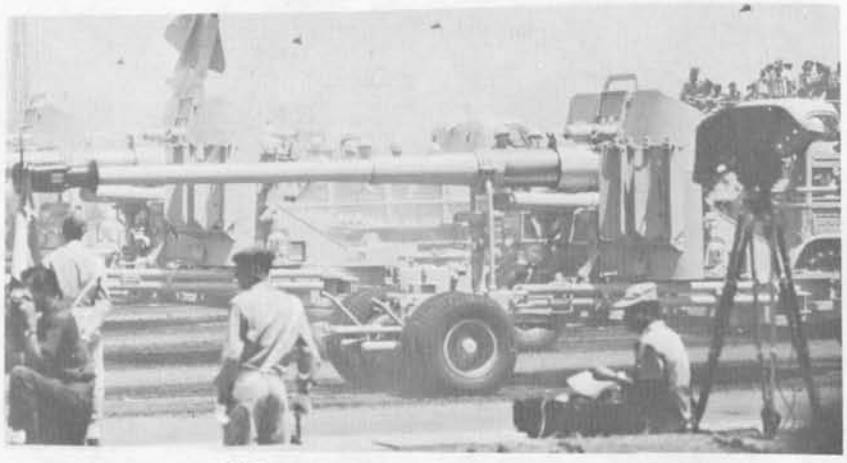


122 mm field gun D–74





130 mm field gun M–46



130 mm coastal gun SM–4–1

130mm field gun M-46
130mm coastal gun SM-4-1

During the early 1950s the 130mm field gun M-46 was introduced as one of the replacements for the older 122mm corps gun. Although heavier than the corps gun, the M-46 has a greater range, armor penetration, and fires a much heavier shell. This field piece, which was first shown in public on 1 May 1954, is the largest field gun (in contrast to howitzers) normally found in the Soviet ground forces.

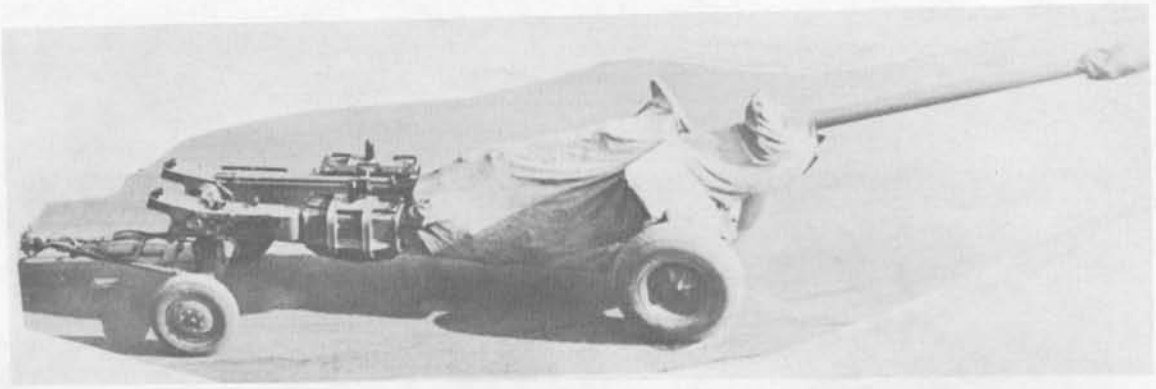
Although the M-46 bears superficial resemblance to many other Soviet field pieces, the combination of features is distinctive. It has a manually-operated horizontal sliding wedge breechblock and fires case-type, variable-charge, separate-loading ammunition. The recoil system has a hydraulic buffer and a hydropneumatic recuperator. When in travel position the tube is withdrawn from battery. Large sponge-filled rubber tires are used on the carriage. The M-46 is found in the East German Army as well as in the Soviet forces, and has been exported to a number of non-Communist countries.

The 130mm coastal gun SM-4-1 is a mobile piece designed after World War II on the basis of a German 150mm model. It is basically a 130mm naval gun placed on a mobile land carriage permitting 360 degree traverse. Normally it is employed in batteries with radar fire control. Although the SM-4-1 resembles a large-caliber antiaircraft gun, it can be distinguished by its large shield and unique muzzle brake.

The ammunition for the various 130mm guns (field, coastal and antiaircraft) is not interchangeable.

		M-46	SM-4-1
Caliber	mm	130	130
Length of tube in cals		55	55*
Length of tube overall	mm	7600	7600
Weight in firing position	kg	7700	16000
Weight in travel position	kg	8450	
Length in travel position	mm	11730	12800
Width in travel position	mm	2450	2850
Height in travel position	mm	2550	3050
Track	mm	2060	
Clearance	mm	400	300
Tire size		13.50x380	10.50x20
Height of axis of bore 0°	mm	1380	2030
Elevation	°	+45	+45
Depression	°	-2.5	-5
Traverse	°	50	360
Rate of fire	rpm	5-6	5
Projectile weight: HE	kg	33.4	33.4
APHE	kg	33.6	33.6
Muzzle velocity: HE	m/s	930	1050
APHE	m/s	930	1050
Maximum range	m	27000	29500
Pointblank range: APHE 2m high target	m	1170	
Armor penetration: APHE 0°/1000m	mm	230	250
Crew		9	
Unit of fire	rds		

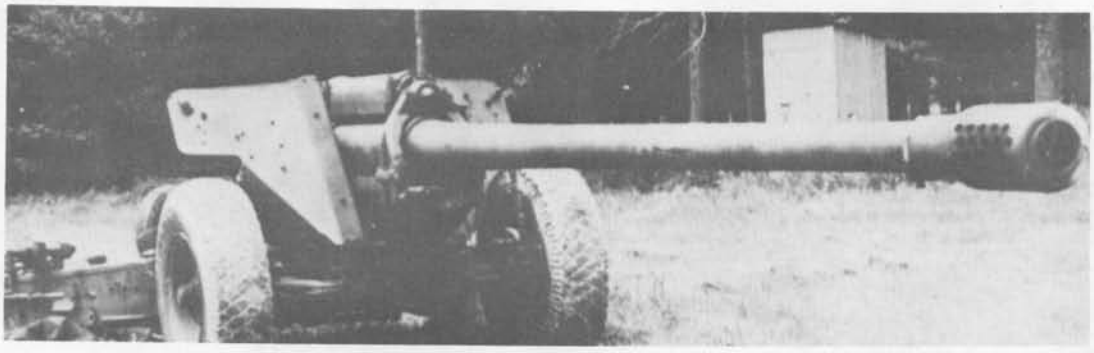
*referred to as the 130/58 in the Soviet Navy, which includes the muzzle brake in the length formula







130 mm field gun M–46



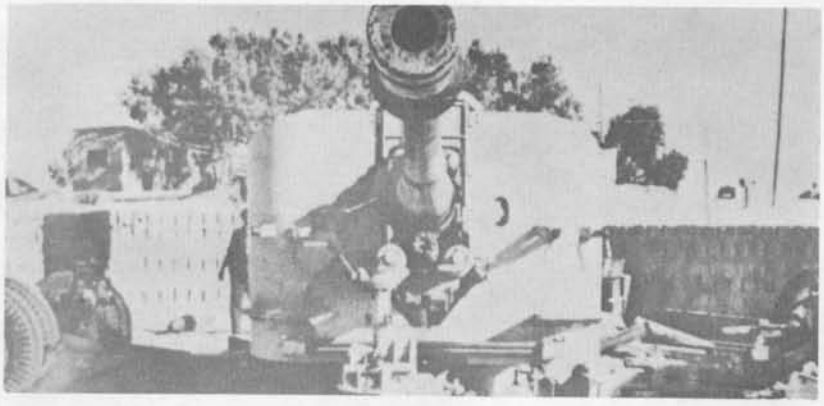
130 mm field gun M–46



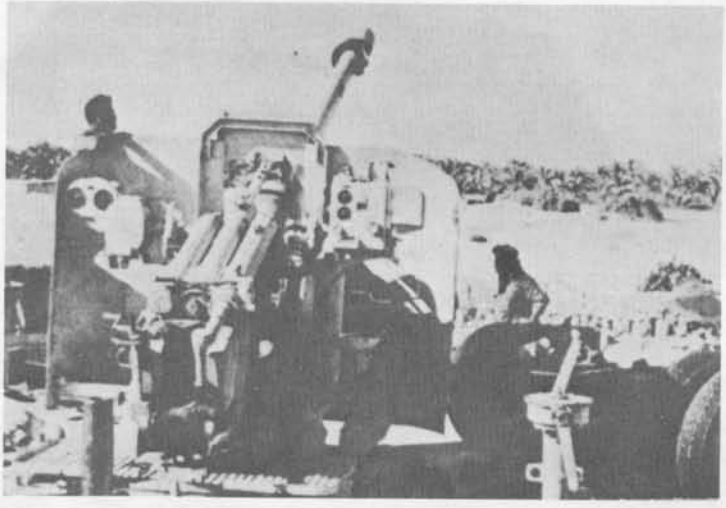


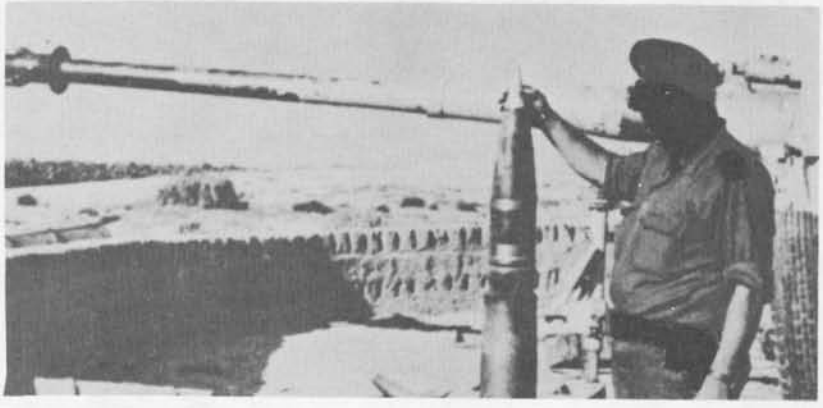
130 mm field gun M–46





130 mm coastal gun SM–4–1





NOT USED

152 mm howitzer M1938 (M–10)





152 mm howitzer M1943 (D-1)

152 mm howitzer M18/46



152mm howitzer M1938 (M-10)
152mm howitzer M1943 (D-1)
152mm howitzer M18/46

Shortly before the outbreak of World War II, the Soviet Army received a new 152mm howitzer designed to replace the older pre-World War I models still in use. The new M1938 was mounted on a rather heavy box-section, split-trail carriage which was similar to that of the 107mm corps gun M1940 (M-60), which came into service slightly later. The M1938 proved to be a fine piece ballistically, but the heavy carriage was a tactical handicap. As a result, in 1943 the tube was mounted on a new carriage. The M1938 recoil system consisted of a hydraulic buffer and a hydropneumatic recuperator, both located below the tube. In common with other Soviet medium-caliber field pieces of the day the M1938 had a hinged screw-type breechblock.

The new carriage chosen for the 1952mm howitzer was that of the 122mm howitzer M1938 (M-30). It was strengthened, and the tube of the 152mm howitzer was fitted with a large double-baffle muzzle brake. The resulting combination was dubbed the 152mm howitzer M1943 (D-1). The change resulted in a saving of 550 kg weight in the firing position and the elimination of the limber. Today the M1943 is still standard, although the older M1938 is found in the Romanian Army.

The 152mm howitzer M18/46 is a German World War II 150mm heavy field howitzer (15 cm sFH 18) modified to fire Soviet 152mm howitzer ammunition. At the end of the war large numbers of these German weapons were found in Czechoslovakia and when the Czechoslovak Army decided to standardize their equipment on Soviet ammunition the German pieces were modified. The M18/46 has a hydraulic recoil buffer, a hydropneumatic recuperator, and a manually-operated horizontal sliding wedge breechblock. Although no longer used in line units, the M18/46 is still held in war reserve and training units.

The ammunition for all of these 152mm howitzers is identical. It is of the variable-charge, case-type, separate-loading design.

		M1938	M1943	M18/46
Caliber	mm	152.4	152.4	152.4
Length of tube in cals		24.5	24.5	29
Length of tube overall	mm	3700	4207	4875
Weight in firing position	kg	4150	3600	5512
Weight in travel position	kg	4550	3640	6304
Length in travel position	mm	6399	7558	8284
Width in travel position	mm	2096	1994	2255
Height in travel position	mm	1900	1854	1707
Track	mm	1655	1800	
Clearance	mm	305	370	
Tire size			1180x35	
Height of axis of bore 0°	mm	1240	1240	
Elevation	°	+65	+63.5	+45
Depression	°	-1	-3	0
Traverse	°	50	35	60
Rate of fire	rpm	4	3-4	4
Projectile weight: HE	kg	39.9	39.9	39.9
SemiAP*	kg	51.1	51.1	51.1
Muzzle velocity: HE	m/s	508	508	508
SemiAP	m/s	432	432	432
Maximum range	m	12400	12400	12400
Pointblank range: SemiAP 2m high target	m	510	510	510
Armor penetration: SemiAP 0°/500m	mm	82	82	82
Crew		7	7	7
Unit of fire	rds	60	60	60

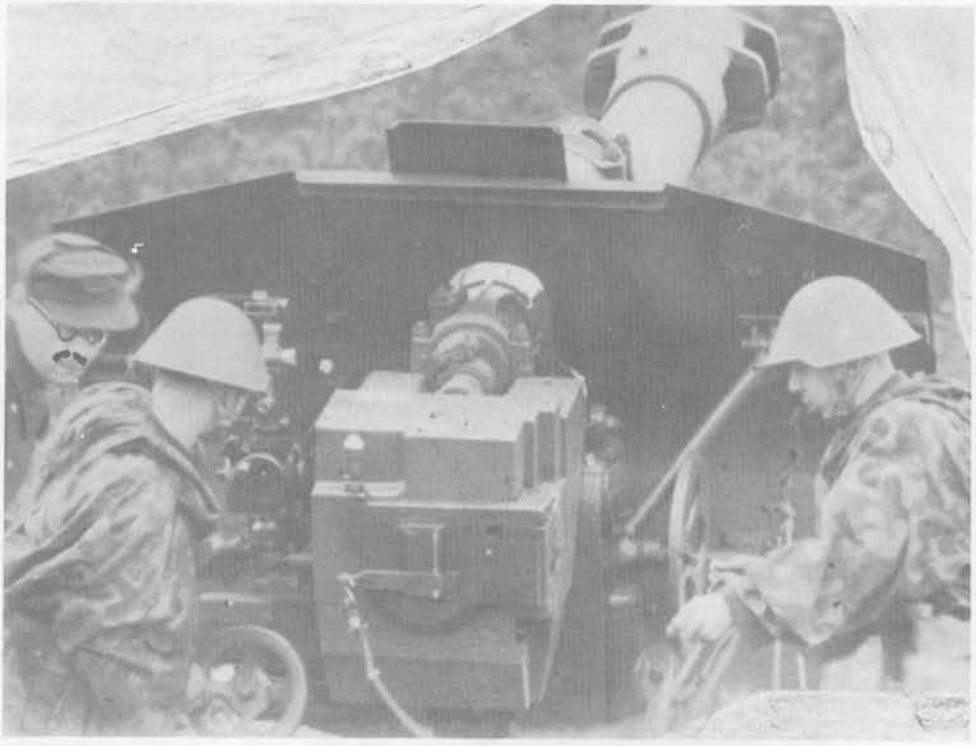
*Naval projectile with larger HE burster than in normal APHE.







152 mm howitzer M1938 (M–10)



152 mm howitzer M1943 (D–1)

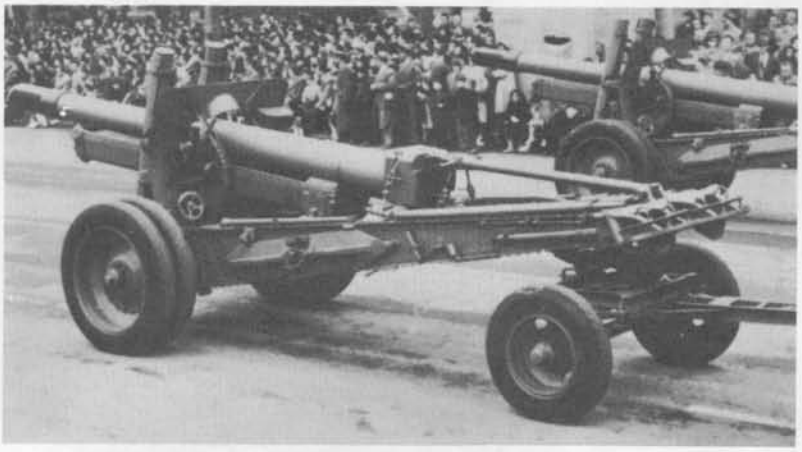




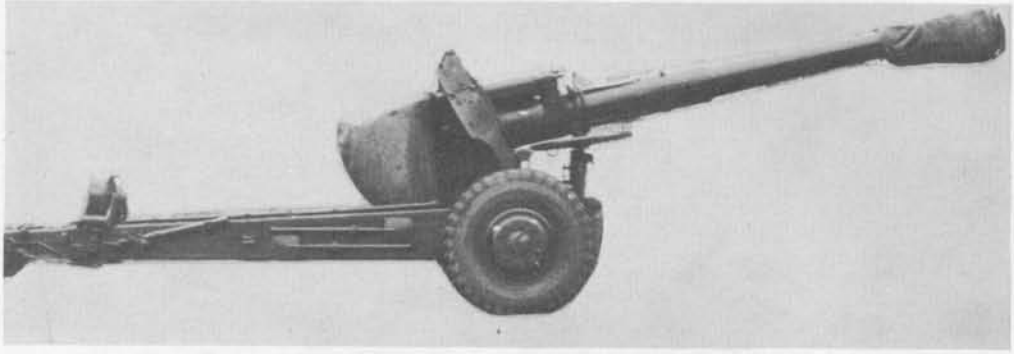




152 mm howitzer M1943 (D–1)



152 mm gun–howitzer M1937 (ML–20)



152 mm gun-howitzer D–20

152mm gun-howitzer M1937 (ML-30)
152mm gun-howitzer D-20

The Soviet 152mm gun-howitzer M1937 (ML-20) was the principal cannon used for counter battery, long-range interdiction and destruction fires during World War II. The weapon is the last of a long line of improved versions of a basic piece of French design which was introduced into the Imperial Russian Army in 1910. Following some minor carriage improvements in 1930, the Soviets placed the 152mm tube on the new carriage of the 122mm corps gun M1931, which resulted in the new designation of 152mm gun M1910/34. Some of these weapons continued in use until the 1960s. They can be distinguished from the later M1937 by the forward slope of the shield and the equilibrators. The primary practical difference is the limitation of the maximum elevation of the M1910/34 to 45 degrees.

The M1937 resulted from carriage improvements which gave the piece a greater maximum elevation. These improvements were also incorporated in the 122mm corps gun carriage. A further version of the M1937 is the main armament of the JSU-152, the 152mm gun M1937/43 (ML-20S). All of these weapons have hydraulic recoil buffers, hydropneumatic recuperators, and hinged screw-type breechblocks.

The M1937 is still used in many countries, but has been replaced in first-line Soviet units by the improved post-World War II, 152mm gun-howitzer D-20. This weapon, which was first displayed in public in Moscow on 1 May 1955, is a lighter and more powerful piece than the M1937. Its carriage and recoil system are identical to those of the 122mm field gun D-74, however the D-20 can be distinguished by the thicker tube and the much larger size double-baffle muzzle brake.

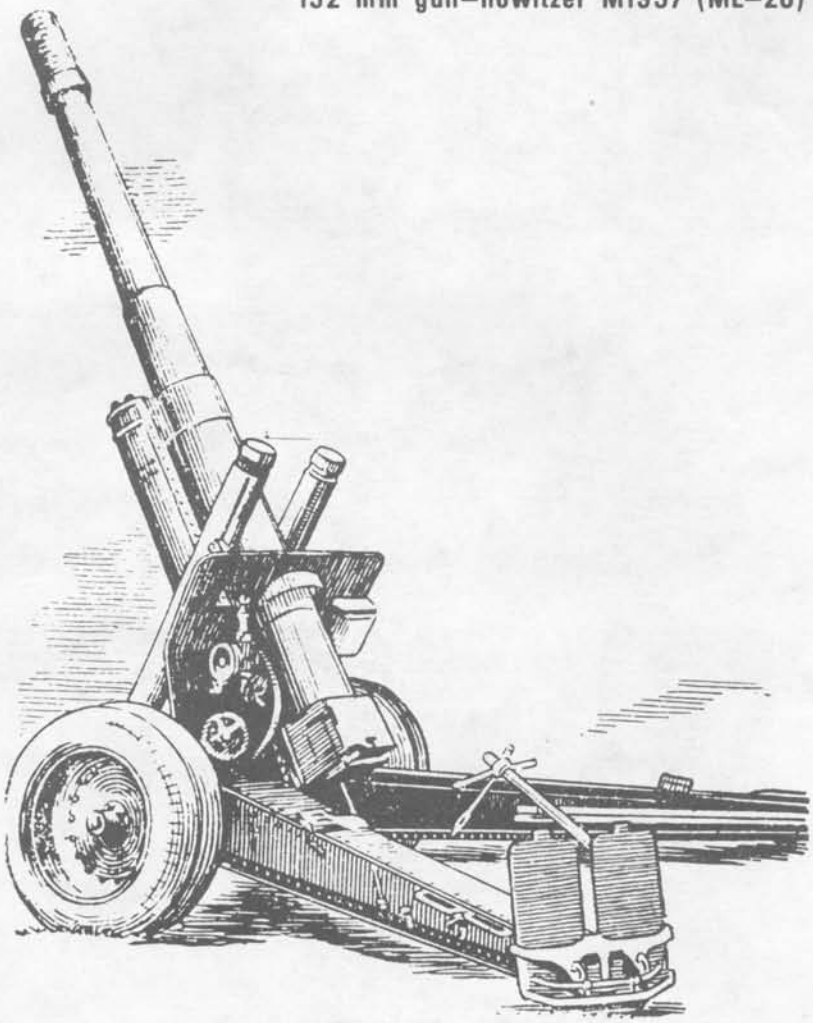
Both pieces fire similar, but not interchangeable case-type, variable-charge, separate-loading ammunition.

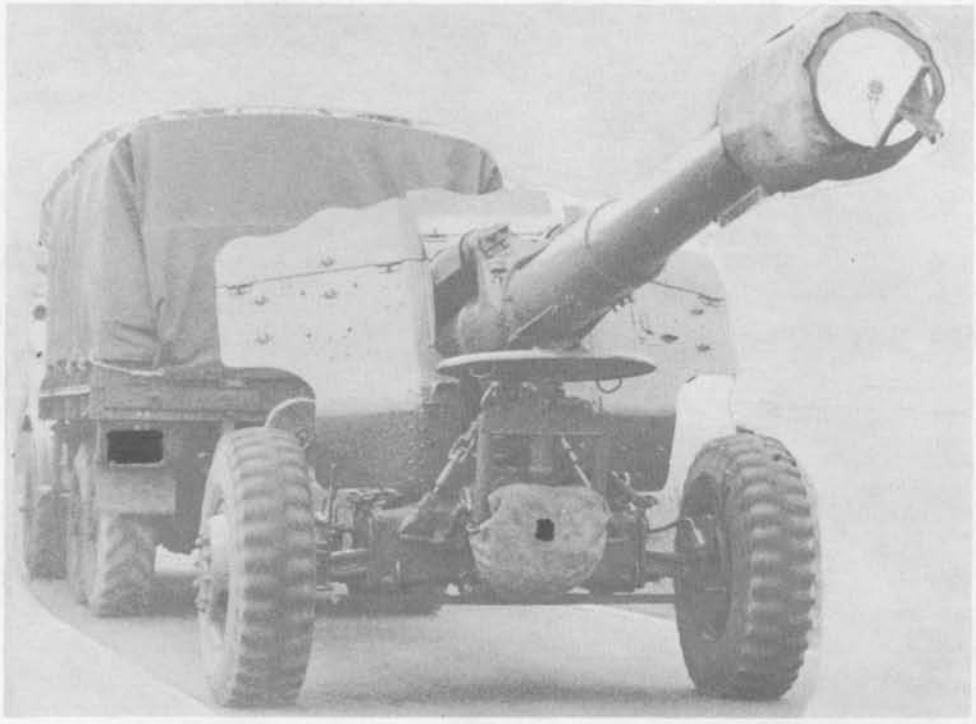
		M1937	D-20
Caliber	mm	152.4	152.4
Length of tube in cals		28.8	29
Length of tube overall	mm	4925	5055
Weight in firing position	kg	7261	5500
Weight in travel position	kg	8073	5550
Length in travel position	mm	7210	8626
Width in travel position	mm	2312	2350
Height in travel position	mm	2260	2464
Track	mm	1900	2030
Clearance	mm	315	400
Tire size		12.50x20	12.00x20
Height of axis of bore 0°	mm	1500	1668
Elevation	°	+65	+63
Depression	°	-2	-5
Traverse	°	58	58
Rate of fire	rpm	3-4	5
Projectile weight: HE	kg	43.6	43.6
APHE	kg	48.8	48.8
Muzzle velocity: HE	m/s	655	700
APHE	m/s	600	700
Maximum range	m	17265	18500
Pointblank range: APHE 2m high target	m	800	850
Armor penetration: APHE 0°/1000m	mm	124	130
Crew		9	10
Unit of fire	rds	60	60



towed by AT–S

152 mm gun–howitzer M1937 (ML–20)

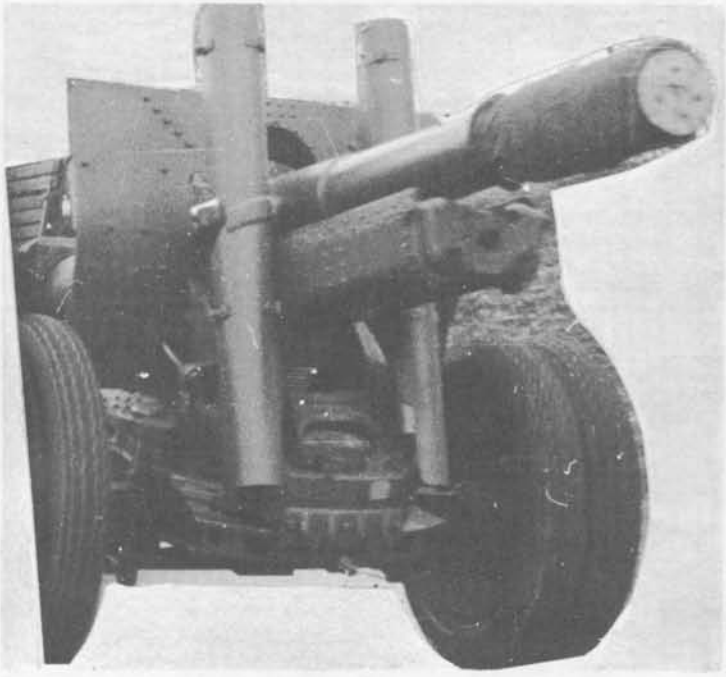








152 mm gun-howitzer D–20



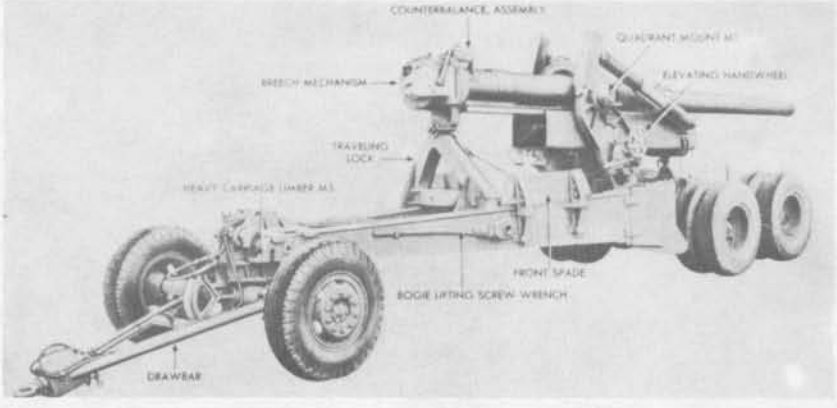
152 mm gun-howitzer M1937 (ML–20)



152 mm gun-howitzer D–20



155 mm howitzer M1



155 mm gun M2

155mm howitzer M1
155mm howitzer M-65
155mm gun M2

The Yugoslav Army uses United States towed 155mm howitzers and guns of World War II vintage. In addition it also produces a copy of the United States 155mm howitzer. This weapon, known as the M-65, is almost identical in appearance, but is lighter in weight.

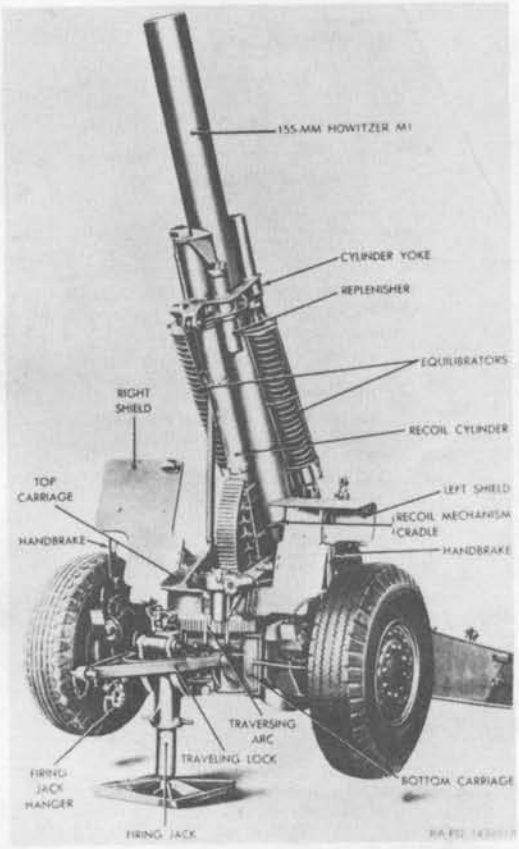
The 155mm howitzer M1 has a box-section, split-trail carriage equipped with pneumatic tires. The recoil system is hydropneumatic, and the breechblock uses the interrupted screw system. In firing position the weapon rests on a firing jack giving it three-point suspension. The distinctive appearance of this weapon makes it easy to distinguish from other artillery pieces used in Yugoslavia.

The 155mm gun M2 is mounted on the same carriage as is the United States 203mm (8 inch) howitzer M2, which is also found in the Yugoslav Army. At the front of the carriage a bogie is provided which can be lowered for travelling or raised to rest the carriage on the ground when the piece is emplaced for firing. In travel the carriage is placed on a heavy limber, or it can be towed semi-trailed. When emplaced, removable spades are installed on the rear of the box-section split trail. Like the other 155mm weapons, the M2 has an interrupted screw-type breech and a hydropneumatic recoil system.

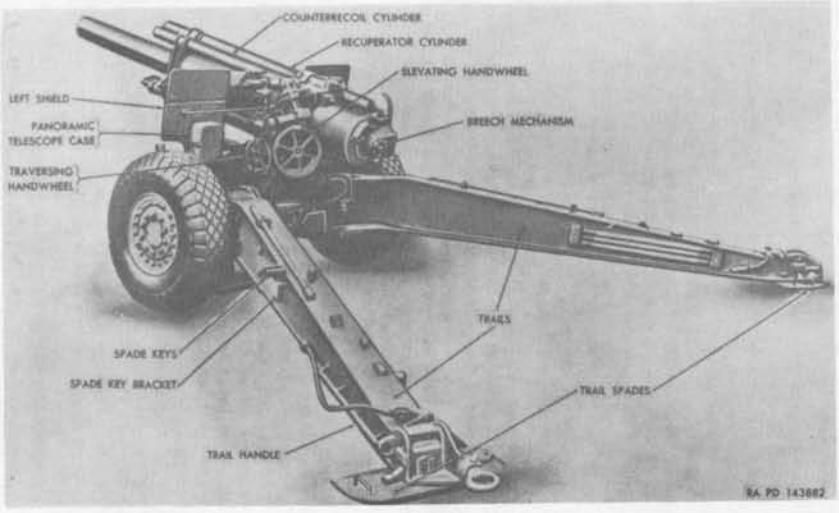
All of these 155mm cannon use bag-type, variable-charge, separate-loading ammunition.

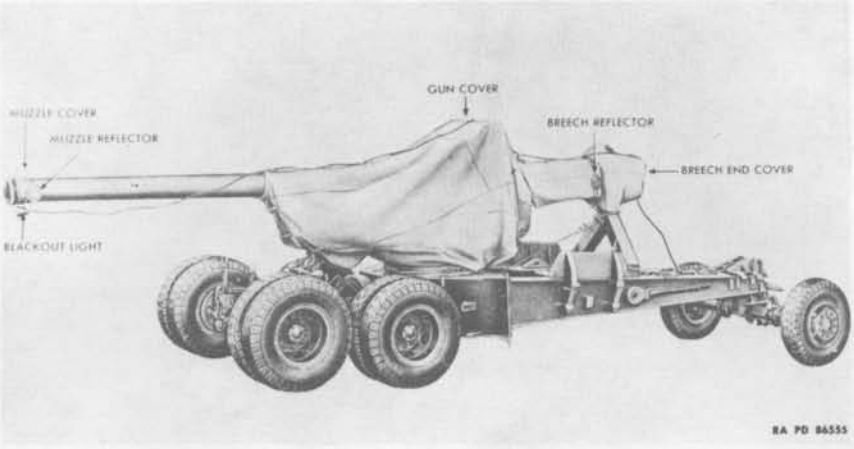
		Howitzer M1*	Gun M2**
Caliber	mm	155	155
Length of tube in cals		24.5	45.3
Length of tube overall	mm	3790	7036
Weight in firing position	kg	5766	12576
Weight in travel position	kg	5766	13665
Length in travel position	mm	7315	11024
Width in travel position	mm	2426	2512
Height in travel position	mm	1803	2718
Track	mm	2144	1890
Clearance	mm	229	330
Tire size		14.00x20	11.00x20
Height of axis of bore 0°	mm	1675	2380
Elevation	°	+63	+63.3
Depression	°	-2	-1.8
Traverse	°	48.7	60
Rate of fire	rpm	3	2
Projectile weight: HE	kg	41	43.4
AP	kg	---	45.4
Muzzle velocity: HE	m/s	564	837
AP	m/s	---	854
Maximum range: HE	m	14948	22005
Pointblank range: AP 2m high target	m	---	
Armor penetration: AP 0°/1000m	mm	---	
Crew		10	13
Unit of fire	rds		60

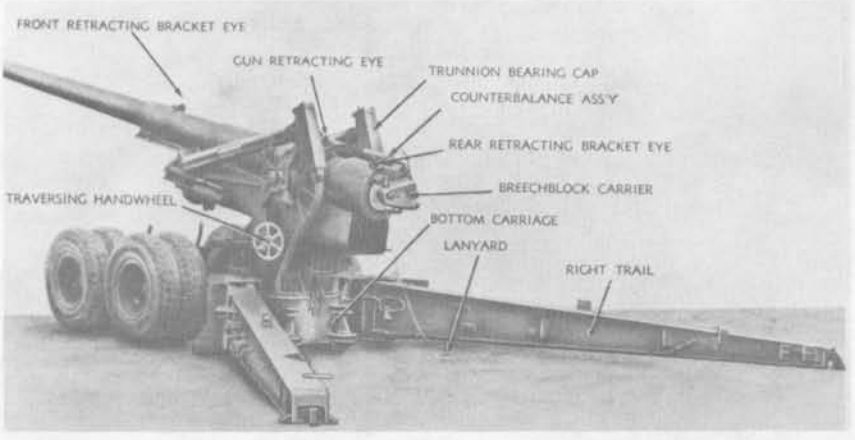
*on carriage M1A1
**on carriage M1



155 mm howitzer M1

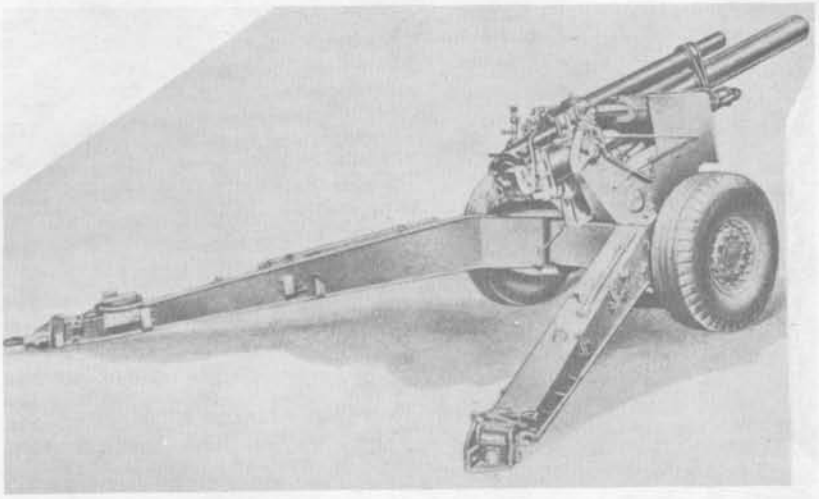



GUN COVER
MUZZLE COVER
MUZZLE REFLECTOR
BREECH REFLECTOR
BREECH END COVER
BLACKOUT LIGHT
RA PD 86555

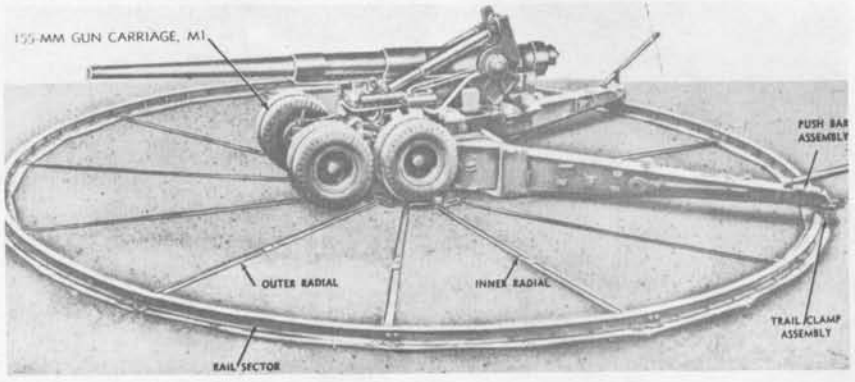

FRONT RETRACTING BRACKET EYE
GUN RETRACTING EYE
TRUNNION BEARING CAP
COUNTERBALANCE ASS'Y
REAR RETRACTING BRACKET EYE
BREECHBLOCK CARRIER
TRAVERSING HANDWHEEL
BOTTOM CARRIAGE
LANYARD
RIGHT TRAIL



155 mm gun M2

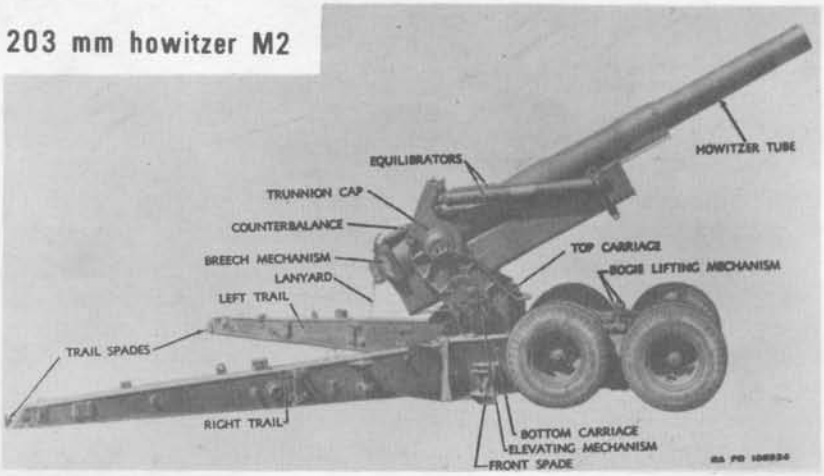


155 mm howitzer M1



155 mm gun M2 on coastal firing platform

203 mm howitzer M2

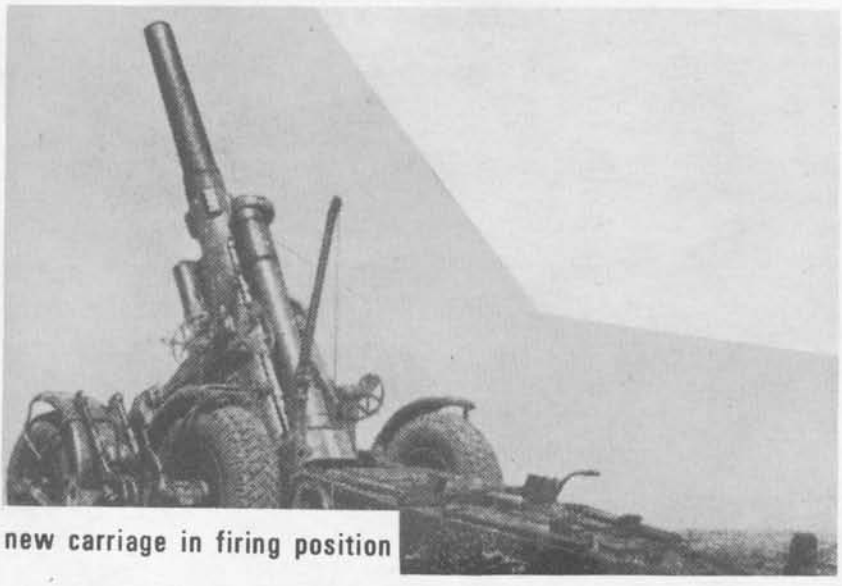


203 mm gun–howitzer M1955





203 mm howitzer M1931 (B-4)



new carriage in firing position

203mm howitzer M2
203mm howitzer M1931 (B-4)
203mm howitzer M1931 (M)
203mm gun-howitzer M1955

The United States eight inch (203mm) howitzer M2 is the largest caliber artillery piece employed in the Yugoslav Army. The carriage for this cannon is the same as that used by the United States 155mm gun M2, which is also found in Yugoslavia. The recoil system and breechblock are also of the same type as those used for the 155mm gun. The ammunition is of the bag-type, variable-charge, separate-loading variety.

The Soviet 203mm howitzer M1931 (B-4) is a rather old weapon which was the most widely used heavy artillery piece of the Soviet Army during World War II. Along with the less common 152mm gun M1935 (BR-2) and the 280mm howitzer M1939 (BR-5), it used a common full-track (but not self-propelled) carriage in firing position and for short moves. For longer moves the tube was removed and transported on a separate four-wheel tube transporter. The original 203mm howitzer M1931 was only 22 calibers long, but later models were increased to 25 calibers. The weapon has a hydraulic recoil buffer, a hydropneumatic recuperator, and a screw-type breechblock. The ammunition is of the bag-type, variable-charge, separate-loading variety.

After World War II the Soviets modified the M1931, replacing the tracked carriage with a large four-wheeled carriage which permits long moves without the use of a tube transporter. In firing position the wheels are raised, and the weapon rests on a firing platform. The modified howitzer, however, continues to use the box trail of the older model.

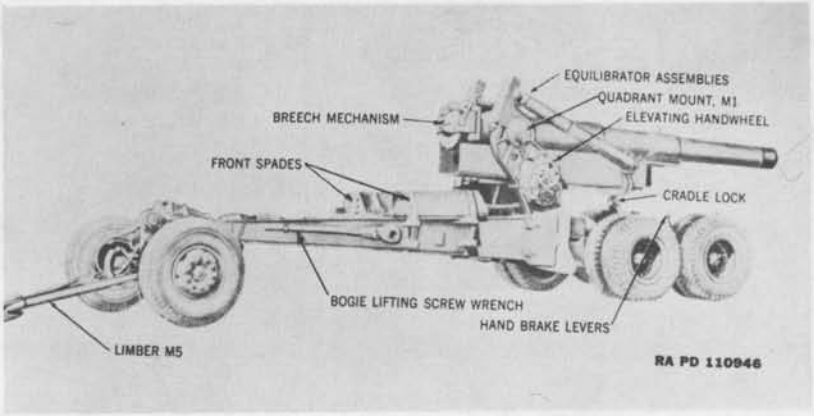
The 203mm gun-howitzer M1955 is the largest of Soviet post-World War II artillery pieces on towed mounts. Light in weight, and mobile for its caliber, the M1955 combines the advantages of both a gun and a howitzer. In addition to firing conventional high-explosive and concrete-piercing projectiles, the M1955 may have the capability for firing rounds with nuclear warheads. The M1955 has a carriage with box-section split trails and large dual tires filled with sponge rubber. In transport the tube is withdrawn from battery.

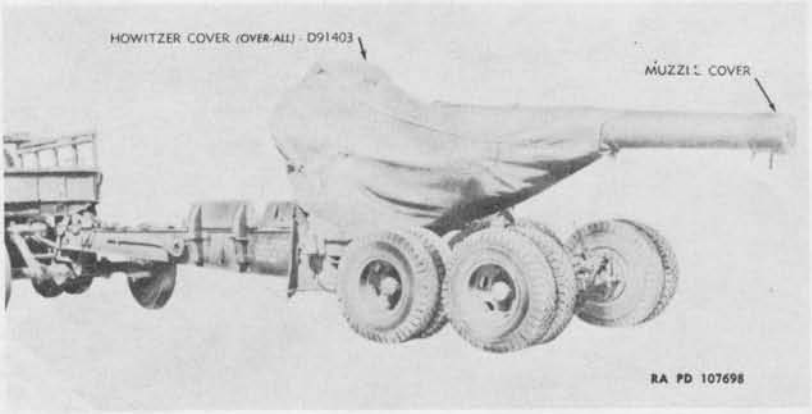
The piece has a screw-type breechblock and is fitted with a large multi-perforated muzzle brake. The ammunition is of the bag-type, variable-charge, separate-loading variety. The normal prime mover is the AT-T heavy tracked artillery tractor.

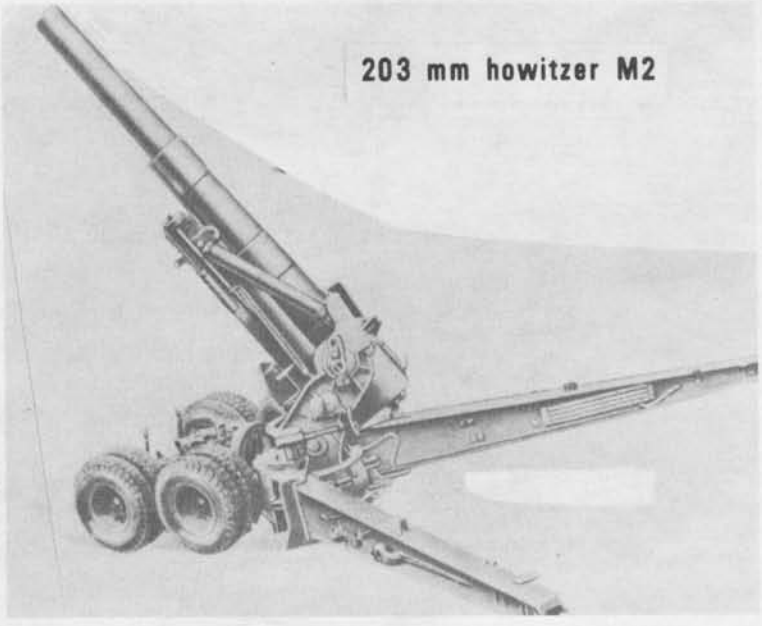
		M2*	M1931	M1955
Caliber	mm	203.2	203.2	203.2
Length of tube in cals		25.3	25	40
Length of tube overall	mm	5144	5092	8800
Weight in firing position	kg	13483	17700	20400
Weight in travel position	kg	14528	**	
Length in travel position	mm	10972	11151***	10485
Width in travel position	mm	2539	2710***	2996
Height in travel position	mm	2743	2500***	2621
Track	mm	1890	1893***	2195
Clearance	mm	318	330***	400
Tire size		11.00x20	---	
Height of axis of bore 0°	mm	2380	1920	1990
Elevation	°	+65	+60	+50
Depression	°	-2	0	-2
Traverse	°	60	8	44
Rate of fire	rpm	1	0.5	
Projectile weight: HE	kg	90.8	98.8	102
Muzzle velocity: HE	m/s	595	607	790
Maximum range: HE	m	16918	18025	29250
Crew		13		
Unit of fire	rds			

---

*on carriage M1 and limber M5
**in normal travel configuration--Type 2 transporter
tube transporter with tube 10620 kg
carriage without tube w/trail limber 13290 kg
in short move configuration w/trail limber 19000 kg
*** in short move configuration


EQUILIBRATOR ASSEMBLIES
QUADRANT MOUNT, M1
ELEVATING HANDWHEEL
BREECH MECHANISM
FRONT SPADES
CRADLE LOCK
BOGIE LIFTING SCREW WRENCH
HAND BRAKE LEVERS
LIMBER M5
RA PD 110946


HOWITZER COVER (OVER-ALL) - D91403
MUZZLE COVER
RA PD 107698

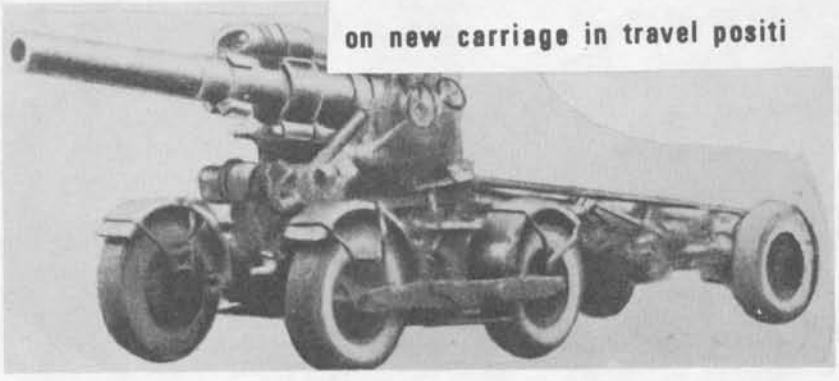

203 mm howitzer M2

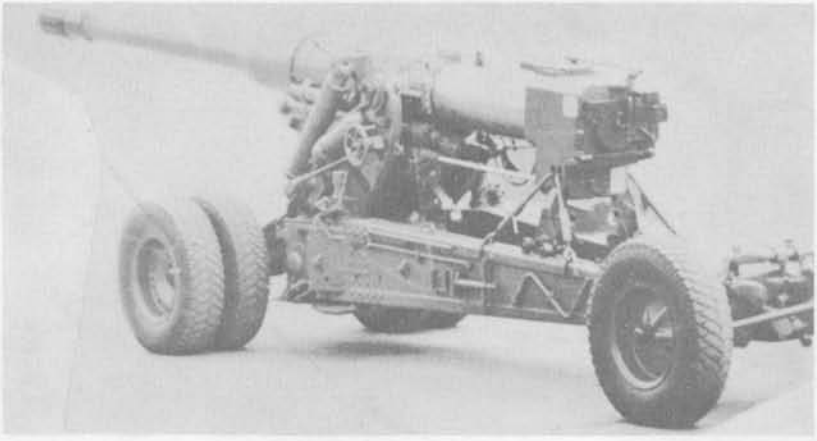




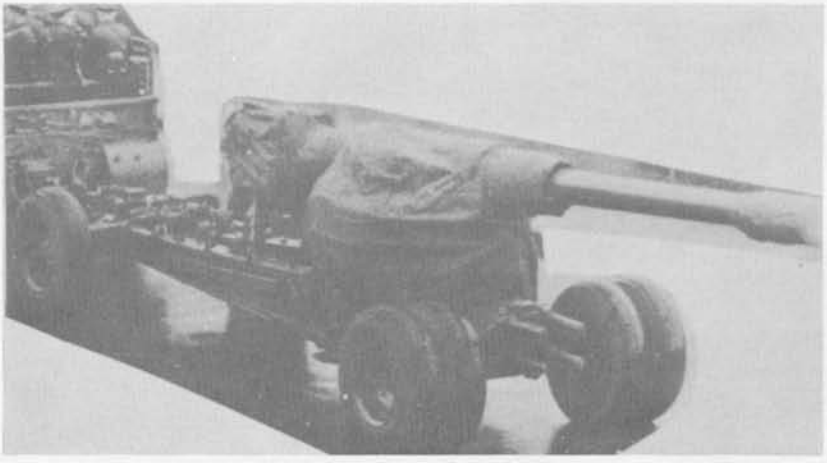
203 mm howitzer M1931 (B–4)

on new carriage in travel positi









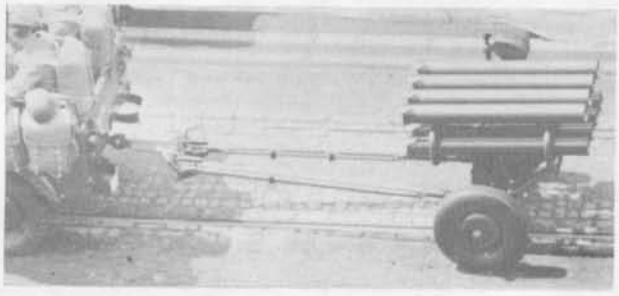
203 mm gun-howitzer M1955

NOT USED

FIELD ARTILLERY ROCKET LAUNCHERS



128 mm rocket launcher (32–round) M–63



140 mm rocket launcher (8–round) WP–8



140 mm rocket launcher (16-round) RPU–14

107mm rocket launcher (12-round) Type 63
128mm rocket launcher (32-round) M-63
140mm rocket launcher (8-round) WP-8
140mm rocket launcher (16-round) RPU-14

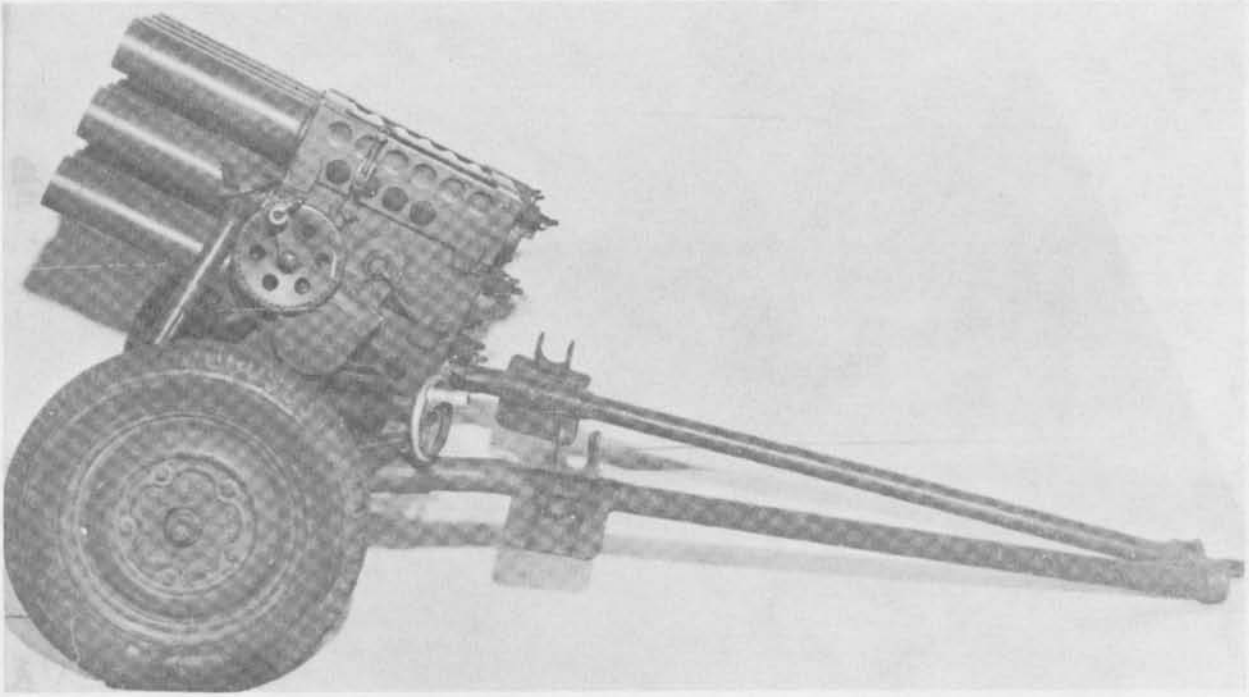
Four different towed multiround rocket launchers are employed by the East European Communist armies. The smallest caliber weapon is the Chinese Communist 107mm Type 63 which is used by the Albanian Army. This weapon, which has been encountered in South Vietnam, can be towed, broken down into packloads, or mounted on vehicles as it has been in Albania. The rocket is spin stabilized.

The next largest weapon is the Yugoslav 128mm M-63, which is a slightly modified version of the Czechoslovak 130mm M51 placed on a split-trail towed carriage. This rocket too is spin stabilized.

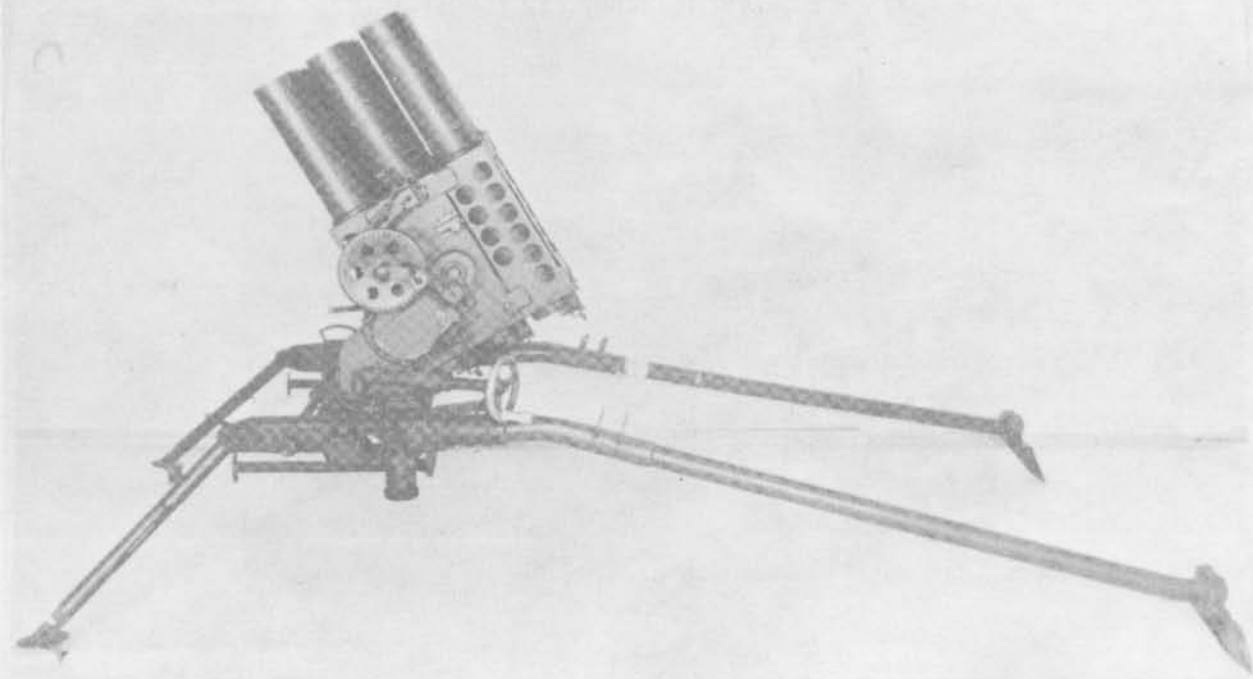
The two towed 140mm rocket launchers were both designed for employment with airborne troops. They both fire the same spin-stabilized rockets as do the Soviet BM-14 truck-mounted launchers. The 8-round WP-8 is a Polish development which is used solely in that country. The 16-round RPU-14 has appeared only with Soviet troops.

		107mm Type 63	128mm M-63	140mm WP-8	140mm RPU-14
Launcher					
Number of rounds		12	32	8	16
Weight in firing position	kg	602*	1395	370	1200
Weight in travel position	kg				
Length in travel position	mm	2895	3595	3294	4036
Width in travel position	mm	1651*	1634	1634	1800
Height in travel position	mm	921	1278	1200	1600
Track	mm			1400	1450
Clearance	mm		327	254	315
Tire size		5.00x16	8.25x20		6.50x20
Elevation: maximum	°	+57	+48	+45	+45
minimum	°	-3	0	0	0
Traverse	°	32	30	30	30
Time to reload	min	3	3	2	4
Crew			3-5	5	5
Rocket					
Caliber	mm	106.7	128	140	140
Length	mm	837	800	1085	1085
Weight	kg	19	23	39.6	39.6
Maximum velocity	m/s	385	420	400	400
Maximum range	m	8050	9600	9810	9810
Unit of fire	rds				

*** With wheeled carriage. Pack version without wheels weighs 281 kg.**

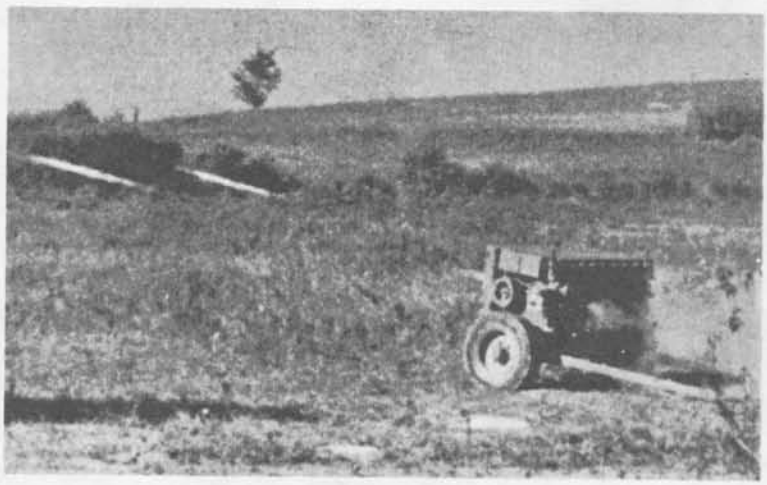


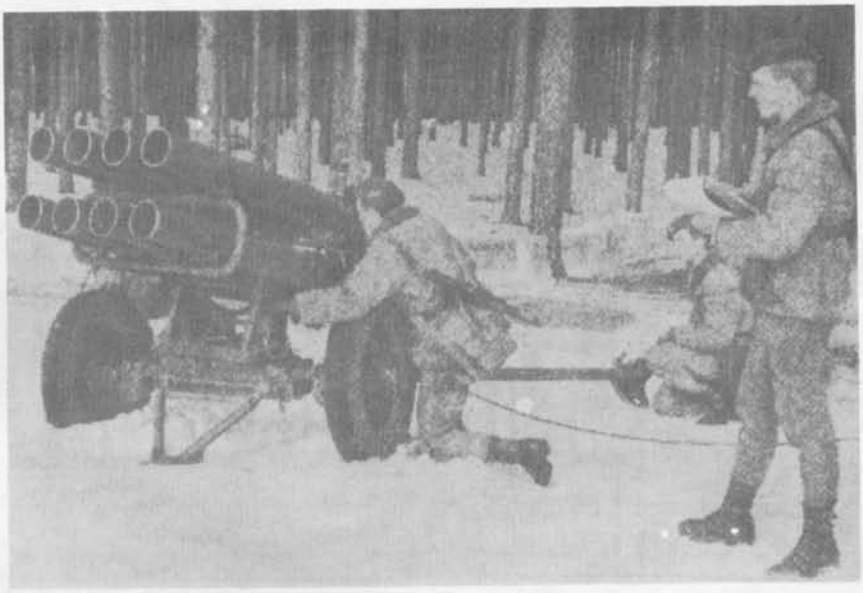
107 mm rocket launcher (12–round) Type 63





128 mm rocket launcher (32-round) M–63





140 mm rocket launcher (8-round) WP–8



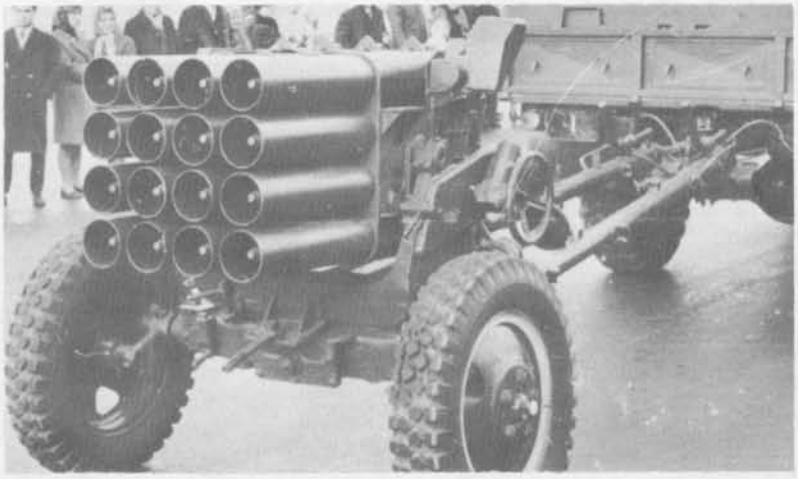


140 mm rocket launcher (16-round) RPU–14





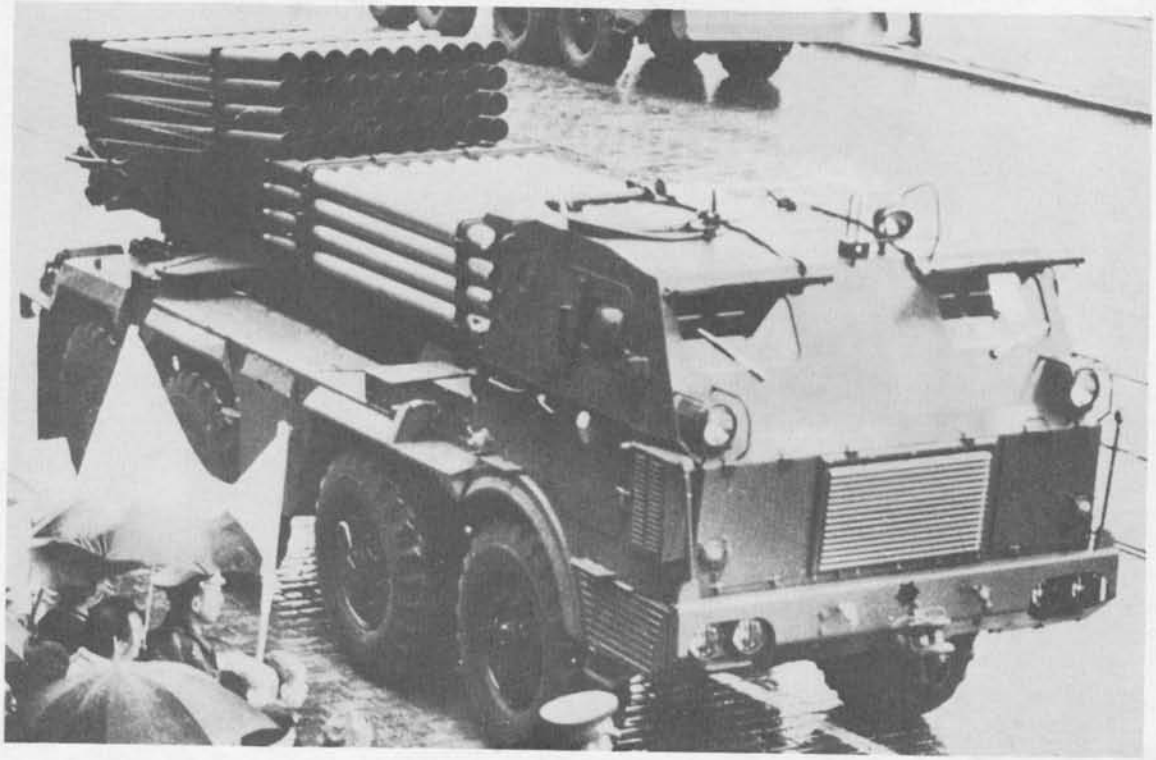
140 mm rocket launcher (16–round) RPU–14





122 mm rocket launcher (40-round) BM–21

122mm rocket launcher (40-round) M1972



TRUCK-MOUNTED 122mm MULTIROUND ROCKET LAUNCHERS

122mm rocket launcher (40-round) BM-21
122mm rocket launcher (40-round) M1972

The BM-21, which first appeared on the 7 November 1964 parade in Moscow, is the most modern truck-mounted multiround rocket launcher used in the Warsaw Pact armies. Although the rocket is smaller in caliber than any of the post-World War II models previously in use, the warhead weight is the same as that of the 140mm rocket, and the range of both the short and long rockets exceeds that of the 140mm and 240mm models. A further advantage is that the BM-21 launcher fires more rockets than any 140mm or 240mm launcher previously in use.

Although having a slow spin, the 122mm rockets are primarily fin-stabilized. In addition to the short and long rockets, there is a combination of the short rocket with an additional rocket motor, thus giving a projectile with a range almost as great as that of the long rocket.

The BM-21 can be distinguished easily from other multiround rocket launchers by the use of the Ural-375 truck and the 40-round launching apparatus. It is also the only known Soviet launcher without blast shields on the driver's cab.

During the parade following the SHIELD-72 maneuvers the Czechoslovak Army displayed a new version of the 122mm 40-round rocket launcher mounted on a modified Tatra 813 (8x8) truck. Although the basic launcher is almost identical with that of the Soviet BM-21, the transport vehicle is entirely different. Notable are the armored cab and the provision for carrying an additional 40 rockets. Although this combination is heavier and larger than the Soviet BM-21 mounted on the Ural-375 truck, it is much more mobile and permits a greater degree of tactical flexibility due to the additional rocket supply on the launch vehicle.

		BM-21	M1972
Vehicle			
Weight w/launcher and 40 rkts	kg	11500	14000
Wheelbase	mm	3500+1400	1400+2400+1400
Length	mm	7350	7760
Width	mm	2690	2500
Height in travel position	mm	2850	2700
Clearance	mm	410	400
Tire size		14.00x20	15.00x21
Engine model		ZIL-375	T930
Horsepower		175	270
Cylinders		V-8	V-12
Fuel		gasoline	Diesel
Cooling		water	air
Speed	km/h	75	75
Cruising range	km	405	1000
Trench	mm	875	1600
Step	mm	650	600
Slope	°	30	35
Tilt	°		
Ford	mm	1000	1400
Launcher			
Number of rounds		40	40
Weight	kg	3500	3500
Elevation: maximum	°	+50	+50
minimum	°	0	0
Traverse	°	240	240
Time to reload	min	10	5
Crew		6	6
Rocket			
Caliber	mm	122	122
Length: long rocket	mm	3226	3226
short rocket	mm	1905	1905
Weight: long rocket	kg	775	77.5
short rocket	kg	45.8	45.8
Maximum velocity (short)	m/s	450	450
Maximum range: long rocket	m	20500	20500
short rocket	m	11000	11000
Unit of fire	rds	80	80



122 mm rocket launcher (40-round) BM–21

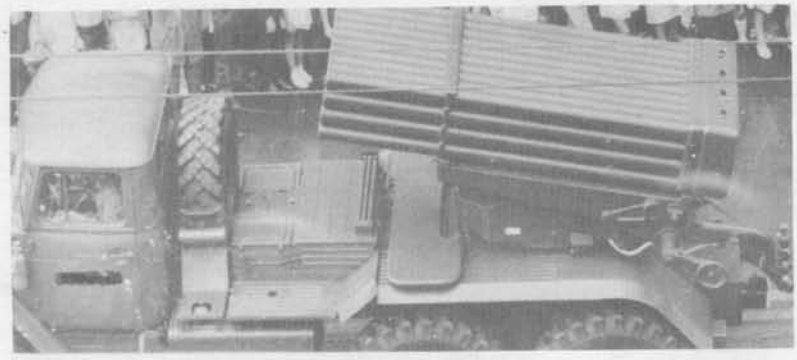






122 mm rocket launcher (40-round) BM–21



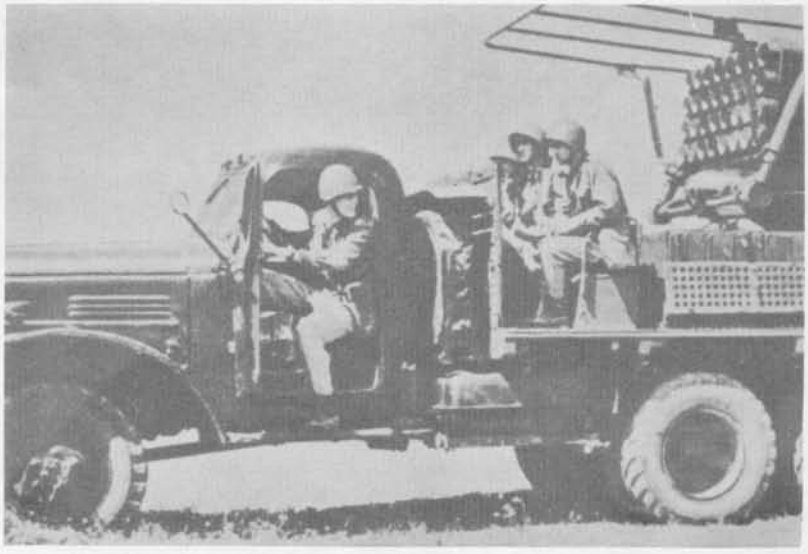


122 mm rocket launcher (40-round) BM–21





130 mm rocket launcher (32-round) M51 on Praga V3S



130 mm rocket launcher (32–round) M51 on ZIL–151

130mm rocket launcher (32-round) M51 on Praga V3S
130mm rocket launcher (32-round) M51 on ZIL-157

The Czechoslovak 130mm rocket launcher M51, sometimes known as the RM-130, consists of four banks of eight tubes each, mounted in a boxlike frame. Normally the M51 is mounted on the Czechoslovak Praga V3S (6x6) truck and is so used in the Czechoslovak and Bulgarian armies. The Romanian Army used the Soviet ZIL-157 (6x6) truck. Formerly it used the older ZIL-151 (6x6) truck. Regardless of the truck mount, the launcher is fired from either the right or left of the cab since there is no armor shielding as provided on most Soviet models.

The rocket is spin stabilized, and in recent years the maximum range has been increased.

A very similar 32-round launcher is found on a towed split-trail carriage in the Yugoslav Army.

		M51 Praga	M51 ZIL-157
Vehicle			
Weight w/launcher and 66 rkts	kg	8900	8630
Wheelbase	mm	3580+1120	3665+1120
Length	mm	6910	6684
Width	mm	2310	2315
Height in travel position	mm	2920	2780
Clearance	mm	400	310
Tire size		8.25x20	12.00x18
Engine model		Tatra 912	ZIL-157
Horsepower		98	109
Cylinders		6 inline	6 inline
Fuel		Diesel	gasoline
Cooling		air	water
Speed	km/h	62	65
Cruising range	km	443	430
Trench	mm	690	720
Step	mm	460	600
Slope	°	31	28
Ford	mm	800	850
Launcher			
Number of rounds		32	32
Weight	kg	1680	1680
Elevation: maximum	°	+50	+50
minimum	°	0	0
Traverse	°	240	240
Time to reload	min	2	2
Crew		6	6
Rocket			
Caliber	mm	130	130
Length	mm	800	800
Weight	kg	24.2	24.2
Maximum velocity	m/s	410	410
Maximum range	m	8200	8200
Unit of fire	rds	96	96



130 mm rocket launcher (32-round) M51







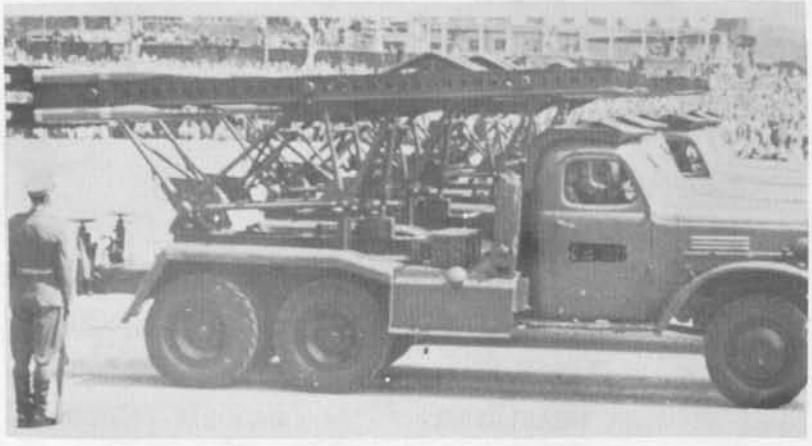
130 mm rocket launcher (32-round) M51 on Praga V3S



130 mm rocket launcher (32-round) M51 on ZIL–151



130 mm rocket launcher (32-round) M51 on Praga V3S



132 mm rocket launcher (16–round) BM–13–16



140 mm rocket launcher (16–round) BM–14–16



140 mm rocket launcher (17–round) BM–14–17

132mm rocket launcher (16-round) BM-13-16
140mm rocket launcher (16-round) BM-14-16
140mm rocket launcher (17-round) BM-14-17

The BM-13-16 is the only World War II multiround rocket launcher which is still encountered today. Its use, however, is confined to training. During World War II, it was mounted on a variety of trucks, although the United States Lend-Lease models were preferred. Postwar BM-13-16's are usually found on the Soviet ZIL-151. It should be noted that this launcher uses rails instead of frames or tubes which have become common for postwar launchers. The rockets are fin stabilized. Total firing time for all of the rockets on the BM-13-16 is between 7 and 10 seconds.

In the early 1950s the Soviet Army introduced a number of new multiround rocket launchers. One of these was the BM-14-16, which was first displayed in public in Moscow in 1953. An improved launcher, the BM-14-17, mounted on a lighter truck (GAZ-63A) showed up in the 7 November 1959 parade. It has been issued to both Soviet and Polish units as has been the BM-14-16. It should be noted that the BM-14-17 launching apparatus is rotated 90 degrees during travel.

All Soviet 140mm rockets are spin stabilized and are launched from tube-type launchers. Both of the truck-mounted launchers fire the same rockets as are used in the Soviet and Polish towed models. Single 140mm ground-mount launchers have been employed in South Vietnam.

		BM-13-16 ZIL-151	BM-14-16 ZIL-151	BM-14-17 GAZ-63A
Vehicle				
Weight w/launcher and rkts	kg	6432	8200*	5323*
Wheelbase	mm	3665+1220	3665+1220	3300
Length	mm	7500	6920	5410
Width	mm	2300	2300	1935
Height in travel position	mm	3190	2650	2245
Clearance	mm	265	265	270
Tire size		8.25x20	8.25x20	10.00x18
Engine model		ZIL-121	ZIL-121	GAZ-51
Horsepower		92	92	70
Cylinders		6	6	6
Fuel		gasoline	gasoline	gasoline
Cooling		water	water	water
Speed	km/h	60	60	65
Cruising range	km	600	600	650
Trench	mm	690	690	550
Step	mm	460	460	460
Slope	°	28	28	28
Ford	mm	800	800	800
Launcher				
Number of rockets		16	16	17
Weight	kg		3200	680
Elevation: maximum	°	+45	+50	+50
minimum	°	+15	0	0
Traverse	°	20	140	180
Time to reload	min	5-10	3-4	1.5-2
Crew		6	7	6
Rocket				
Caliber	mm	132	140	140
Length	mm	1473	1085	1085
Weight	kg	42.5	39.6	39.6
Maximum velocity	m/s	350	400	400
Maximum range	m	9000	9810	9810
Unit of fire	rds	80		

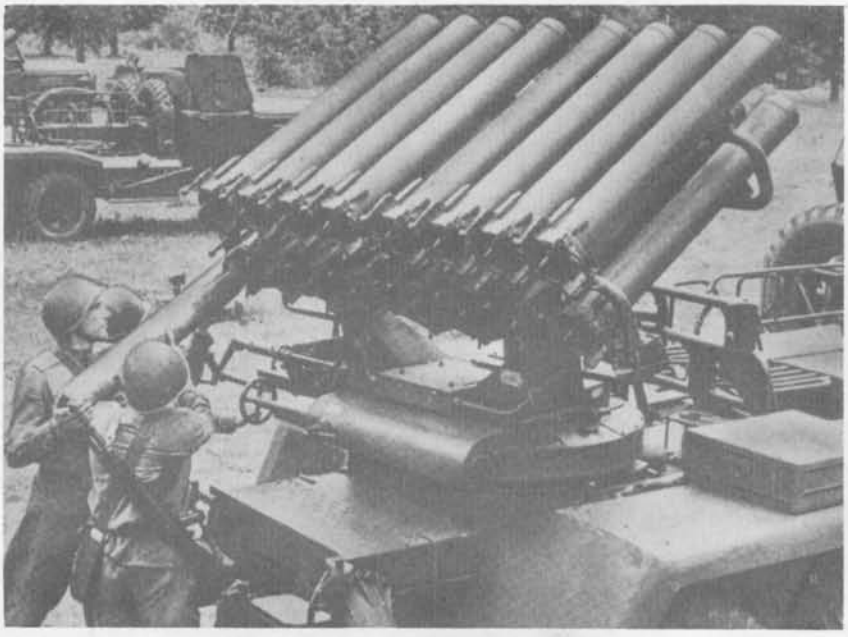
*with crew, average weight 75 kg per man



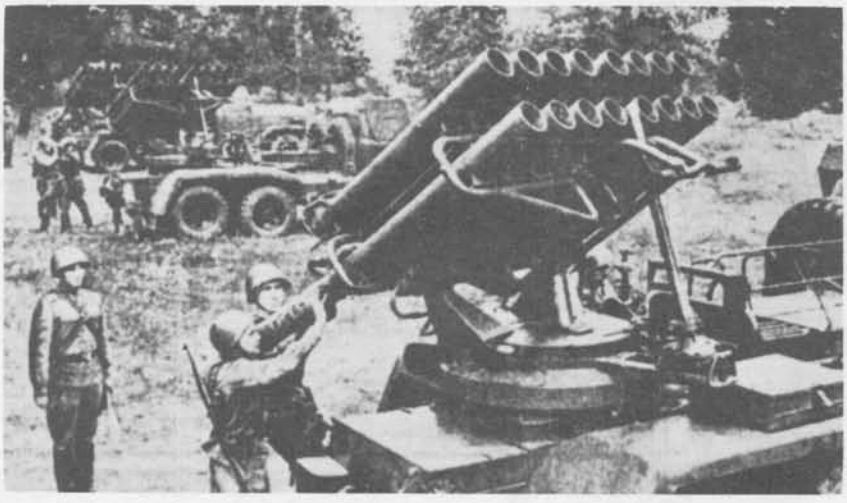




132 mm rocket launcher (16–round) BM–13–16



140 mm rocket launcher (16–round) BM–14–16





140 mm rocket launcher (17-round) BM–14–17

in travel position



in firing position



200 mm rocket launcher (4–round) BMD–20



250 mm rocket launcher (6–round) BM–25

TRUCK-MOUNTED 200mm AND 250mm MULTIROUND ROCKET LAUNCHERS

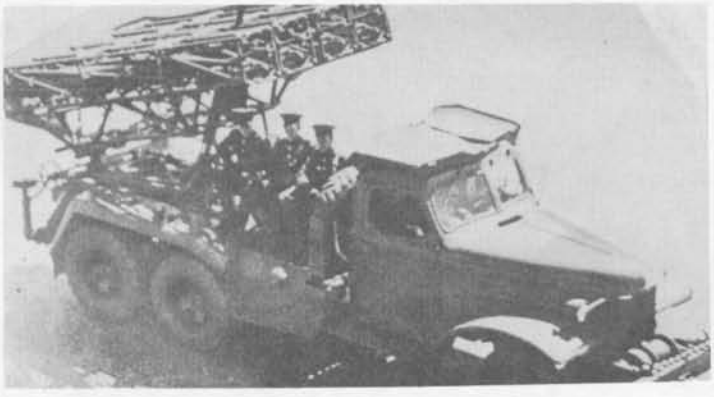
200mm rocket launcher (4-round) BMD-20
250mm rocket launcher (6-round) BM-25

In the middle of the 1950s the Soviet Army introduced two multiround rocket launchers which fired rockets of considerably greater range than those of the other models then in use. The smaller caliber launcher was the 200mm BMD-20, which was rather widely encountered for a number of years, but today is rarely seen. Originally the ZIL-151 (6x6) truck was used, but it was later replaced by the improved ZIL-157. The finned 200mm rockets had a slow spin imparted to them by the guide rails of the launching frames.

The larger weapons system, the BM-25, was the largest multiround rocket launcher system used by the Soviet forces, and had the greatest range. Only the wartime BM-31-12 exceeded it in caliber. The system also had the distinction of probably using a storable liquid propellant and of being mounted on the larger KrAZ-214 (6x6) truck in place of the smaller ZIL's used for other systems. The BM-25 has not been encountered frequently and probably is now obsolescent.

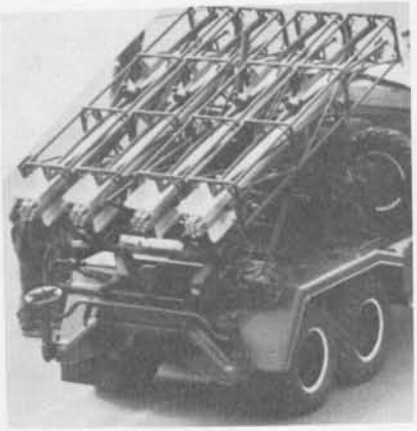
		BMD-20 on ZIL-151	BM-25 on KrAZ-214
Vehicle			
Weight w/launcher and rkts	kg	8700	18145
Wheelbase	mm	3665+1220	4600+1400
Length	mm	7200	9815
Width in travel position	mm	2300	2700
Height in travel position	mm	2850	3500
Clearance	mm	265	380
Tire size		8.25x20	15.00x20
Engine model		ZIL-121	YaMZ-206B
Horsepower		92	205
Cylinders		6	6
Fuel		gasoline	diesel
Cooling		water	water
Speed	km/h	60	55
Cruising range	km	600	530
Trench	mm	690	960
Step	mm	460	800
Slope	°	28	30
Tilt	°		
Ford	mm	800	1000
Launcher			
Number of rounds		4	6
Weight	kg	2700	2720
Elevation: maximum	°	+60	+55
minimum	°	+9	0
Traverse	°	20	6
Time to reload	min	6-10	
Crew		6	
Rocket			
Caliber	mm	200	250
Length	mm	3110	5822
Weight	kg	91.4	455
Maximum velocity	m/s		
Maximum range	m	20000	30000+
Unit of fire	rds		

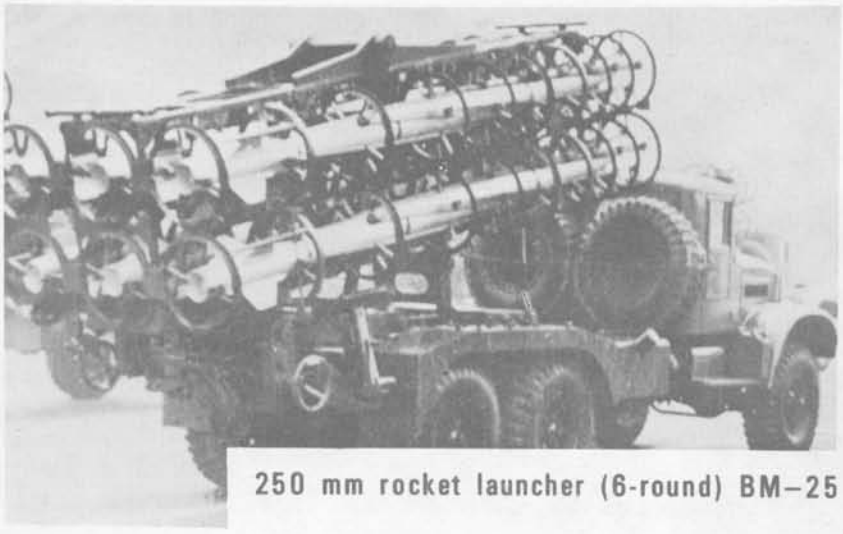




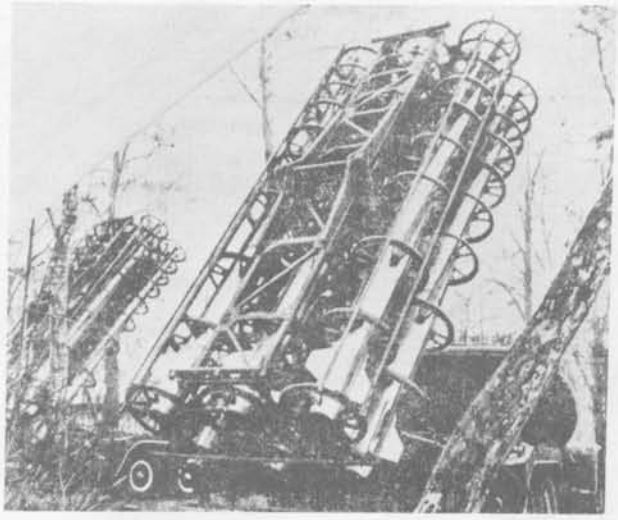
200 mm rocket launcher (4–round) BMD–20





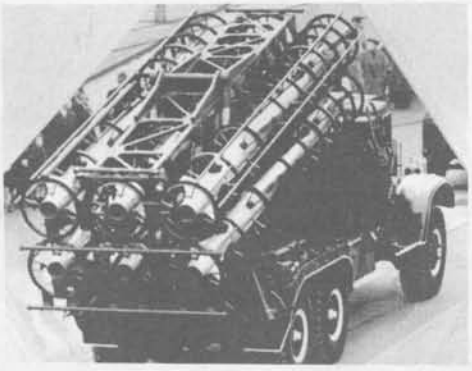


250 mm rocket launcher (6-round) BM–25





in travel position



250 mm rocket launcher (6-round) BM–25



in travel position

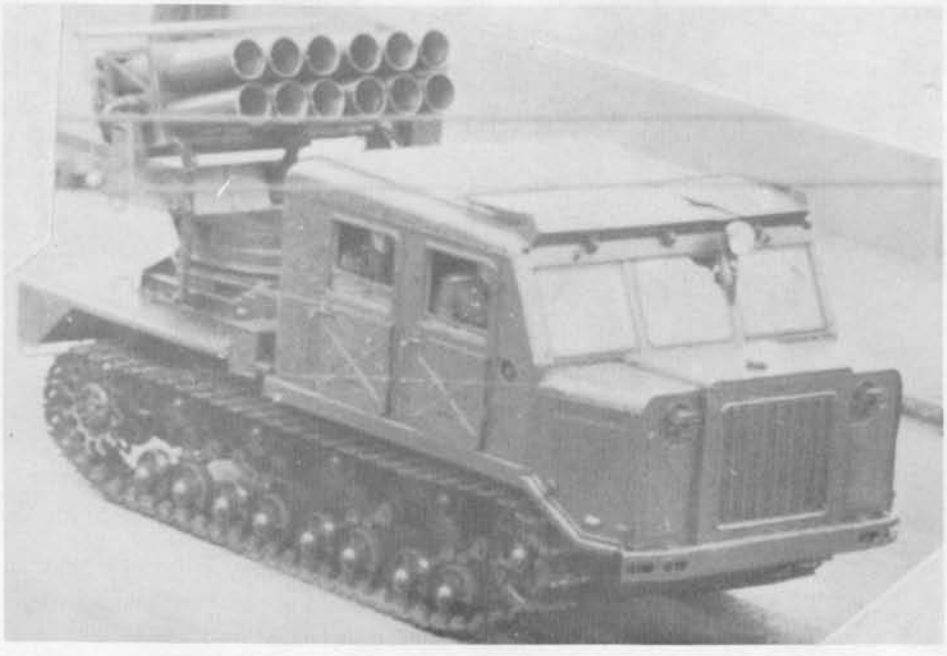


200 mm rocket launcher (4-round) BMD–20

in travel position



240 mm rocket launcher (12–round) BM–24



240 mm rocket launcher (12–round) BM-24T

TRUCK AND TRACTOR-MOUNTED 240mm MULTIROUND ROCKET LAUNCHERS

240mm rocket launcher (12-round) BM-24
240mm rocket launcher (12-round) BM-24T

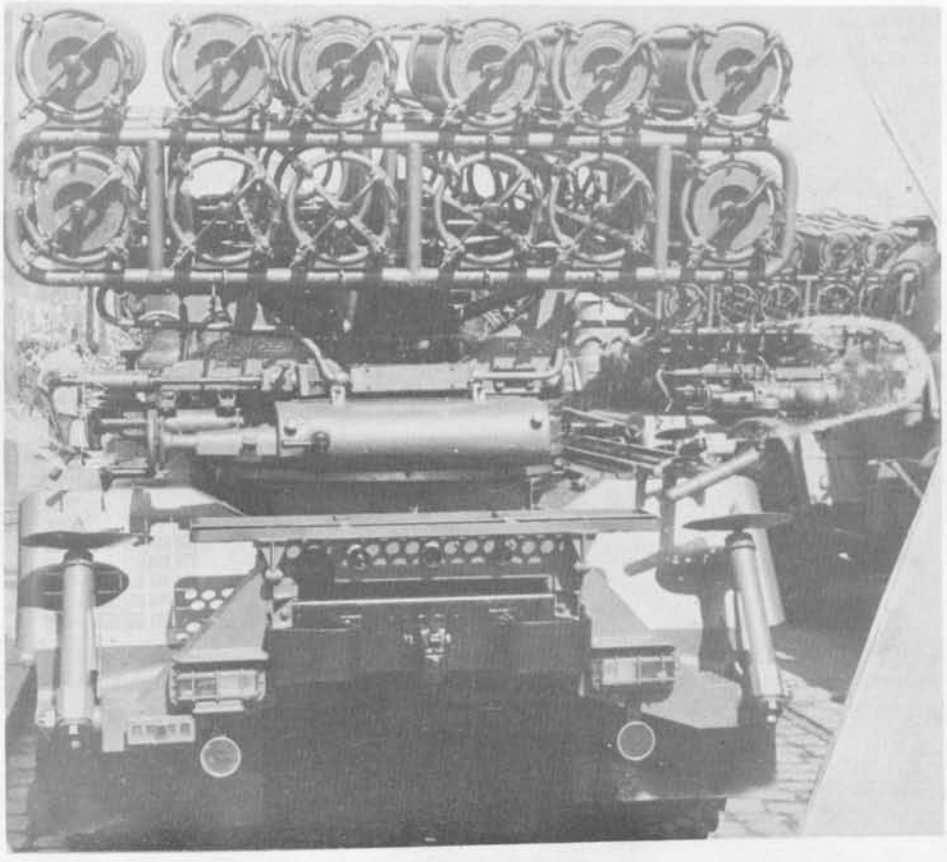
The BM-24 was introduced in the early 1950s to replace the World War II 300mm rocket launcher BM-31-12 which had insufficient range. Although the first launchers were mounted on the ZIL-151 (6x6) truck, the currently used models are mounted on the improved ZIL-157. This launcher is used in the East German Army as well as in the Soviet Forces, and has been exported to the Middle East.

The BM-24T on the AT-S medium-tracked artillery tractor differs from the truck-mounted launcher in that it uses tubes in place of frames for launching. It is the only currently used multiround rocket launcher mounted on a full-tracked vehicle. It is found only with Soviet troops, primarily in tank divisions.

All 240mm rockets are spin stabilized. There are two models almost identical in length, one with a short rocket motor giving a range of 6575 m, the second with a longer motor (and smaller warhead) resulting in a range of 10200 m.

		BM-24 on ZIL-157	BM-24T on AT-S
Vehicle			
Weight w/launcher & 12 rockets	kg	8230*	15240
Wheelbase/track on ground	mm	3665+1120	3070
Length	mm	6705	5870
Width in travel position	mm	2315	2570
Height in travel position	mm	2910	3100
Clearance	mm	310	400
Tire size		12.00x18	---
Track width	mm	---	425
Engine model		ZIL-157	V-54-T
Horsepower		109	250
Cylinders		6	V-12
Fuel		gasoline	Diesel
Cooling		water	water
Speed	km/h	65	35
Cruising range	km	430	380
Ground pressure	kg/cm	---	0.58
Trench	mm	720	1450
Step	mm	600	600
Slope	°	28	28
Tilt	°		
Ford	mm	850	1000
Launcher			
Number of rounds		12	12
Weight	kg	3200	2720
Elevation: maximum	°	+65	+45
minimum	°	0	0
Traverse	°	140	210
Time to reload	min	3-4	3-4
Crew		6	6
Rocket			
Caliber	mm	240	240
Length: long model	mm	1290	1290
short model	mm	1225	1225
Weight: long model	kg	109	109
short model	kg	112	112
Maximum velocity	m/s	465	465
Maximum range: long model	m	10200	10200
short model	m	6575	6575
Unit of fire	rds	60	60

*8680 kg with crew



240 mm rocket launcher (12–round) BM–24

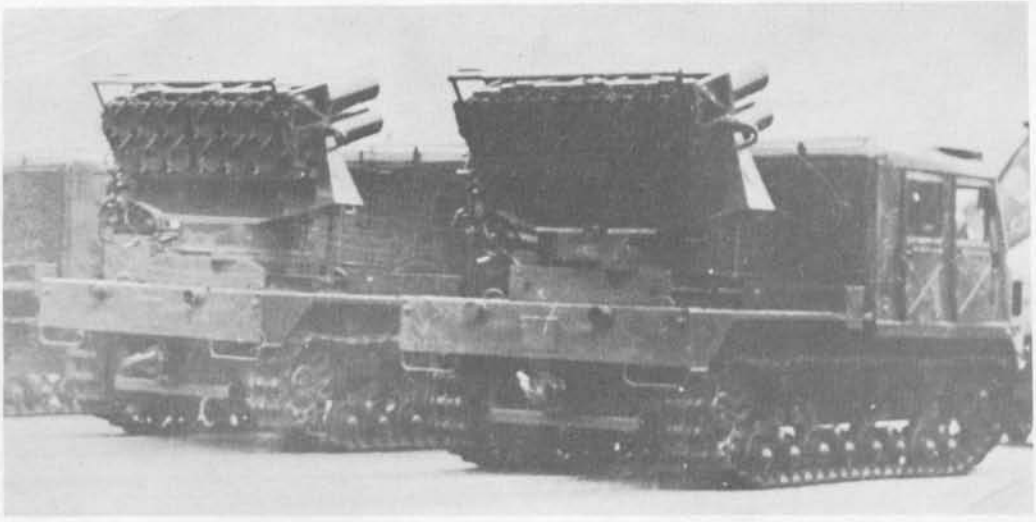


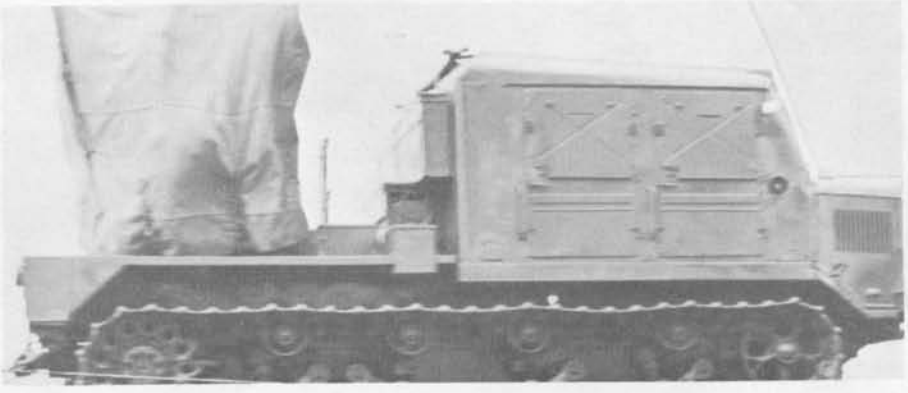




240 mm rocket launcher (12–round) BM–24







240 mm rocket launcher (12–round) BM-24T



NOT USED

SURFACE-TO-SURFACE FREE ROCKETS AND GUIDED MISSILES



FROG–7

Free rocket over ground FROG-1
Free rocket over ground FROG-2
Free rocket over ground FROG-3
Free rocket over ground FROG-4
Free rocket over ground FROG-5
Free rocket over ground FROG-6
Free rocket over ground FROG-7

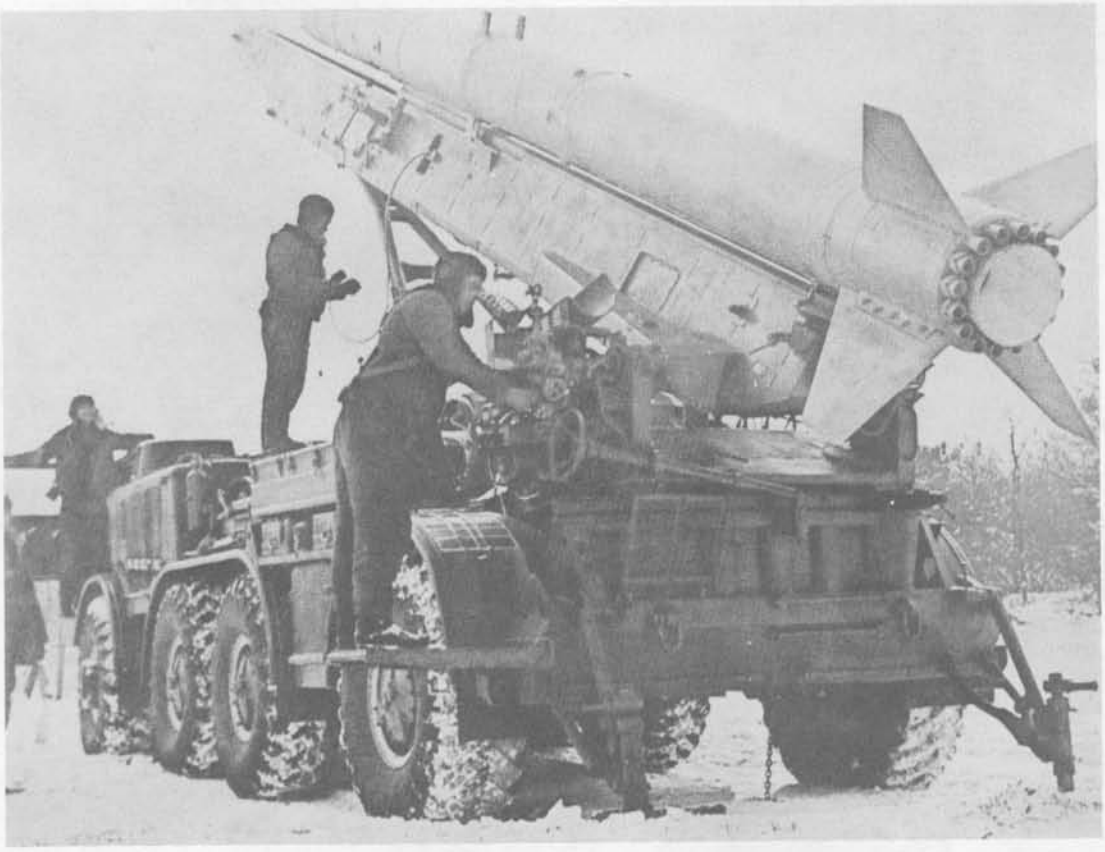
The FROG-1 and FROG-2 were the earliest of the Soviet large free rockets. FROG-1 can be distinguished by its large, bulbous nose and by the large transporter-launch vehicle based on the JS heavy tank chassis. FROG-2 is a smaller rocket, also with a bulbous nose, but transported by and launched from a light-tracked vehicle derived from the PT-76 tank chassis. Both FROG-1 and FROG-2 are considered obsolete today and are no longer in first line units.

FROG-3, FROG-4, and FROG-5 are three variants of a single rocket, which are transported on and launched from the same basic light-tracked chassis derived from the PT-76 tank. This chassis can be distinguished from that of the FROG-2 transport-launch vehicle by the presence of track support rollers. The rockets are identical, differing only in the size and shape of the warheads. Although still encountered in many Warsaw Pact armies, this series of FROG's is in the process of being replaced by FROG-7 which is carried on and launched from a wheeled vehicle.

FROG-6 is a dummy rocket used for training purposes. It is transported on a specially modified ZIL-157 (6x6) truck chassis.

FROG-7 is the latest in the free rocket series. In addition to improvements in the rocket which give it greater range, a new transport-launch vehicle using a wheeled chassis has been developed based on the ZIL-135 (8x8) truck. It incorporates a number of improvements in rocket handling such as an on-board crane. A very similar vehicle is also used with the FROG-7 system to transport the reserve rockets. The earlier FROG's used semitrailers towed by ZIL-157V tractor trucks, and needed crane trucks for reloading of the transport-launch vehicles.

		FROG-1	FROG-2	FROG-3	FROG-7
Vehicle					
Weight w/rocket	t	36.5	14.2	14.2	20
Wheelbase	mm	---	---	---	2415+1500+2415
Length	mm	10700	9400	10550	10750
Width	mm	3200	3180	3180	2800
Height	mm	3322	3050	3050	3660
Track	mm	2400	2740	2740	2300
Clearance	mm	460	370	370	580
Track width	mm	650	360	360	---
Tire size		---	---	---	16.00x20
Ground contact	mm	4625	4080	4080	---
Engine model		V-2 IS	V-6	V-6	ZIL-375 (2x)
Horsepower		520	240	240	180
Cylinders		V-12	6 inline	6 inline	V-8
Fuel		Diesel	Diesel	Diesel	gasoline
Cooling		water	water	water	water
Speed	km/h	37	44	44	65
Cruising range	km	150	260	260	500
Fuel capacity	l	520	250	250	768
Fuel consumption	l/100km	350	96	96	160
Ground pressure	kg/cm^2	0.67	0.48	0.48	---
Trench	mm	2500	2800	2800	2630
Step	mm	1000	1100	1100	685
Slope	°	30	30	30	30
Tilt	°				
Ford	mm	1300	1000	1000	580
Crew		5	5	5	4
Rocket					
Weight	kg	3175	2450	2266	2300
Length	mm	10200	9400	10550	9100
Diameter: warhead	mm	840	580	535	550
motor	mm	610	305	400	550
Weight of warhead	kg	1180	545	454	450
Range	m	32000	19000	35000	60000



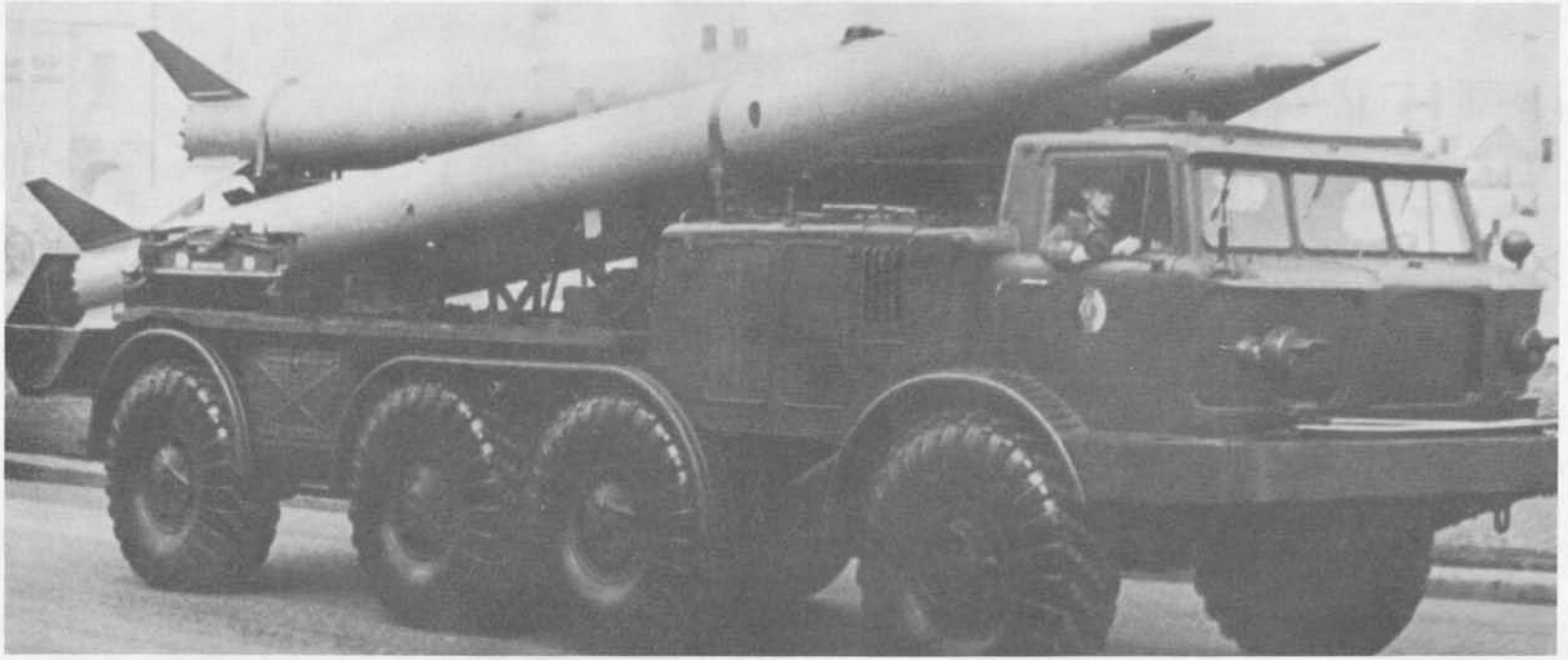
FROG–7 being prepared for firing



FROG–7



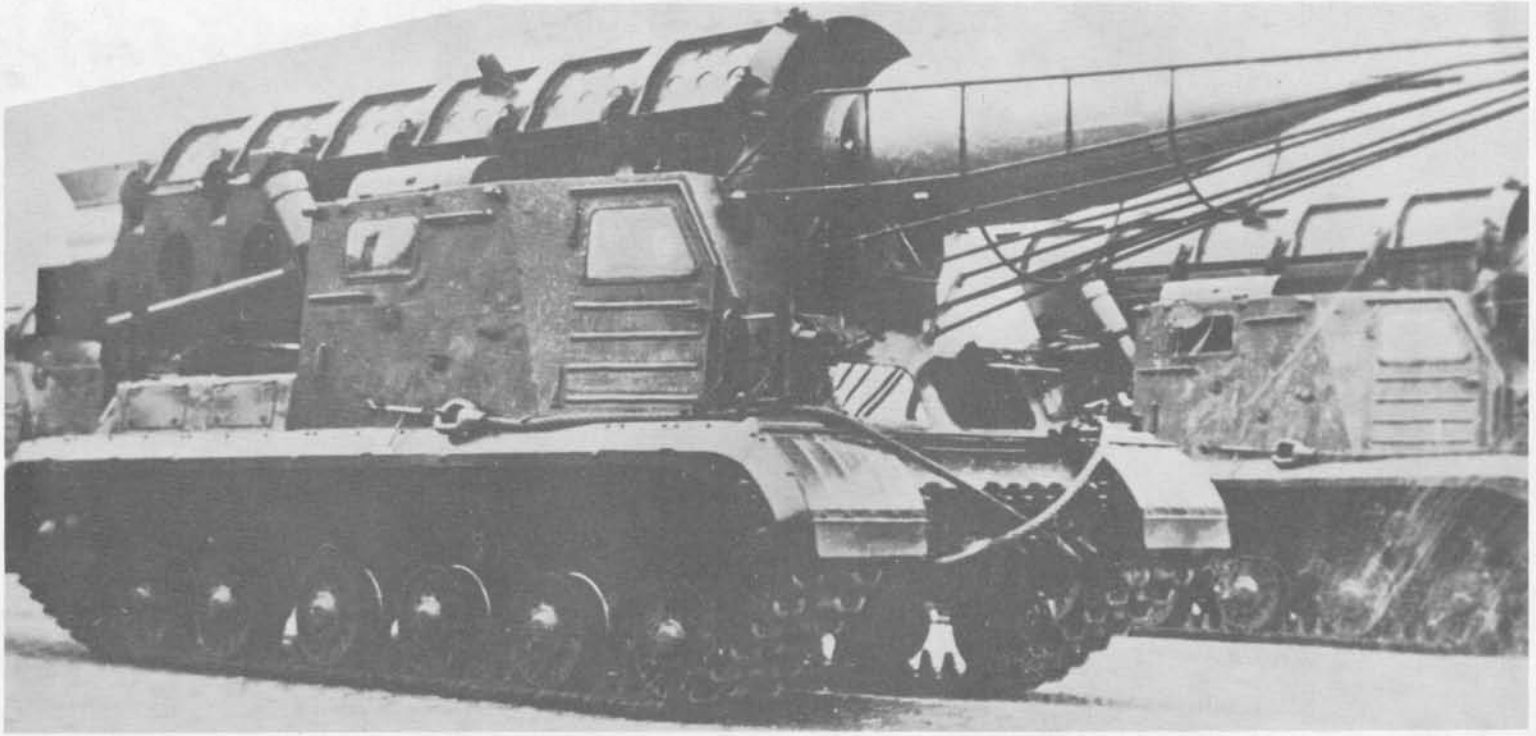




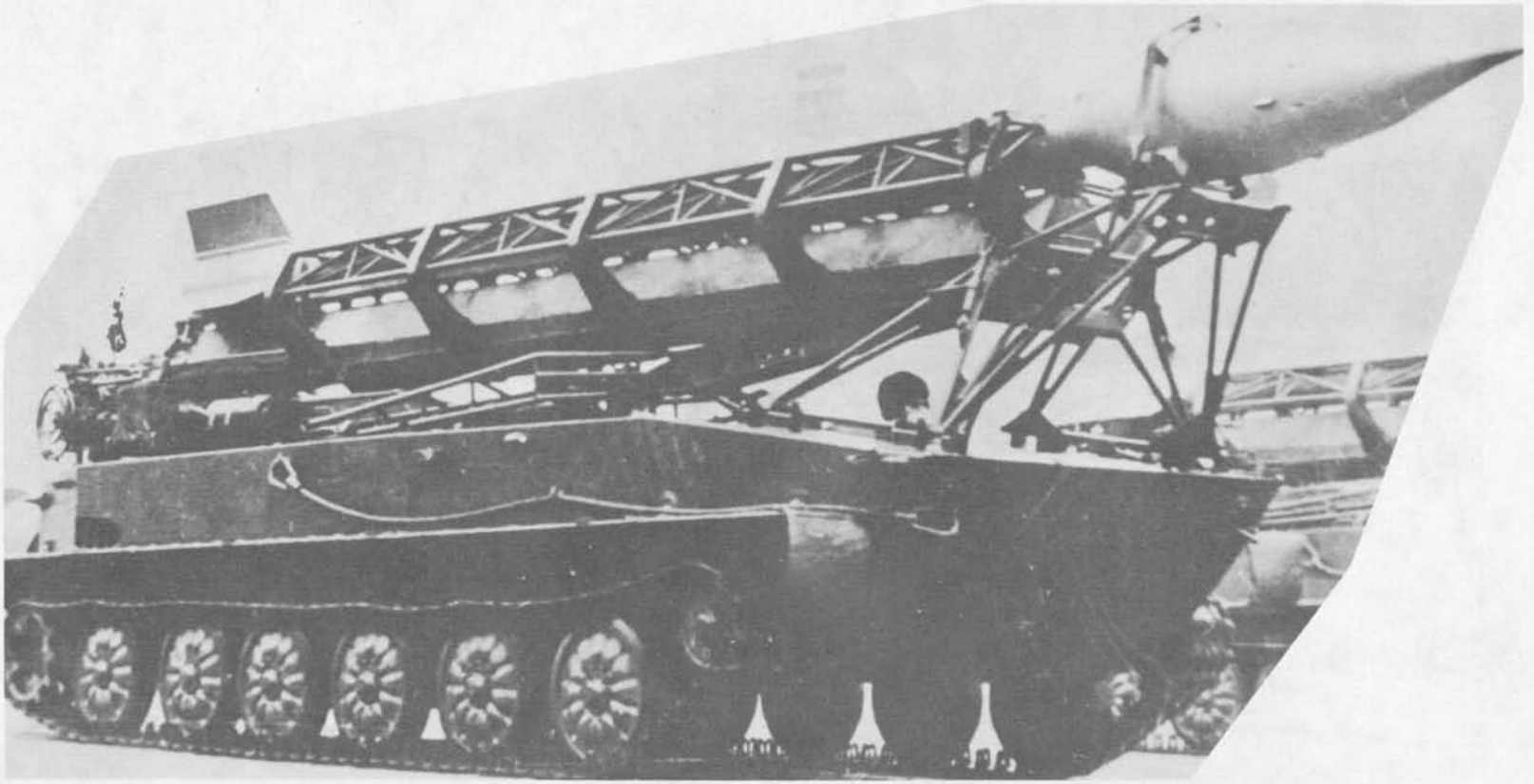
FROG–7 resupply vehicle



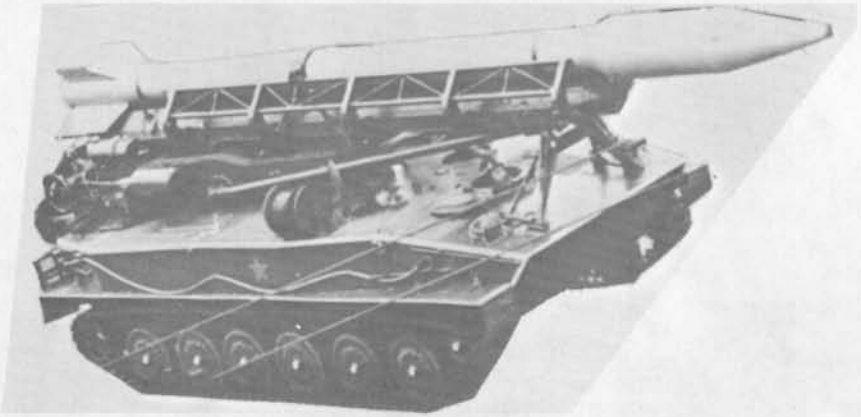
FROG–7 being transferred to launcher



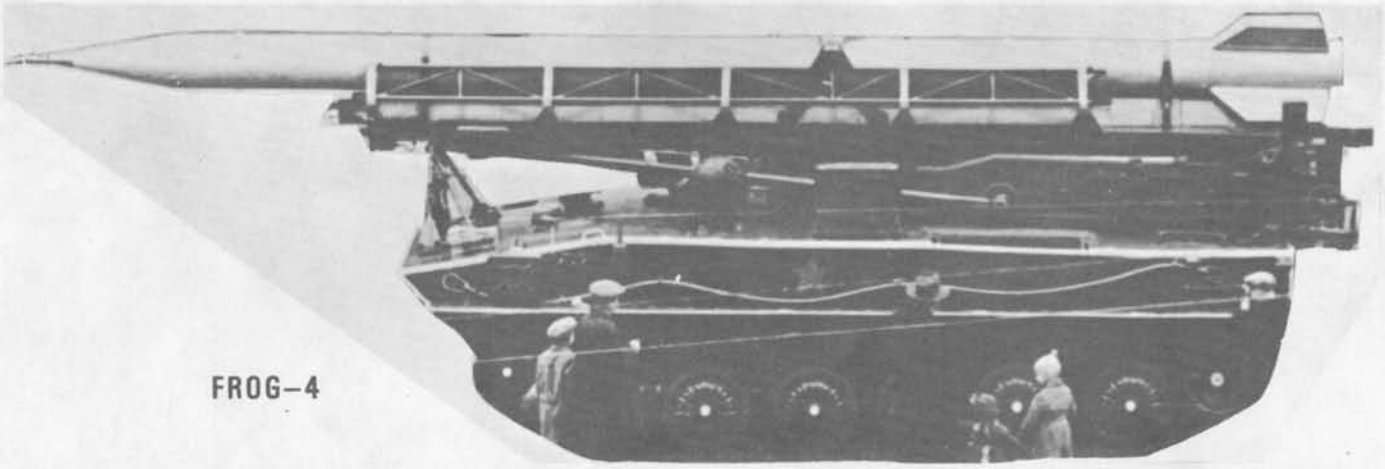
FROG–1



FROG–2



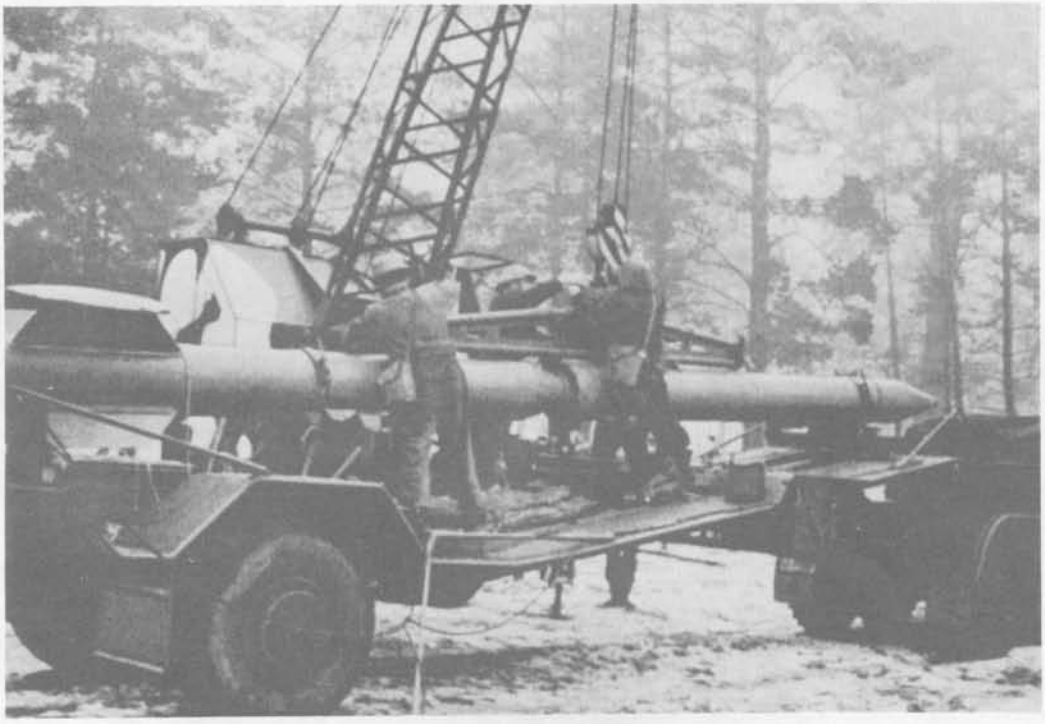
FROG–3



FROG–4



FROG–5



FROG–5 being transferred from resupply semitrailer

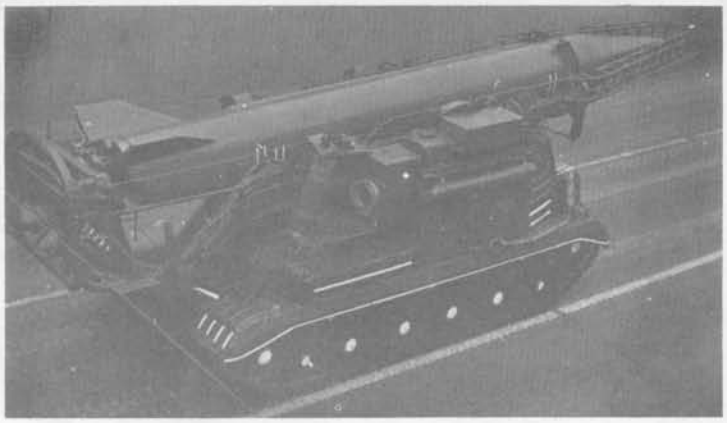


FROG–5



FROG–5 being transferred to launcher

NOT USED

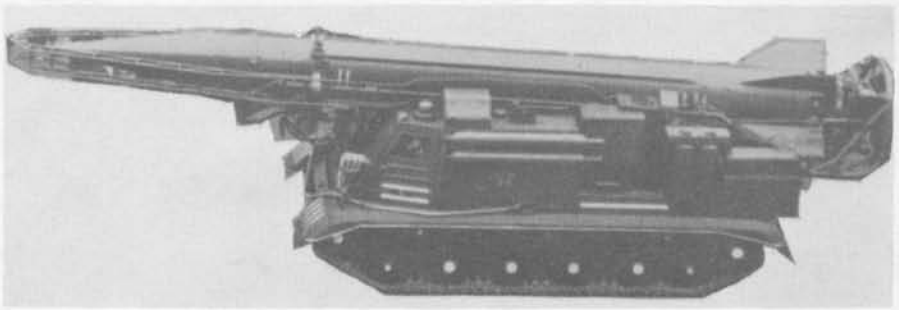


SCUD A on JS chassis





SCUD B on JS chassis



SURFACE-TO-SURFACE GUIDED BALLISTIC MISSILES

Surface-to-surface guided missile SS-1b "SCUD A" on JS chassis
Surface-to-surface guided missile SS-1c "SCUD B" on JS chassis
Surface-to-surface guided missile SS-1c "SCUD B" on MAZ-543

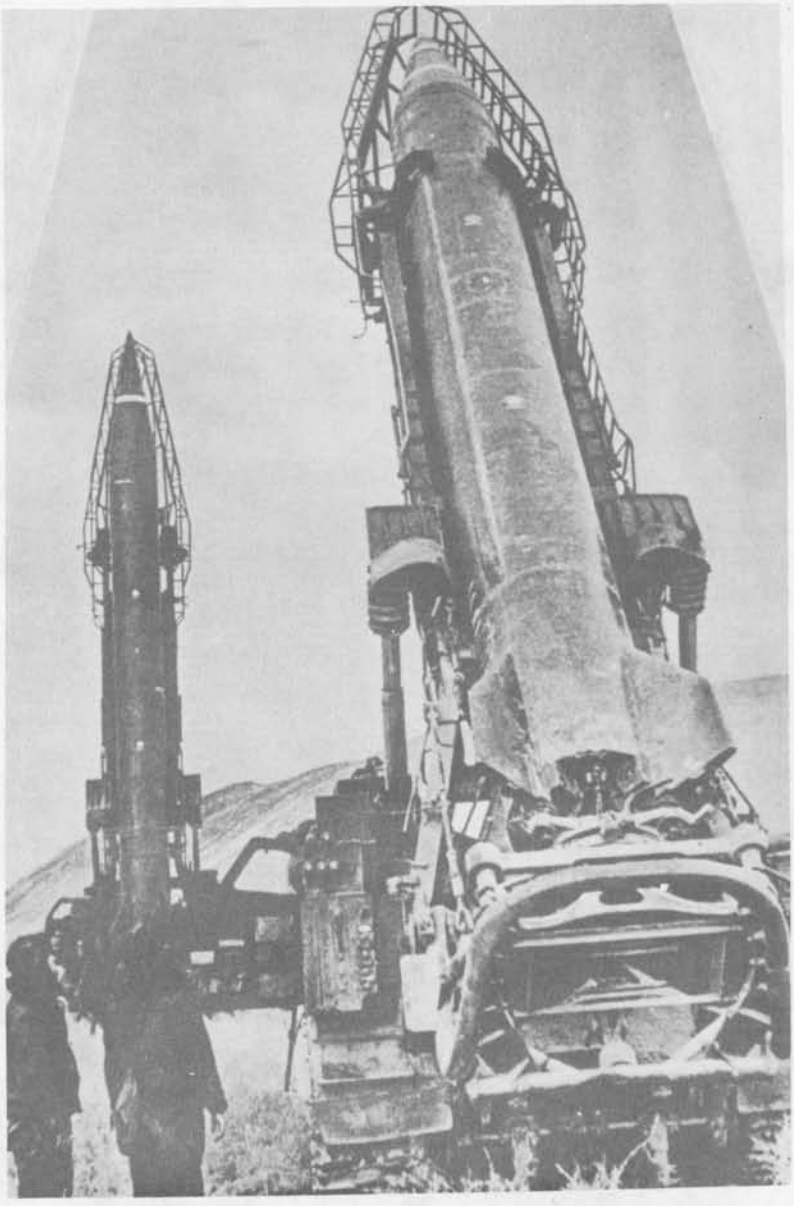
Surface-to-surface guided missiles SS-1 "SCUD" are single-stage, short-range, ballistic missiles using storeable liquid propellants. They were transported originally on a heavy-tracked vehicle based on the JS heavy-tank chassis. This vehicle serves also as an erector and launcher for the missiles. The longer range "SCUD B" can be distinguished by the one meter greater length of the missile and the presence of two air bottles on the side of the superstructure in place of the single bottle used for the "SCUD A" missile.

In recent years the "SCUD B" missile has appeared on a new transporter-erector-launcher based on the MAZ-543 (8x8) truck. The introduction of this new powerful cross-country wheeled vehicle gives this missile system greater road mobility, reduces the number of support vehicles required, and still preserves a great choice in selecting off-road firing positions. The same basic chassis also has been used for the transporter-erector-launcher for the "SCALEBOARD" surface-to-surface guided missile.

"SCUD" missiles are used by all armies of the Warsaw Pact.



SCUD A being erected

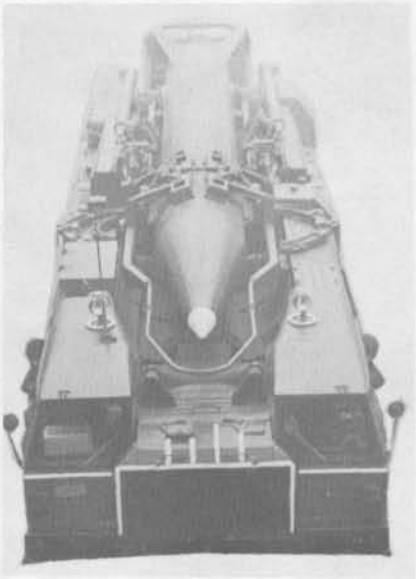


SCUD B being erected



SCUD B on MAZ–543

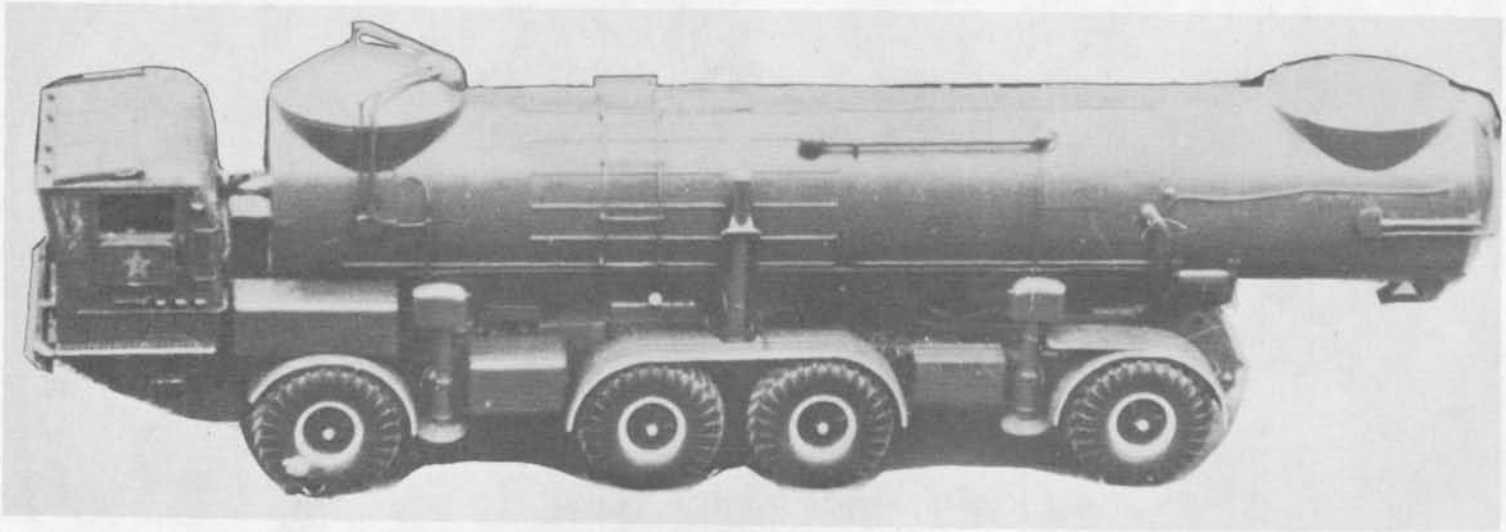








SCUD B on MAZ–543



SSC–1a "SHADDOCK" cruise missile

SURFACE-TO-SURFACE GUIDED CRUISE MISSILES

Surface-to-surface guided missile SSC-1a "SHADDOCK"
Surface-to-surface guided missile SSC-1b "SHADDOCK"
Surface-to-surface guided missile SSC-2a "SALISH"
Surface-to-surface guided missile SSC-2b "SAMLET"

Two basic surface-to-surface cruise missiles are used in the Warsaw Pact forces. Both have field and coastal defense versions.

The "SHADDOCK" missile is transported in and launched from a long cylindrical container mounted on an eight-wheel vehicle of distinctive appearance. For launching, the crew lowers the four hydraulic stabilization jacks, removes the hemispherical end covers to the top-mounted tables, clamps down the blast shields over the windows, and elevates the container to the proper launch angle.

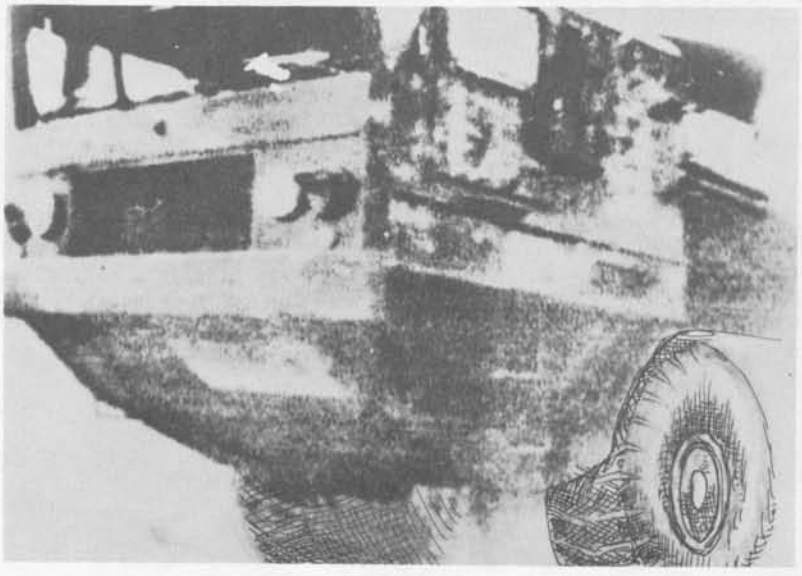
The SSC-1b coastal defense version can be distinguished by the longer driver's cab on the transport-launch vehicle.

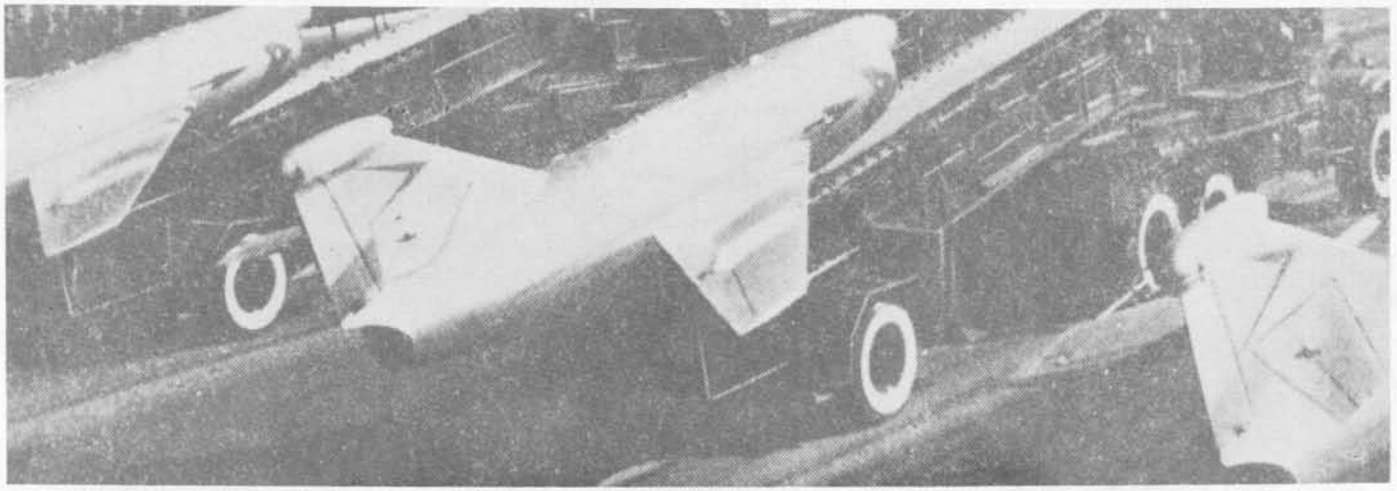
The two versions of the SSC-2 were developed from the Soviet "KENNEL" air-to-surface anti-shipping missile. They resemble a small jet fighter in appearance and are transported on one-axle semitrailers. The field missile SSC-2a "SALISH" is launched from its transport semitrailer which is towed by a KrAZ-214 tractor truck. The SSC-2b "SAMLET" coastal missile transport semitrailer is towed by a ZIL-157V tractor truck and is not used for launching. The missile must be removed from the transport semitrailer and placed on a large rail-type launcher for firing.

The "SAMLET" coastal defense missile is the most commonly encountered cruise missile, and has been identified in East Germany and Poland.

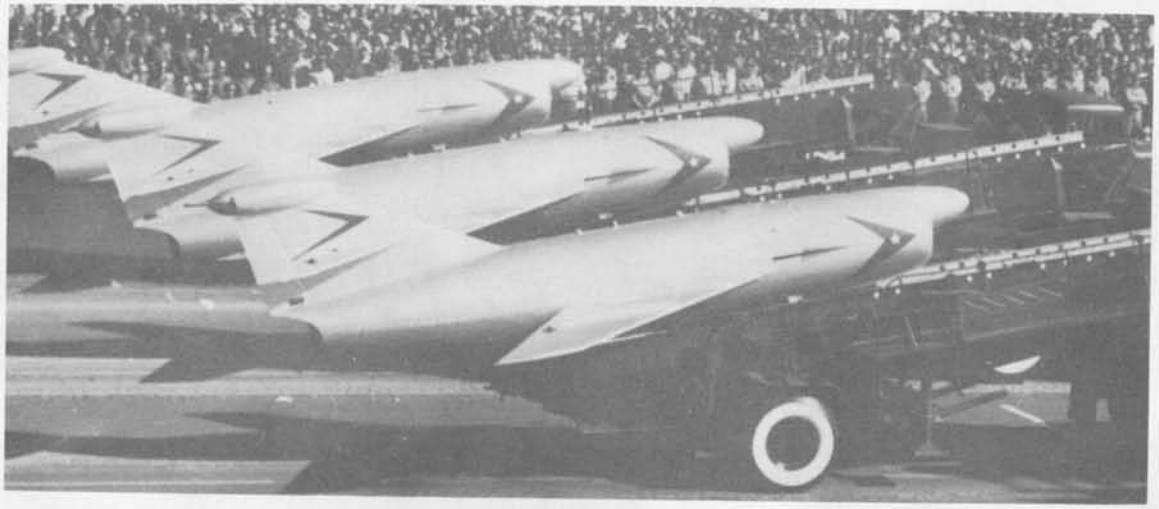


SSC–1b "SHADDOCK" coastal missile

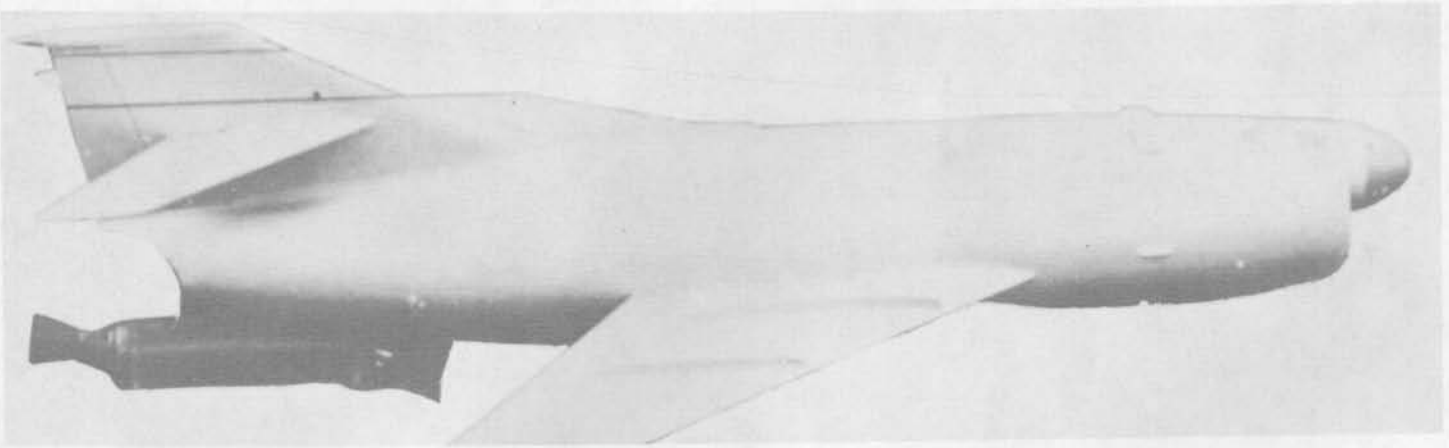




SSC–2a "SALISH" cruise missile



SSC–2a "SALISH"



SSC–2b "SAMLET"



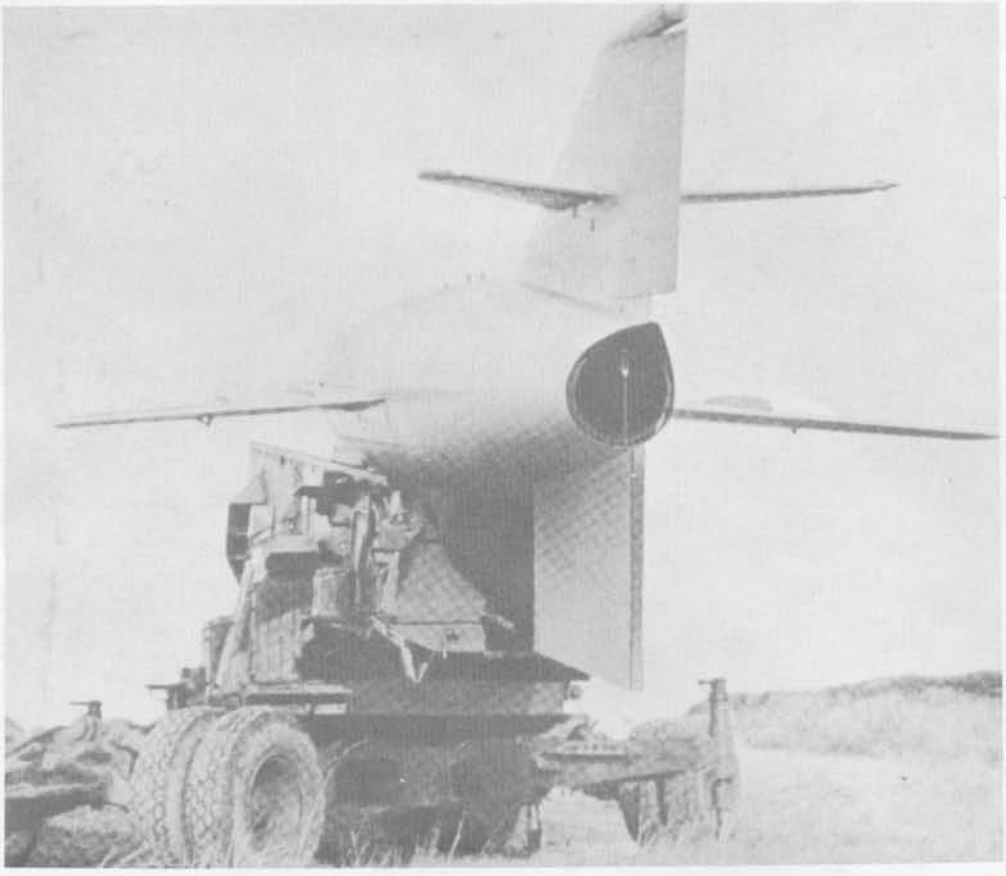
"SAMLET"
being transferred to launcher



"SAMLET" on launcher



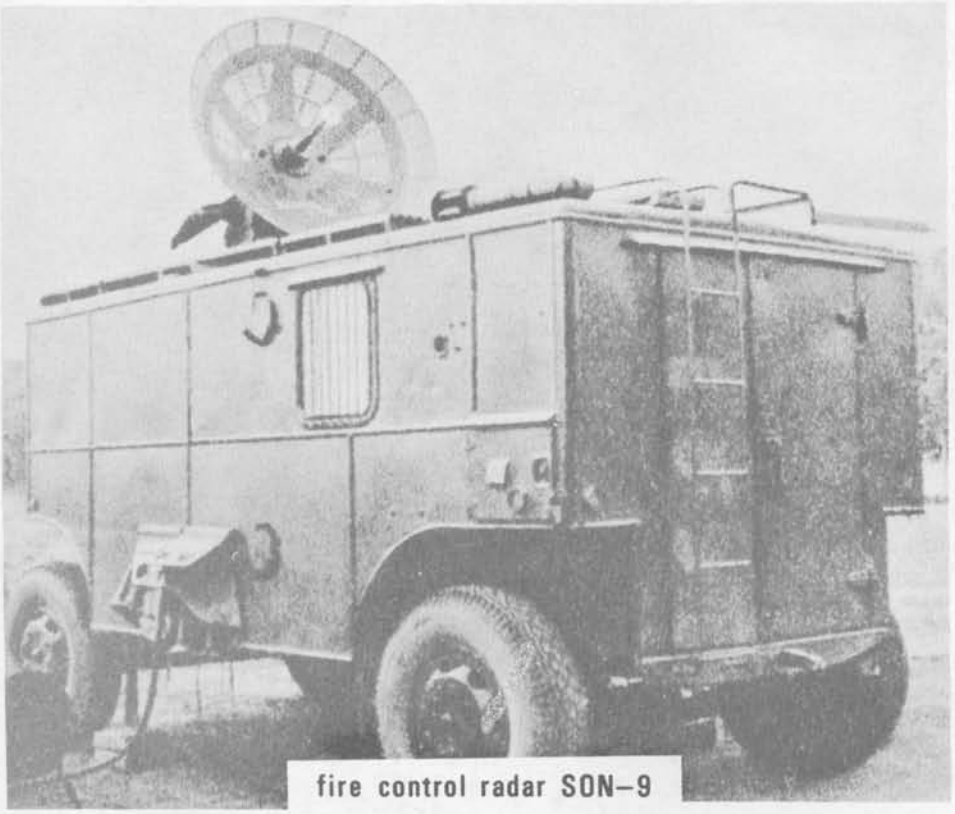
"SAMLET" at launch



"SAMLET" on launcher

NOT USED

AIR DEFENSE ARTILLERY MACHINEGUNS AND CANNON

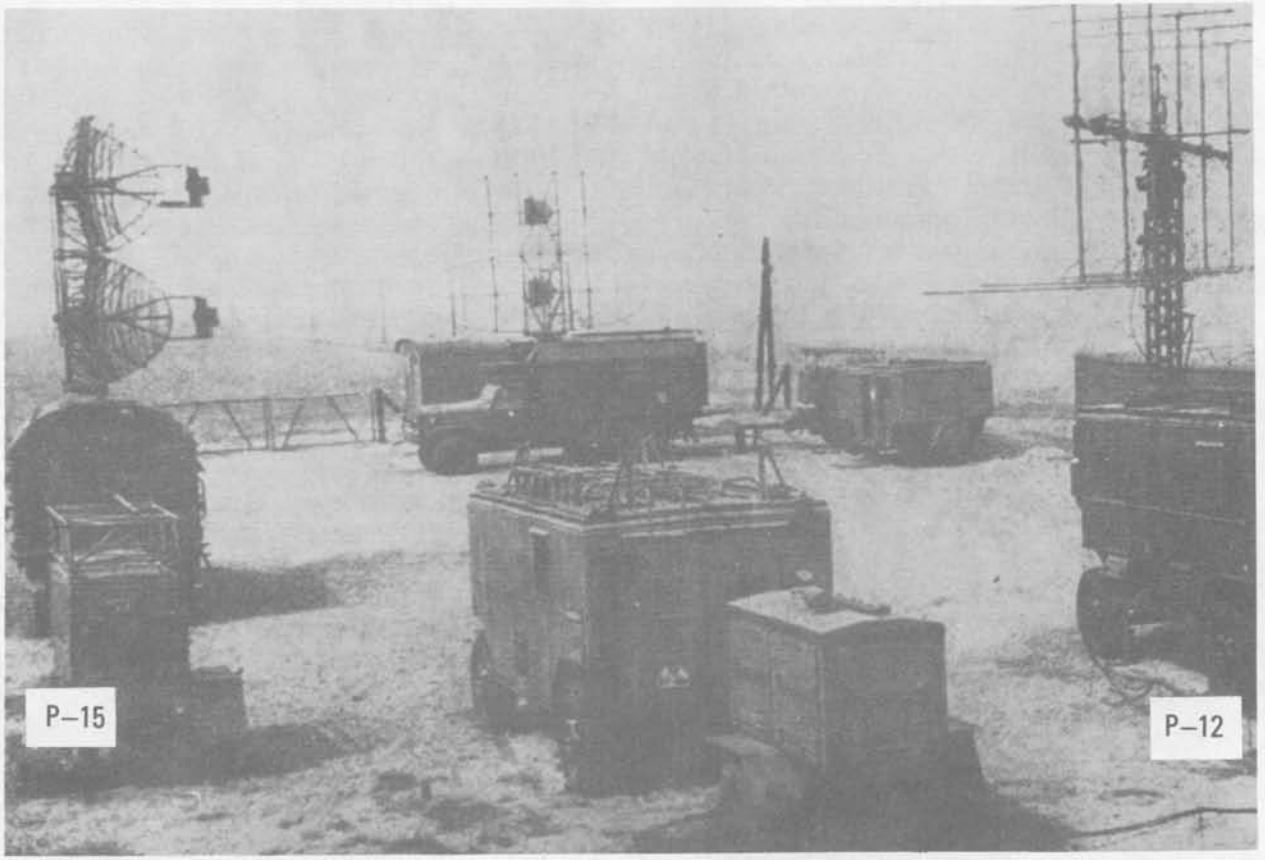


fire control radar SON–9



D–49 rangefinder

Antiaircraft fire control director PUAZO–6



Air defense early warning site with P–12 and P–15 radars



7.62 mm general-purpose machinegun PKS on AA MOUNT



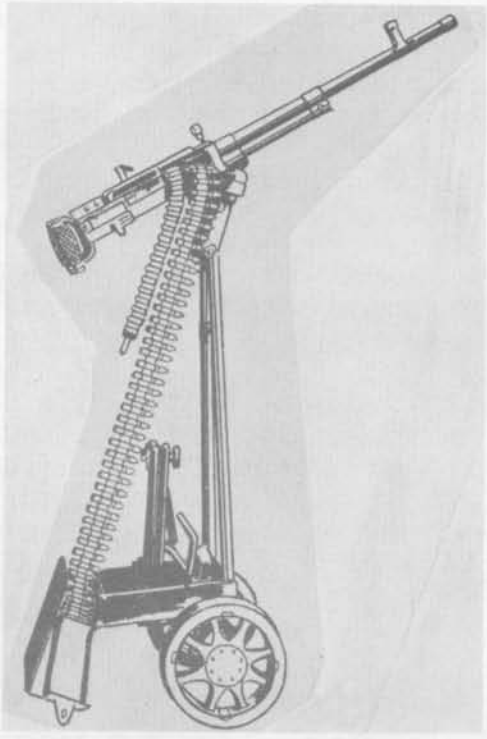
7.62 mm general-purpose machinegun M59 on AA mount

7.62mm Maxim machinegun M1910 (SPM) on M1931 mount
7.62mm Goryunov machinegun M1943 (SG)
7.62mm modified Goryunov machinegun M1943 (SG-43M)
7.62mm modernized Goryunov machinegun M1943 (SGM)
7.62mm modernized Goryunov machinegun M1943 for armored personnel carriers (SGMB)
7.62mm general-purpose machinegun Kalashnikov (PK/PKS)
7.62mm general-purpose machinegun M59/M59L
7.9mm light machinegun M26
7.9mm general-purpose machinegun MG34
7.9mm general-purpose machinegun M-53
7.9mm machinegun M37

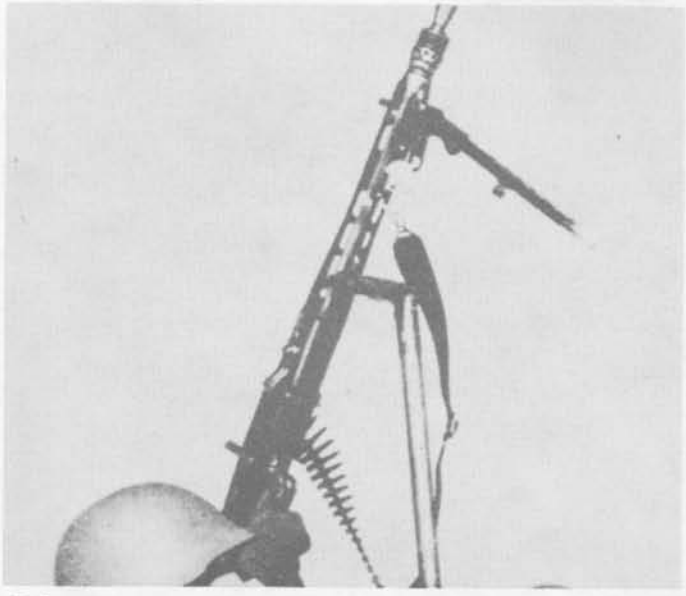
Virtually all of the rifle caliber machineguns used by the East European Communist armies are equipped with special mounts which allow them to be used as antiaircraft machineguns. Normally the tripods of both the general-purpose and the medium machineguns are readily convertible to the antiaircraft model.



7.62 mm Maxim machinegun M1910 (SPM) on AA mount



7.62 mm Goryunov machinegun M1943 (SG) on AA mount

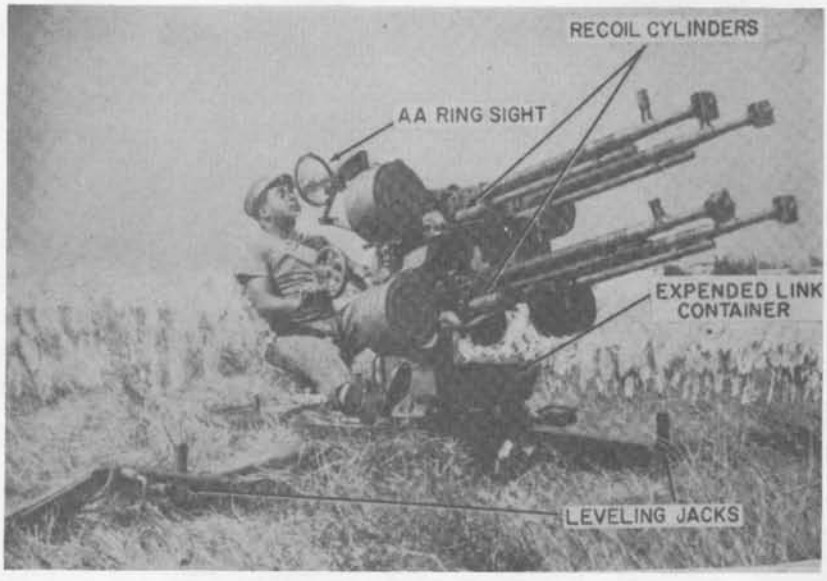


7.9 mm general-purpose machinegun M–53 on AA mount

NOT USED



12.7 mm heavy machinegun M1938/46 (DShK) on AA mount



Quad 12.7 mm AA heavy machinegun M53

12.7mm ANTIAIRCRAFT HEAVY MACHINEGUNS

12.7mm Degtyarev heavy machinegun M1938 (DShK)
12.7mm Degtyarev heavy machinegun M1938/46 (DShKM)
Quad 12.7mm antiaircraft heavy machinegun M53

During World War II the M1938 heavy machinegun was employed in an antiaircraft role on its extended tripod mount, on a special twin antiaircraft mount, on small warships, and mounted on the roofs of heavy tanks and assault guns. After the war the improved M1938/46 was similarly used. Currently within the Warsaw Pact the 12.7mm machinegun is used primarily in an antiaircraft role mounted on the cupola of medium tanks. It is standard on the T-54 series, and is found on some T-55 and T-62 models as well. Sometimes it is also used on armored personnel carriers and amphibious scout cars. The ground mount tripod is still used in Southeast Asia.

Czechoslovakia developed a multiple mount for the M1938/46 which consists of four DShKM machineguns with four ammunition drums (holding belts) placed on a light, towed, two-wheel carriage. This combination, known as the M53, was used for a number of years in the Czechoslovak forces, but more recently has appeared in both Cuba and the Middle East.

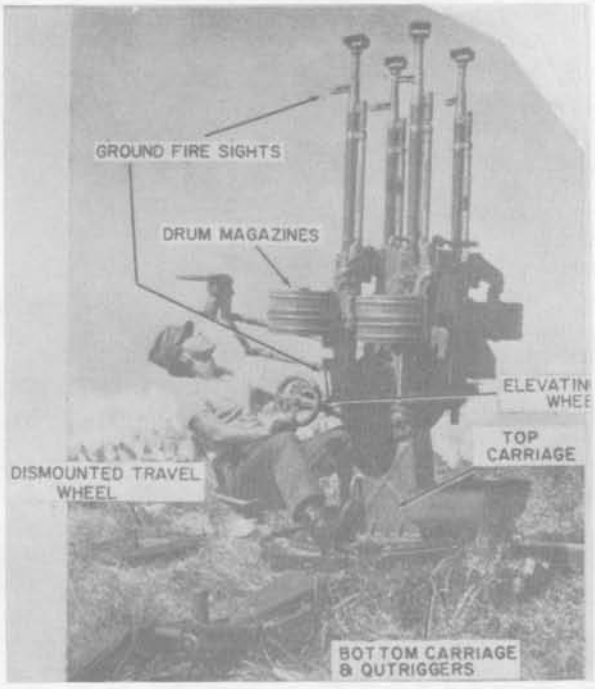
In addition to these weapons the United States caliber .50 M2 HB machinegun is also used in Yugoslav Army on tanks and other armored vehicles in the antiaircraft role.

		Single DShKM	Quad M53
Caliber	mm	12.7	12.7
Length of barrel	mm	967*	967*
Length of machinegun w/muzzle brake	mm	1588	1588
Weight in firing position	kg	131.5**	628
Weight in travel position	kg	131.5**	2830
Length in travel position	mm	2328	2900
Width in travel position	mm	708	1570
Height in travel position	mm	755**	1780
Track	mm		1500
Clearance	mm		
Tire size			5.00x16
Height of axis of bore 0°	mm		
Elevation	°	+80***	+90
Depression	°	-70***	-7
Traverse	°	360***	360
Rate of fire per barrel			
cyclic	rpm	540-600	540-600
practical	rpm	80	80
Feed		50-rd belt	50-rd belt in drum
Projectile weight: API	g	49.5	49.5
Muzzle velocity: API	m/s	840	840
Maximum range: horizontal	m	6500	6500
vertical	m	5600	5600
Effective AA range	m	1000	1000
Pointblank range: API 2m high target	m	833	833
Armor penetration: API 0°/500m	mm	20	20
Crew		2	6
Unit of fire	rds	120	2000

*w/o muzzle brake
**w/o shield or ammunition
***on antiaircraft mounts

Quad 12.7 mm AA heavy machinegun M53



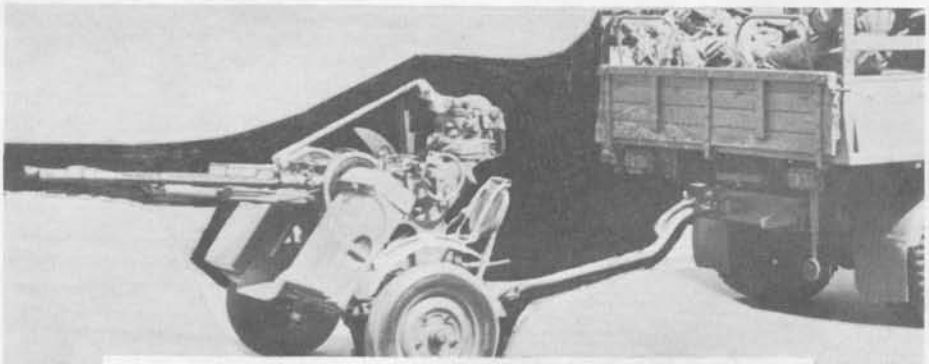








14.5 mm AA heavy machinegun ZPU–1



14.5 mm AA heavy machinegun ZPU–2 (late model)



14.5 mm AA heavy machinegun ZPU–4

14.5mm ANTIAIRCRAFT HEAVY MACHINEGUNS

14.5mm antiaircraft heavy machinegun ZPU-1
14.5mm antiaircraft heavy machinegun ZPU-2 (early model)
14.5mm antiaircraft heavy machinegun ZPU-2 (late model)
14.5mm antiaircraft heavy machinegun ZPU-4

The single and multiple mounts of the ZPU series all use the basic 14.5mm Vladimirov (KPV) heavy machinegun which is also found mounted in various armored vehicles in both the ground and antiaircraft roles.

The ZPU-1 is a single towed weapon which is now obsolete in the Soviet Army. The light two-wheeled carriage is somewhat similar to the late model ZPU-2, although the tires are smaller. The single ammunition box is to the right of the quick-change barrel. Although not used in the Warsaw Pact countries today, the ZPU-1 has been identified in Southeast Asia and in the Middle East.

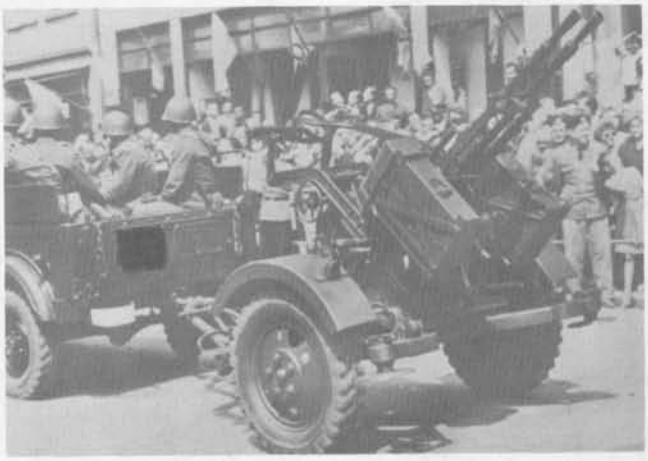
The twin ZPU-2 has appeared on two different two-wheeled carriages. The earlier model has larger fenders and a double tubular tow bar. In firing position the crew removes the wheels, and the weapon rests on a three-point platform. The later model, which is lighter in weight, has smaller fenders, a lighter single tow bar, and a lower silhouette. When in firing position the wheels are raised, but not removed. A very similar carriage is used for the twin 23mm automatic antiaircraft gun ZU-23, although the ammunition boxes, barrels and flashhiders are distinctly different. The ZPU-2 is no longer found in first line Soviet units, although it is still used as a close-in defense weapon for certain airfields. It is used by some Warsaw Pact armies and by security elements such as the East German Workers' militia. The Chinese Communist-produced ZPU-2 is referred to as the Type 58, the individual KPV machineguns as the Type 56.

The quad ZPU-4 uses a four-wheel carriage similar to that once used by the obsolete 25mm automatic antiaircraft gun M1940. In firing position the weapon is lowered onto firing jacks. The ZPU-4 is still used widely within the Warsaw Pact, although in many units it has been replaced by the newer and more powerful twin 23mm automatic antiaircraft gun ZU-23.

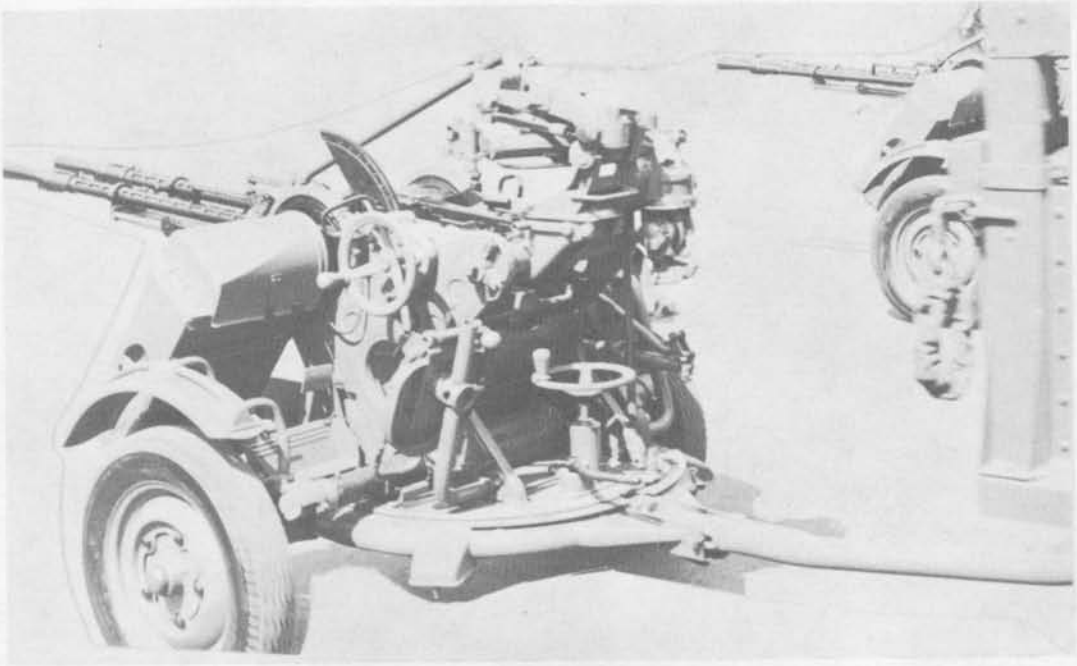
		ZPU-1	Early ZPU-2	Late ZPU-2	ZPU-4
Caliber	mm	14.5	14.5	14.5	14.5
Length of barrel	mm	1348	1348	1348	1348
Length of machinegun w/flashhider	mm	2007	2007	2007	2007
Weight in firing position	kg	413	639	621	1810
Weight in travel position	kg	413	994	649	1810
Length in travel position	mm	3440	3536	3871	4633
Width in travel position	mm	1620	1920	1372	1859
Height in travel position	mm	1340	1830	1097	2286
Track	mm	1384		1100	1641
Clearance	mm	280		270	458
Tire size		4.50x16	6.50x20	6.50x20	6.50x20
Height of axis of bore 0°	mm	635	800		1020
Elevation	°	+88	+90	+85	+90
Depression	°	8	-3	-15	8.5
Traverse	°	360	360	360	360
Rate of fire per barrel					
cyclic	rpm	600	600	600	600
practical	rpm	150	150	150	150
Feed					
Projectile weight: API	g	64.4	64.4	64.4	64.4
Muzzle velocity: API	m/s	1000	1000	1000	1000
Maximum range: horizontal	m	8000	8000	8000	8000
vertical	m	5000	5000	5000	5000
Effective AA range	m	1400	1400	1400	1400
Pointblank range: API 2m high target	m				
Armor penetration: API 0°/500m	mm	32	32	32	32
Crew		4	5	5	5
Unit of fire	rds	1200	2400	2400	4800



14.5 mm AA heavy machinegun ZPU–1



14.5 mm AA heavy machinegun ZPU–2 (early model)



14.5 mm AA heavy machinegun ZPU–2 (late model)

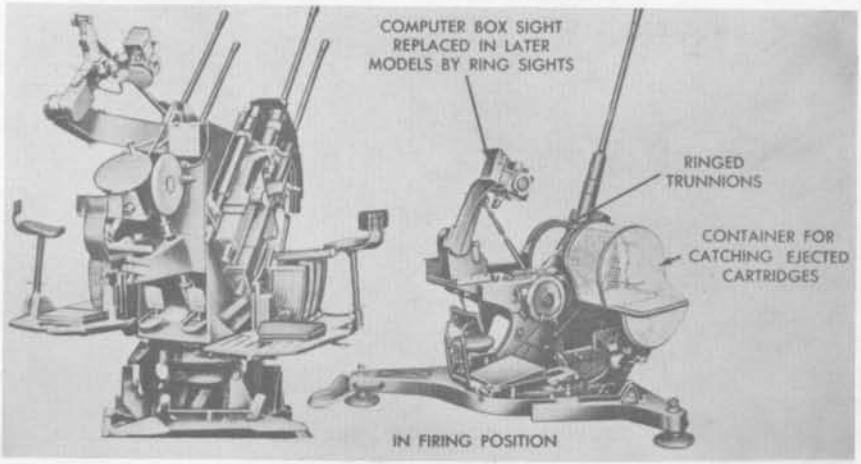




14.5 mm AA heavy machinegun ZPU–4







20 mm automatic AA gun M38V **20 mm automatic AA gun M38**



Triple 20 mm automatic AA gun M55

20mm automatic antiaircraft gun M30
20mm automatic antiaircraft gun M38
20mm automatic antiaircraft gun M38V
20mm automatic antiaircraft gun M-55

A great variety of 20mm automatic antiaircraft guns are used in Yugoslavia, but the standard weapon is a Swiss-design gun produced under license in Yugoslavia. However, a large number of German World War II 20mm weapons are still in use.

The German weapons are all of the M30 and M38 series which are ballistically identical. Some are C/30 single and twin naval guns, which today are primarily found in coastal defense and home defense roles. In addition there are the single M30 and M38 and the quad M38V which are mounted on mobile carriages. These weapons may all be found with or without shields. All of the German 20mm guns are recoil operated and are horizontally fed by 20-round magazines. The mobile guns are transported on special two-wheel trailers and placed on three firing jacks in firing position. The naval-type weapons are placed on pedestal mounts which have limited mobility.

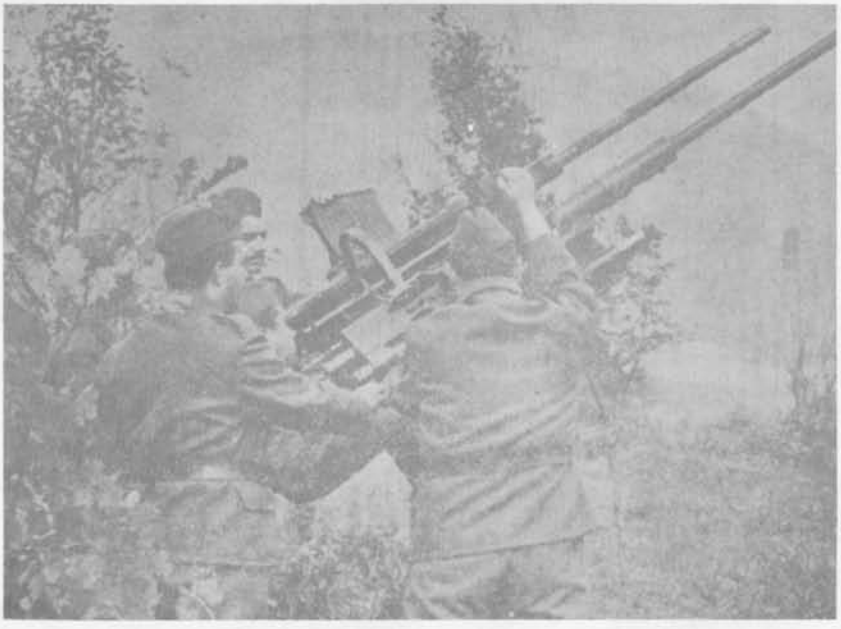
The 20mm automatic gun M-55 consists of three Hispano-Suiza HSS 804 guns on the HSS 630-3 towed carriage. The M-55 is also used aboard warships replacing the German 20mm guns. The ammunition, however, is not interchangeable with that of the German weapons.

		M30	M38	M38V	M-55
Caliber	mm	20	20	20	20
Length of tube in cals		65	65	65	70
Length of tube overall	mm	1300*	1300*	1300*	1955.8
Weight in firing position	kg	450**	420**	1514	1171
Weight in travel position	kg	770**	750**	2212	1089
Length in travel position	mm	4000	4000	4332	4040
Width in travel position	mm	1900	1810	2336	1270
Height in travel position	mm	1490		2166	1930
Track	mm			2030	
Clearance	mm			340	
Tire size					
Height of axis of bore 0°	mm	740***	760***	1140***	
Elevation	°	+90	+90	+100	+83
Depression	°	-12	-20	-10	-5
Traverse	°	360	360	360	360
Rate of fire per tube:					
cyclic	rpm	280	480	480	700-800
practical	rpm	120	220	220	
Feed (magazine)		20-rd	20-rd	20-rd	50-rd
Projectile weight: HE	kg	0.119	0.119	0.119	0.122
AP	kg	0.147	0.147	0.147	0.142
Muzzle velocity: HE	m/s	900	900	900	880
AP	m/s	830	830	830	840
Maximum range: horizontal	m	4800	4800	4800	5700
vertical	m	3700	3700	3700	4500
Effective AA range	m	2200	2200	2200	1500
Pointblank range: AP 2m high target	m	815	815	815	
Armor penetration: AP 0°/500m	mm	24	24	24	18
Crew		5	5	6	6
Unit of fire	rds	800	800	3200	2400

*without flashhider
**without shield
***on firing jacks



Naval twin 20 mm automatic AA gun on ground mount



Naval twin 20 mm automatic AA gun on ground mount

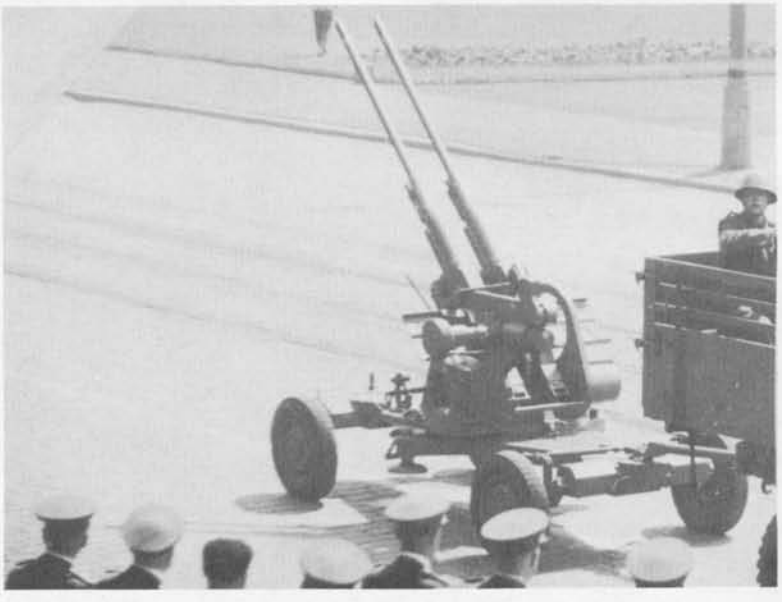


Triple 20 mm automatic AA gun M–55 towed by AR–51 jeep

NOT USED



23 mm automatic AA gun ZU–23



30 mm automatic AA gun M53

23mm AND 30mm AUTOMATIC ANTIAIRCRAFT GUNS

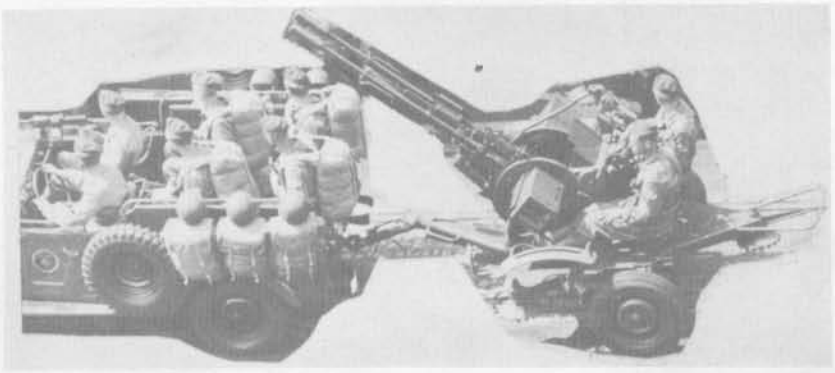
23mm automatic antiaircraft gun ZU-23
30mm automatic antiaircraft gun M53

The ZU-23 is the newest Soviet light towed automatic antiaircraft gun which is replacing the older quad 14.5mm antiaircraft heavy machinegun ZPU-4 in many Warsaw Pact armies. To date it has been identified with the Soviet, Polish, and East German forces. In addition it has been exported elsewhere and has been encountered in Southeast Asia. The ZU-23 is a full-automatic, gas-operated weapon which fires ammunition with the same cartridge case dimensions as those used on the obsolete 23mm automatic aircraft gun VYa. The tubes are of the quick-change type and the guns have vertical sliding wedge breechblocks. Care must be taken to distinguish the ZU-23 from the very similar appearing late model ZPU-2. The size and shape of the ammunition boxes and the shape of the flashhiders are two ready recognition features. The same basic 23mm automatic gun as used on the ZU-23 is also found in a quad liquid-cooled version on the self-propelled ZSU-23-4.

The Czechoslovak twin 30mm automatic antiaircraft gun M53 plays the same role in that country as the 14.5mm and 23mm automatic weapons do in other Warsaw Pact countries. The M53 features a quick barrel change and is a gas-operated, full-automatic weapon. Its ammunition is not interchangeable with that of the 30mm aircraft guns. A modified version, the M53/59, is mounted on an armored truck.

		ZU-23	M53
Caliber	mm	23	30
Length of tube in cals		81	2525
Length of tube overall	mm	2010	2429
Weight in firing position	kg	950*	2000
Weight in travel position	kg	950*	2100
Length in travel position	mm	4570	7587
Width in travel position	mm	1830	1758
Height in travel position	mm	1870	1753
Track	mm	1670	1575
Clearance	mm	360	300
Tire size		6.00x16	
Height of axis of bore 0°	mm	620	860
Elevation	°	+90	85
Depression	°	-10	-10
Traverse	°	360	360
Rate of fire per tube:			
cyclic	rpm	800-1000	450-500
practical	rpm	200	100
Feed		50-rd belt	10-rd clip
Projectile weight: HEI	kg	0.19	0.45
API	kg	0.189	0.45
Muzzle velocity: HEI	m/s	970	1000
API	m/s	970	1000
Maximum range: horizontal	m	7000	9700
vertical	m	5100	6300
Effective AA range	m	2500	3000
Pointblank range: API 2m high target	m	900	
Armor penetration: API 0°/500m	mm	25	55
Crew		5	4
Unit of fire	rds	2400	

*with ammunition

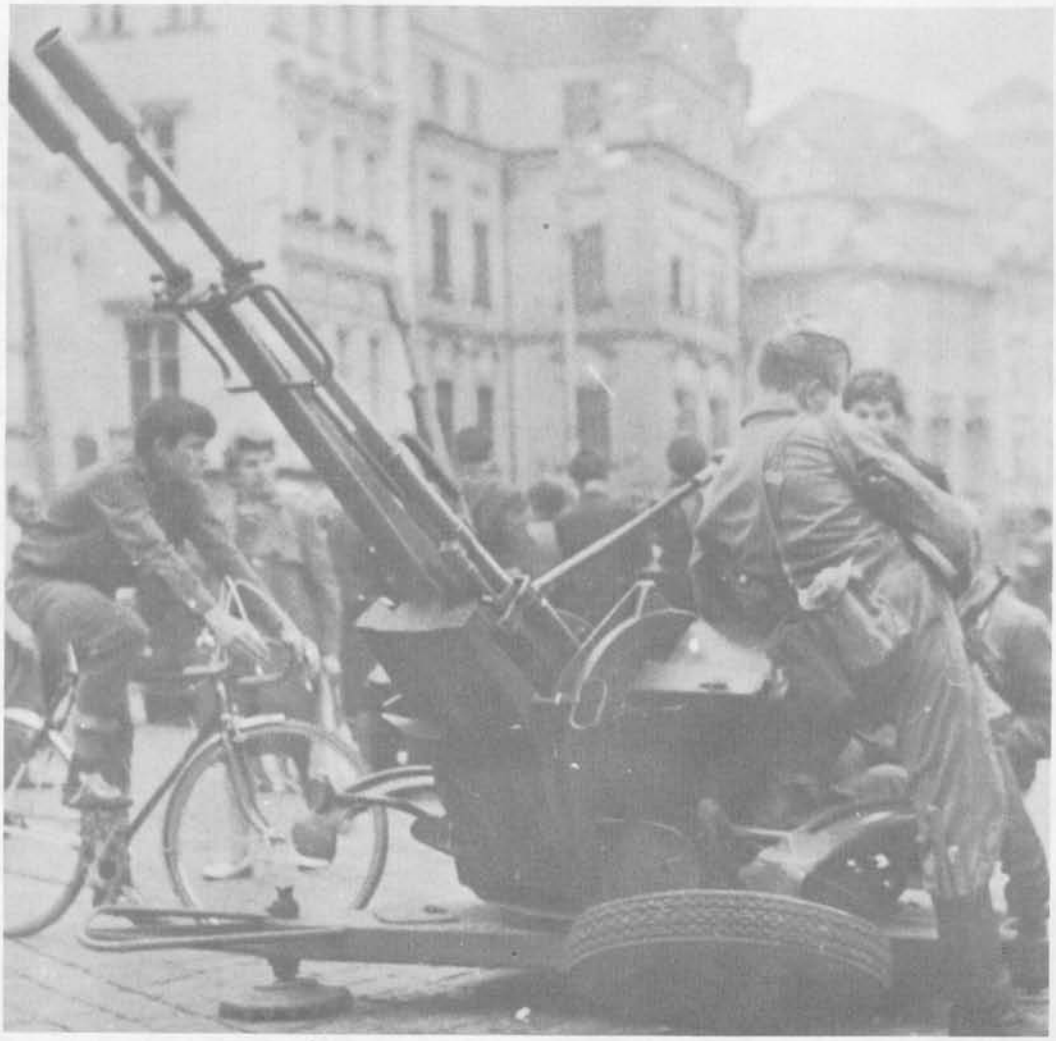






23 mm automatic AA gun ZU–23





23 mm automatic AA gun ZU–23



30 mm automatic AA gun M53



37 mm automatic AA gun M1939



57 mm automatic AA gun S–60



Czechoslovak 57 mm automatic AA gun

37mm AND 57mm AUTOMATIC ANTIAIRCRAFT GUNS

37mm automatic antiaircraft gun M1939
37mm automatic antiaircraft gun M1939 (twin)
57mm automatic antiaircraft gun S-60
57mm automatic antiaircraft gun (Czechoslovak model)

The Soviet recoil-operated 37mm antiaircraft guns are based on a Bofors design and closely resemble the 40mm guns used in both the British and United States forces during World War II. Although the single mount is the most common version, a twin mount was produced and has been exported to Algeria. The Soviet Navy also employs a twin water-cooled version closely resembling the multi-mount United States 40mm guns used in World War II. The Soviet 37mm guns have hydraulic recoil buffers and spring recuperators. The breechblocks are of the rising block type. The field mobile weapon may be equipped with a shield. There is no provision for radar fire control.

The 57mm S-60 gun is a recoil-operated weapon which has replaced the earlier 37mm models in most Warsaw Pact units. It is a powerful weapon, well suited to attack armored vehicles as well as low-flying aircraft. In addition to on-carriage optical fire control, the S-60 also employs off-carriage fire control with the PUAZO-6/60 director and the SON-9 or SON-9A radars. Originally the PUAZO-5 director and SON-4 radar were used. Further improved director/radar combinations have also become available in recent years.

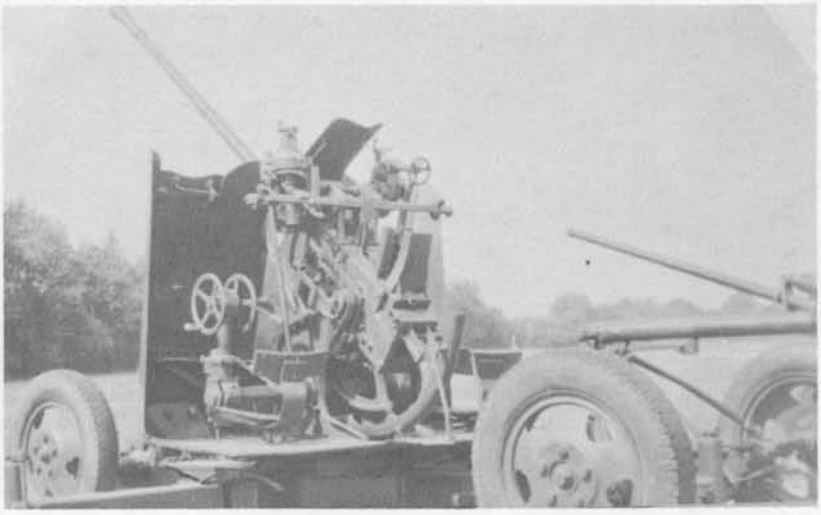
Recognition features of the S-60 are the long, thin tube with multi-perforated muzzle brake, distinctive gun shield which folds down and the horizontal feed tray which holds the four-round clips. The normal Soviet prime mover is the Ural-375 truck. A twin version, the S-68, is mounted on the self-propelled ZSU-57-2, and twin and quad versions are used by the Soviet Navy. It should be noted that the ammunition for the 57mm antiaircraft guns is <u>not</u> interchangeable with that used by the 57mm antitank and assault guns. This is due to the different configuration and dimensions of the cartridge cases.

Both the 37mm gun M1939 and 57mm gun S-60 are used in Communist China where they are known as the Type 55 and Type 59 respectively.

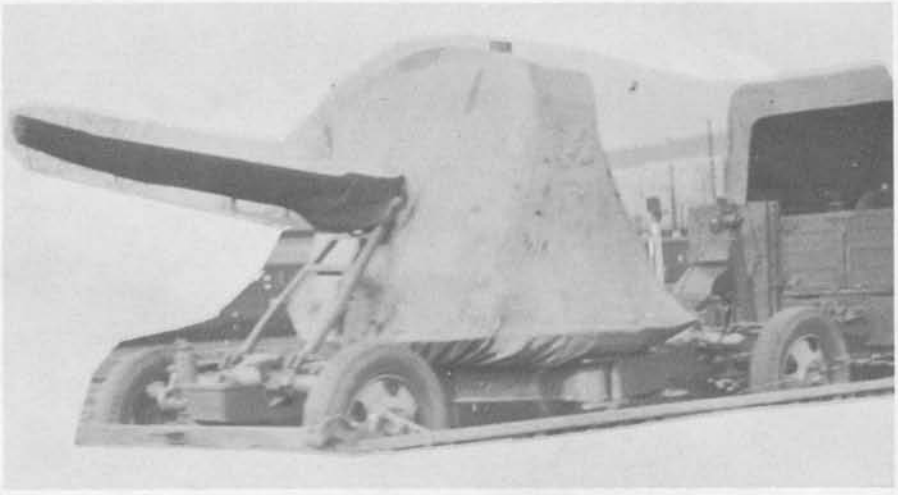
In addition to these weapons, a distinctive 57mm automatic gun was produced in Czechoslovakia and is still used in some units in that country. It can be distinguished by the absence of a muzzle brake, the distinctive shield and the placing of the recoil system both above and below the tube.

		M1939	S-60	Czech
Caliber	mm	37	57	57
Length of tube in cals		66.7	71	
Length of tube overall	mm	2729	4390	4000
Weight in firing position	kg	2100*	4500	5150
Weight in travel position	kg	2100*	4660	
Length in travel position	mm	6036	8500	5500
Width in travel position	mm	1937*	2054	
Height in travel position	mm	2105*	2370	2000
Track	mm	1545	1935	
Clearance	mm	360	380	
Tire size		6.50x20	34x7	
Height of axis of bore 0°	mm	1100	1300	
Elevation	°	+85	+85	+87
Depression	°	-5	-4	-5
Traverse	°	360	360	360
Rate of fire: cyclic	rpm	160-180	105-120	160
practical	rpm	80	70	80-90
Feed		5-rd clip	4-rd clip	3-rd clip
Projectile weight: HE	kg	0.73	2.8	2.58
APHE	kg	0.76	3.1	3.1
HVAP	kg	0.62	---	---
Muzzle velocity: HE	m/s	880	1000	1005
APHE	m/s	880	1000	1005
HVAP	m/s	960	---	---
Maximum range: horizontal	m	9500	12000	12000
vertical	m	6700	8800	8800
Effective AA range				
off-carriage control	m	---	6000	6000
on-carriage control	m	3000	4000	4000
Pointblank range: APHE	m		1100	1100
2m high target HVAP	m		---	---
Armor penetration: APHE	mm	46	106	106
0°/500m HVAP	mm		---	---
Crew		8	7	7
Unit of fire	rds	200	200	200

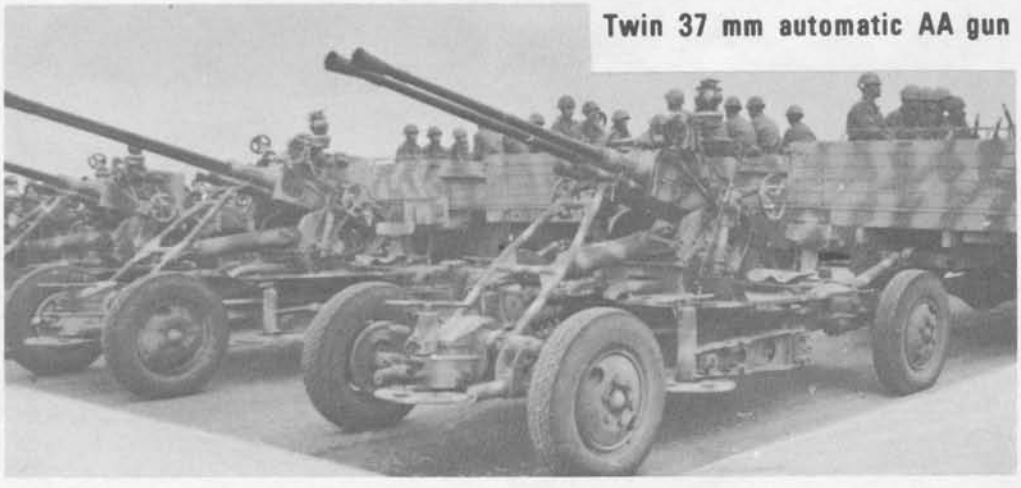
*without shield, shield weighs 100 kg

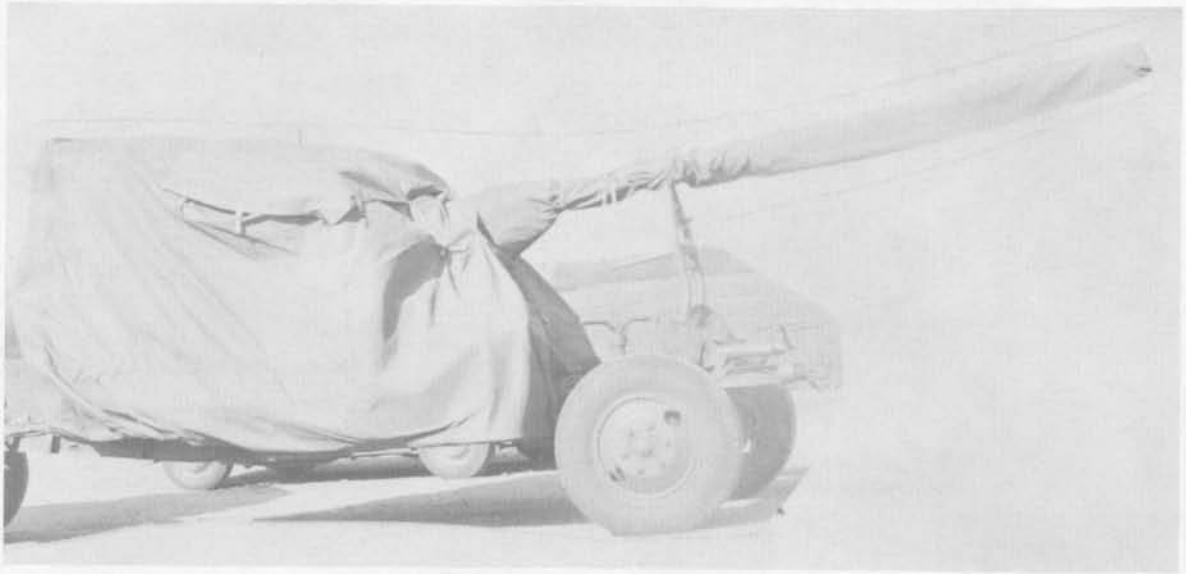


37 mm automatic AA gun M1939



Twin 37 mm automatic AA gun

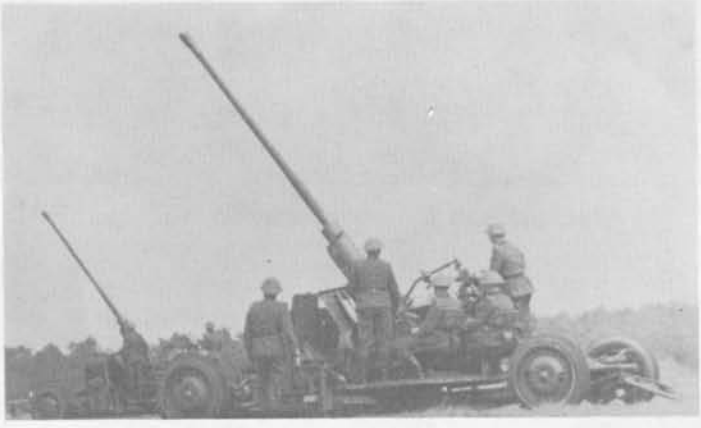




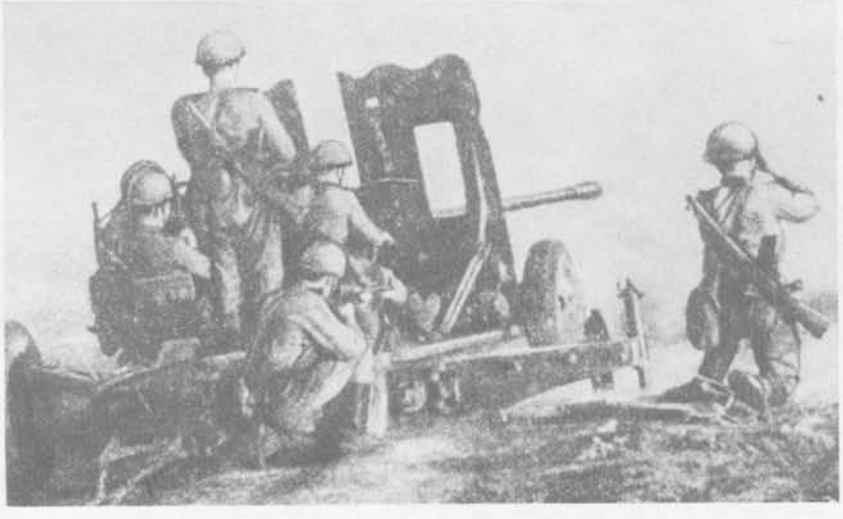
57 mm automatic AA gun S–60





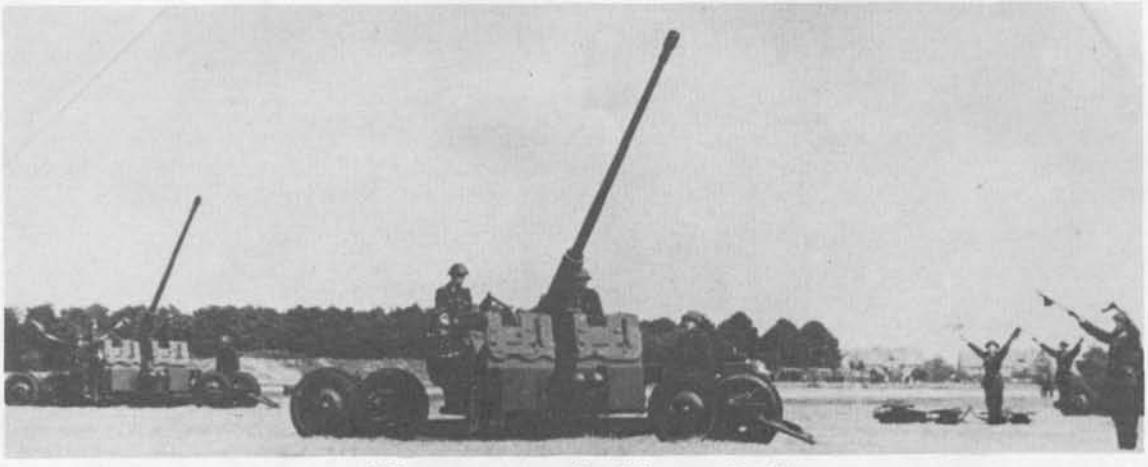


57 mm automatic AA gun S–60

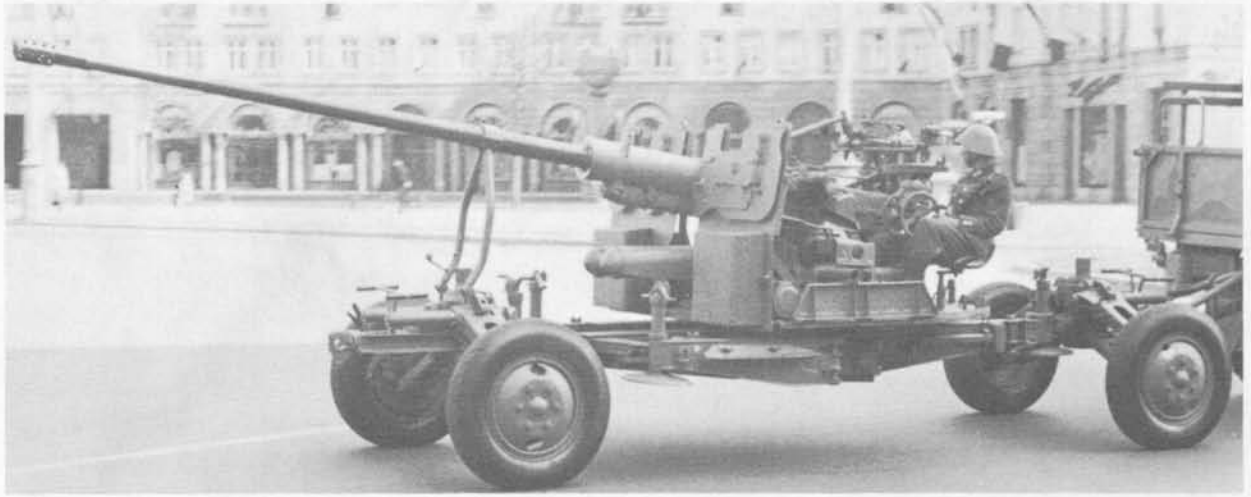




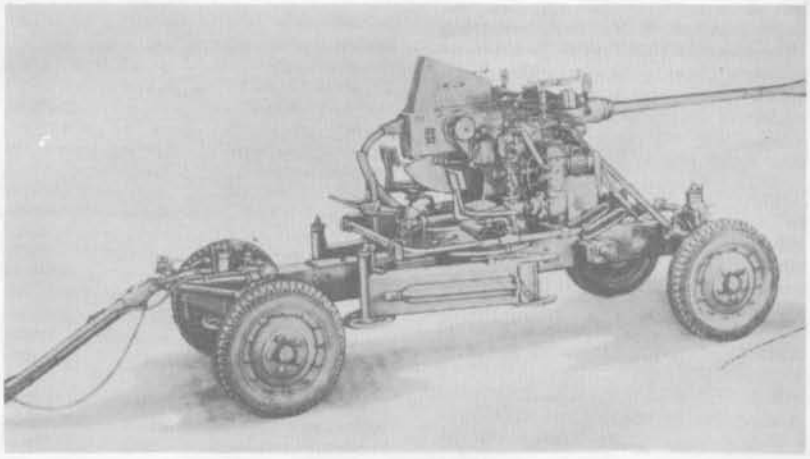
Czechoslovak 57 mm automatic AA gun



57 mm automatic AA gun S–60



57 mm automatic AA gun S–60



40 mm automatic AA gun M1



40 mm automatic AA gun Mk 1

40mm automatic antiaircraft gun M1
40mm automatic antiaircraft gun Mk I

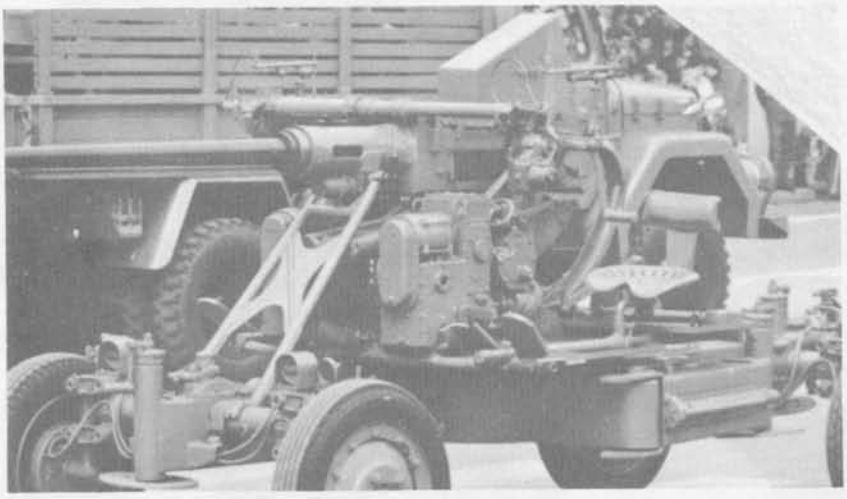
Before and during World War II a number of countries adopted and produced the Swedish Bofors 40mm M1936 L/60 automatic antiaircraft gun. Among these countries were the United States and Great Britain. All of these Bofors 40mm guns are basically the same in design and fire the same ammunition but differ in detail. All guns are air-cooled, full and semiautomatic, recoil-operated weapons with a vertical feed. Firing can be controlled manually or automatically.

The United States M1 gun has box section outriggers and the wheels remain attached to the carriage in firing position, although they are raised. The sight differs from the British models.

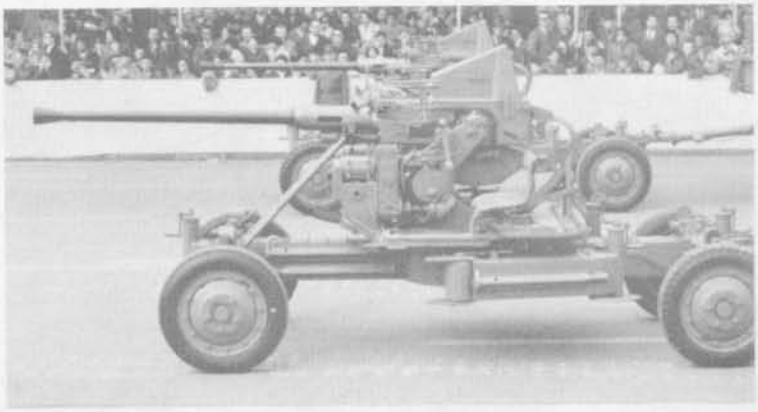
The British Mk I has tubular outriggers and the wheels are removed in firing position. The British gun is also provided with a shield. Three other British variants exist, differing in detail. Both British and United States Bofors 40mm guns are standard in the Yugoslav Army.

		M1	Mk I
Caliber	mm	40	40
Length of tube in cals		60	60
Length of tube overall	mm	2490	2490
Weight in firing position	kg		2034
Weight in travel position	kg	2656	2288
Length in travel position	mm	5728	6248
Width in travel position	mm	1829	1920
Height in travel position	mm	2019	2438
Track	mm		
Clearance	mm	359	
Tire size		6.00x20	
Height of axis of bore 0°	mm		
Elevation	°	+90	+90
Depression	°	-11*	-10
Traverse	°	360	360
Rate of fire: cyclic	rpm	120	120
practical	rpm	60	60
Feed		4-rd clip	4-rd clip
Projectile weight: HE	kg	0.935	0.9
AP	kg	0.89	0.89
Muzzle velocity: HE	m/s	875	853
AP	m/s	875	853
Maximum range: horizontal	m	4753**	4755**
vertical	m	4661**	
Effective AA range	m	2742	2560
Pointblank range: AP 2m high target	m		
Armor penetration: AP 0°/500m	mm	44	44
Crew			
Unit of fire	rds	200	200

*on jacks
**limited by self-destruct of fuze



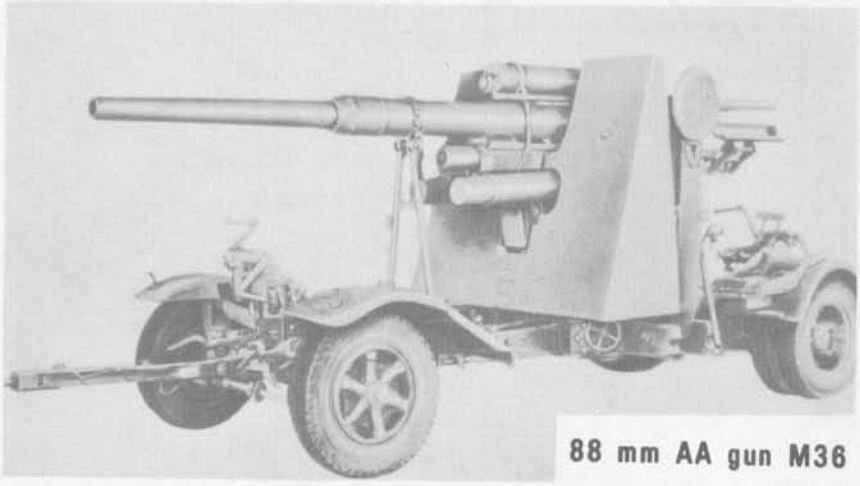
40 mm automatic AA gun M1





85 mm AA gun M1939 (KS–12)





88 mm AA gun M36

85mm AND 88mm ANTIAIRCRAFT GUNS

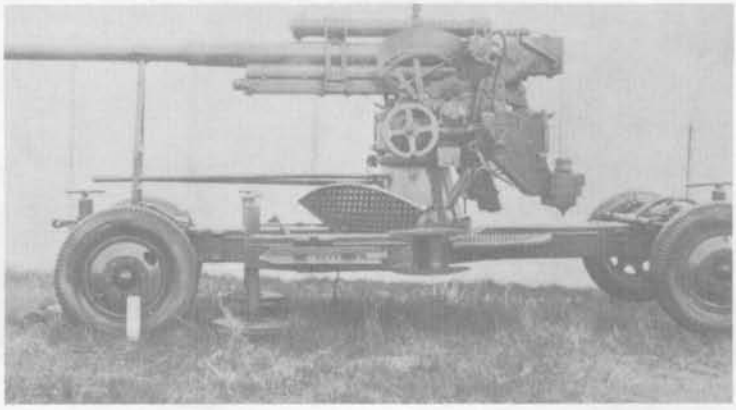
85mm antiaircraft gun M1939 (KS-12)
85mm antiaircraft gun M1944 (KS-12a)
88mm antiaircraft gun M18
88mm antiaircraft gun M36
88mm antiaircraft gun M37

The 85mm antiaircraft gun M1939 was introduced into the Soviet Army just before World War II to replace the earlier 76mm weapons. It uses a four-wheel carriage which may be fitted with a shield. The gun has a semiautomatic vertical sliding wedge breechblock, a hydraulic recoil buffer, and a hydropneumatic recuperator. It is also fitted with a multi-baffle muzzle brake. Antiaircraft fire control is provided by the PUAZO-6/12 director and the SON-9 or SON-9A radar. Provision is also made for direct fire against ground targets such as tanks. The ammunition is fixed, and with some exceptions is interchangeable with that used by the 85mm field, antitank, tank, and assault guns, all of which were developed from the antiaircraft gun. The weapon is known in Communist China as the Type 56.

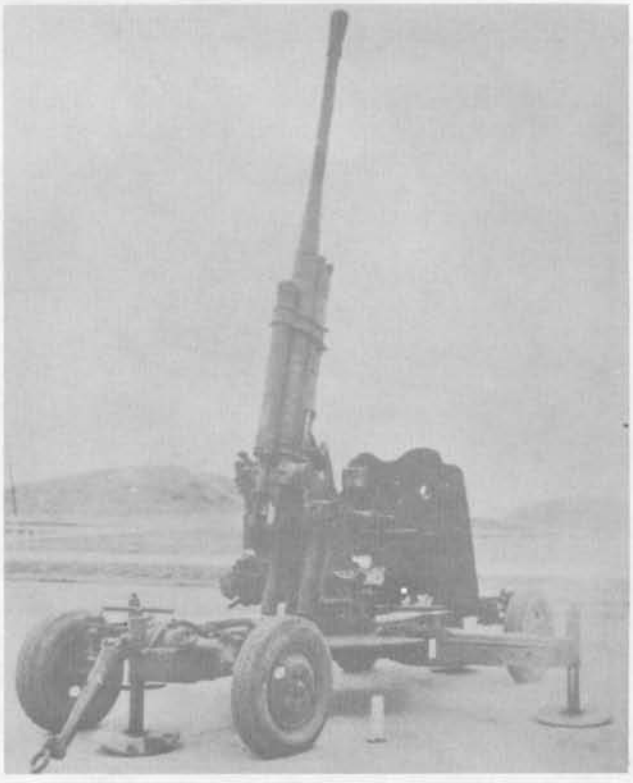
In 1944 slight modifications were made to the piece, including the fitting of "T" shaped muzzle brake. This gun was produced in Czechoslovakia for some years and has found its way into some armies of the Middle East. In the Warsaw Pact countries, however, the 85mm guns have been largely replaced by the 100mm KS-19.

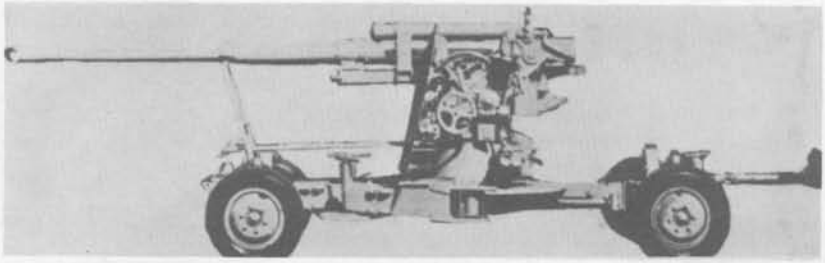
The German 88mm antiaircraft guns M18, M36, and M37 were the mainstay of the German heavy antiaircraft artillery throughout World War II and also served on all fronts as outstanding antitank weapons. All three models have the same ballistic performance, although they differ in tube construction, carriage design and other details, resulting in different weights. Most guns in the field forces were also fitted with large shields. All 88mm guns of this series have semiautomatic horizontal sliding wedge breechblocks and hydropneumatic recoil systems. They were used for a number of years also by various Warsaw Pact armies, but today are found only with the Yugoslav forces.

		85mm M1939	88mm M18
Caliber	mm	85	88
Length of tube in cals		52	56.1
Length of tube overall	mm	4693	4938
Weight in firing position	kg	4300	5000
Weight in travel position	kg	4300	7200
Length in travel position	mm	7049	7772
Width in travel position	mm	2150	2311
Height in travel position	mm	2250	2198
Track	mm	1800	1768/1829
Clearance	mm	400	347
Tire size		34x7	7.50x20
Height of axis of bore 0°	mm	1550	1600
Elevation	°	+82	+85
Depression	°	-3	-3
Traverse	°	360	360
Rate of fire	rpm	15-20	15-20
Projectile weight: HE	kg	9.5	9.23
APHE	kg	9.3	9.4
HVAP	kg	5.0	7.5
Muzzle velocity: HE	m/s	792	820
APHE	m/s	792	810
HVAP	m/s	1030	935
Maximum range: horizontal	m	15650	14860
vertical	m	10500	10600
Effective AA range	m	8382	8000
Pointblank range: APHE	m	950	1000
2m high target HVAP	m	1150	1100
Armor penetration: APHE	mm	102	122
0°/1000m HVAP	mm	130	150
Crew		7	10
Unit of fire	rds	150	150



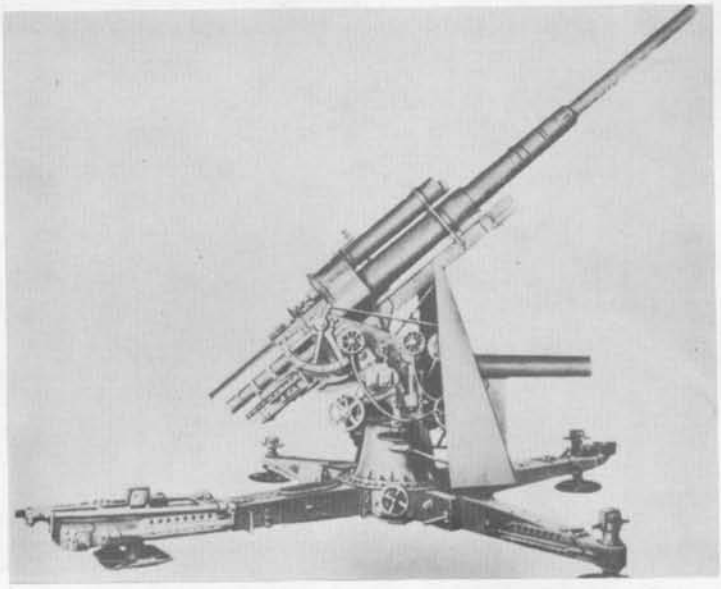
85 mm AA gun M1939 (KS–12)



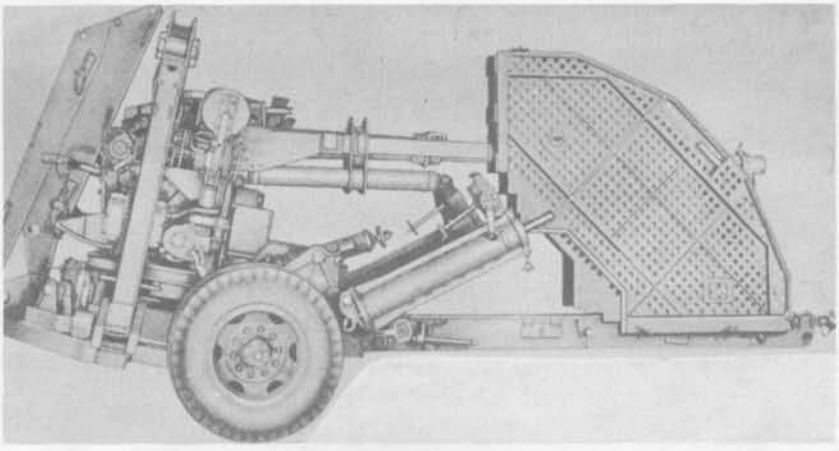


Czechoslovak 85 mm AA gun

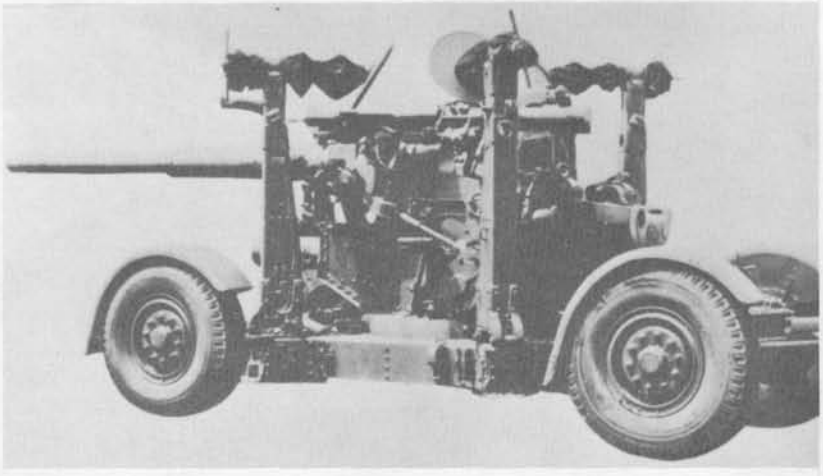




88 mm AA gun M36



90 mm AA gun M1A1 in travel position



94 mm AA gun MK–3 in travel position

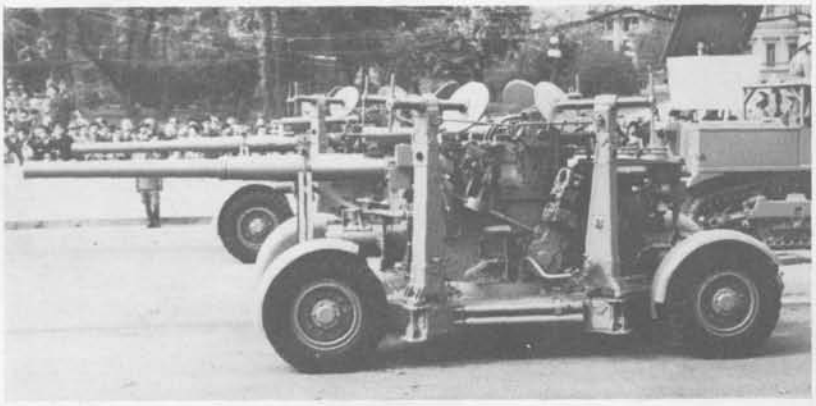
90mm antiaircraft gun M1A1
94mm antiaircraft gun MK-3

The Yugoslav Army uses two Western heavy antiaircraft guns of World War II origin, the United States 90mm M1A1 and the British 3.7 in (94mm). The 90mm gun is very distinctive in travel since it is supported by a single-axle, dual-wheeled bogie. In firing position it rests on a pedestal steadied by outriggers with the bogie removed. This type of carriage is not as handy for employment in the antitank role as are the carriages of either the Soviet 85mm and 100mm guns or the German 88mm weapons. The 90mm M1A1 has a semi-automatic vertical sliding wedge breechblock and a hydropneumatic recoil system. The ammunition is of the fixed type, and with exceptions it is interchangeable with that of the 90mm gun mounted on the M36 tank destroyer (used in the Yugoslav Army), and will chamber in the gun mounted on the United States M47 medium tank, also used in Yugoslavia. On the other hand,the M47 tank gun ammunition will not chamber in the other guns.

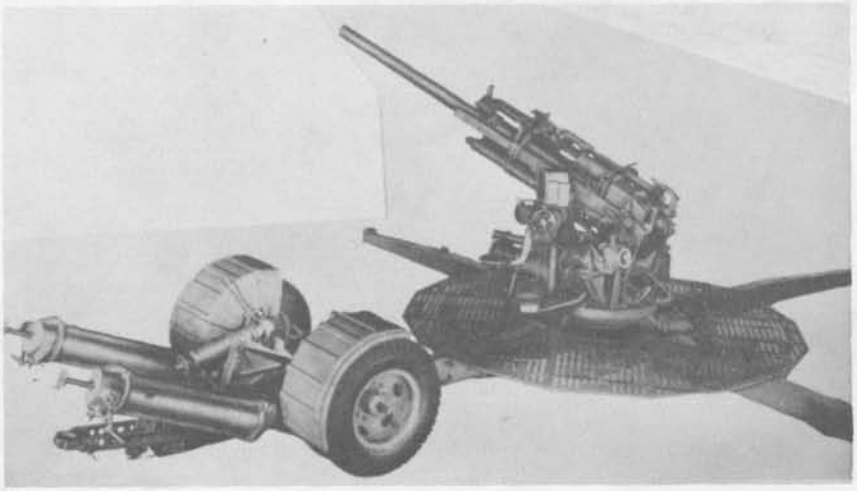
The British 94mm antiaircraft gun was acquired several years ago by the Yugoslav forces to strengthen the then inadequate air defense forces. Three different models of the gun exist, but they differ only in details. The gun can be recognized by the large four wheel carriage with the outriggers folded up in travel position. The ammunition for this weapon is not interchangeable with any other gun used in Yugoslavia.

		90mm M1A1	94mm Mk 3
Caliber	mm	90	93.9
Length of tube in cals		52.5	50
Length of tube	mm	4728	4700
Weight in firing position	kg	6646	7620
Weight in travel position	kg	8626	9321
Length in travel position	mm	6350	8687
Width in travel position	mm	2586	2438
Height in travel position	mm	2845	2510
Track	mm		
Clearance	mm	305	
Tire size		10.00x22	
Height of axis of bore 0°	mm		
Elevation	°	+80	+80
Depression	°	0	-5
Traverse	°	360	360
Rate of fire	rpm	22	20
Projectile weight: HE	kg	10.6	12.7
APHE	kg	10.9	12.7
HVAP	kg	7.63	---
Muzzle velocity: HE	m/s	824	792
APHE	m/s	854	792
HVAP	m/s	1022	---
Maximum range: horizontal	m	17878	18837
vertical	m	10980	12070
Effective AA range	m		9144
Pointblank range: APHE	m	1050	
2m high target HVAP	m	1211	---
Armor penetration: APHE	mm	147	117*
0°/1000m HVAP	mm	252	---
Crew			
Unit of fire	rds	150	150

*at 914 m/30°



94 mm AA gun MK3 in travel position



90 mm AA gun M1A1 in firing position



100 mm AA gun KS–19



130 mm AA gun KS–30

100mm antiaircraft gun KS-19
130mm antiaircraft gun KS-30

The Soviet 100mm antiaircraft gun KS-19 was introduced in the late 1940s as the replacement for the wartime 85mm guns. It found use in all of the Warsaw Pact armies, and although it has been largely replaced by surface-to-air guided missiles, the KS-19 is still held in some Warsaw Pact units, and is employed in other countries as well. The KS-19 has a semiautomatic horizontal sliding wedge breechblock, a power rammer, an automatic fuze setter, and is fitted with a long multi-baffle muzzle brake. The antiaircraft fire control system includes a PUAZO-6/19 director and a SON-9 or SON-9A fire control radar. Provision is also made for direct fire against ground targets such as tanks. The ammunition is of the fixed type and is interchangeable to a large extent with that of other 100mm rifled tank and field guns. The Chinese Communists call the gun the type 55.

The Soviet 130mm antiaircraft gun KS-30 appeared in the early 1950s. Closely resembling the United States wartime 120mm antiaircraft gun, the KS-30 was used for the home defense forces of the USSR and some other Warsaw Pact countries. Currently it is held in war reserve since it has been replaced by surface-to-air guided missiles. Recognition features are the heavy dual-tire carriage, a firing platform which folds up to a 45 degree angle when the piece is in travel, and the long clean tube without muzzle brake. The breechblock is of the semiautomatic horizontal sliding wedge type, and the piece is fitted with a power rammer and an automatic fuze setter. Fire control is provided by the PUAZO-30 director and the SON-30 radar. The ammunition is of the fixed-charge, separated type. It is not interchangeable with that of the 130mm field or coastal guns.

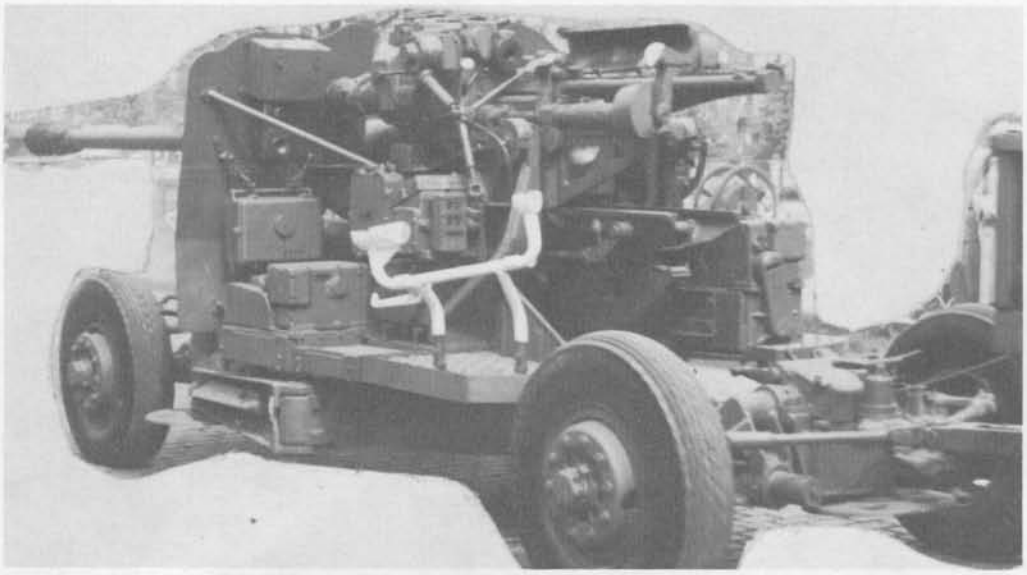
		KS-19	KS-30
Caliber	mm	100	130
Length of tube in cals		56	65
Length of tube overall	mm	5742	8412
Weight in firing position	kg		24900
Weight in travel position	kg	19450	29500
Length in travel position	mm	9238	11521
Width in travel position	mm	2286	3033
Height in travel position	mm	2201	3048
Track	mm	2165	2388
Clearance	mm	305	408
Tire size			
Height in axis of bore 0°	mm	1682	2576
Elevation	°	+85	+80
Depression	°	-3	-5
Traverse	°	360	360
Rate of fire	rpm	15	10-12
Projectile weight: HE	kg	15.7	33.4
APHE	kg	15.9	33.4
Muzzle velocity: HE	m/s	900	1050
APHE	m/s	1000	1050
Maximum range: horizontal	m	21000	29000
vertical	m	15400	22000
Effective AA range	m	13700	13720
Pointblank range: APHE 2m high target	m	1080	
Armor penetration: APHE 0°/1000m	mm	185	250
Crew			
Unit of fire	rds	100	





100 mm AA gun KS–19

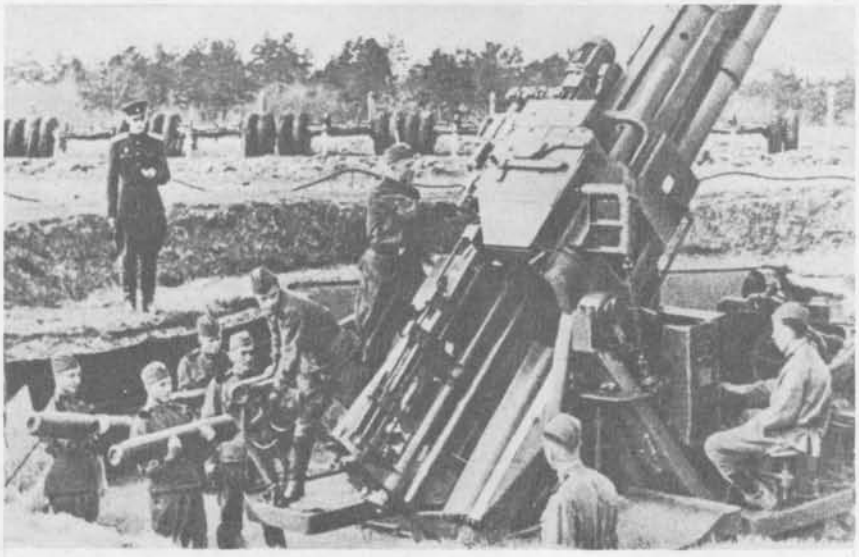




100 mm AA gun KS–19







130 mm AA gun KS–30

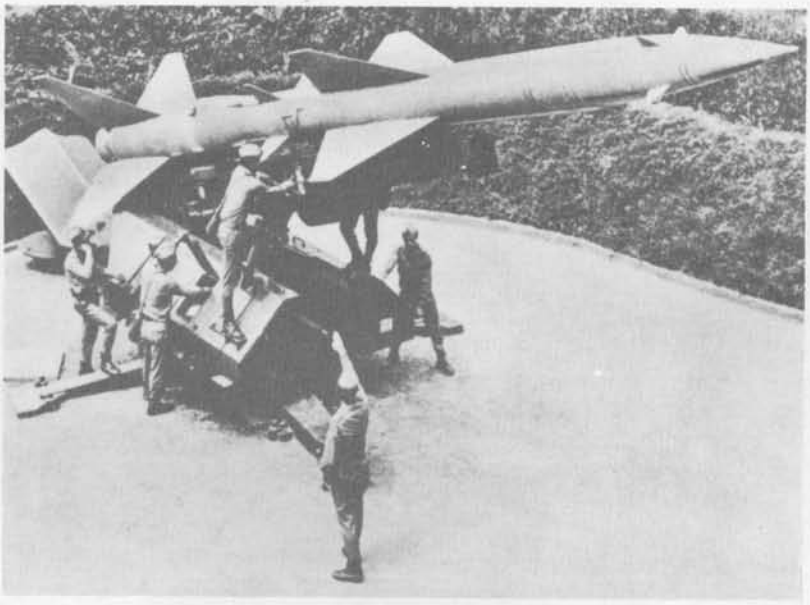




130 mm AA gun KS–30



SURFACE-TO-AIR GUIDED MISSILES



"GUIDELINE" on launcher



"GUIDELINE" being transferred to launcher

SURFACE-TO-AIR GUIDED MISSILE SA-2 "GUIDELINE"

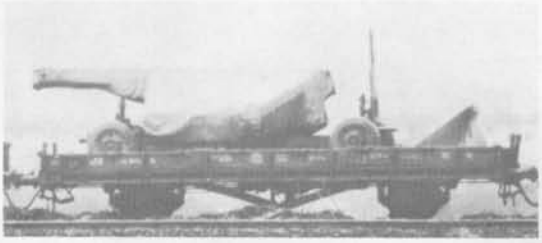
The SA-2 "GUIDELINE" is a two-stage guided missile designed for the destruction of airborne targets. It is fired from single missile launchers which are grouped in batteries of six along with the fire control radar. The normal fire position consists of the six launchers arranged in a star formation around the centrally-located radar.

The missile booster of the "GUIDELINE" has a solid propellant, but the sustainer has liquid propellant. After being assembled the ready missile is transported to the firing position on a special one-axle semitrailer towed by a ZIL-157V tractor truck. There it is loaded by hand on the launcher.

Since its initial appearance the missile and supporting equipment have undergone a number of modifications which have increased their reliability and effectiveness. The SA-2 system is found throughout the Warsaw Pact and has been exported to many other countries.



"GUIDELINE" on resupply semitrailer





"GUIDELINE" launcher



"GUIDELINE" on launcher with fire control radar



"GUIDELINE" on resupply trailer towed by GT–T



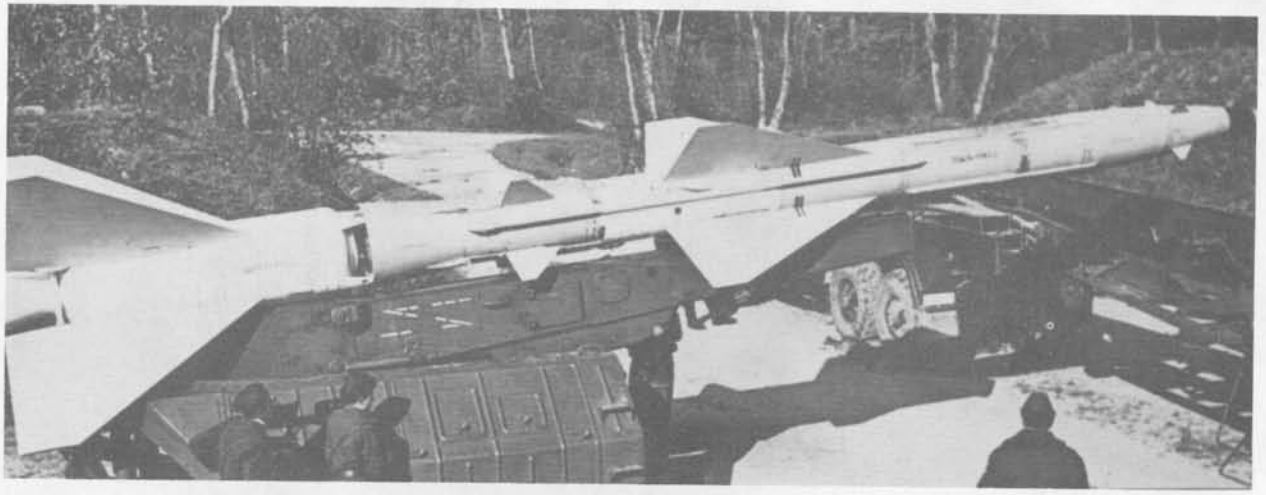
"GUIDELINE" launcher



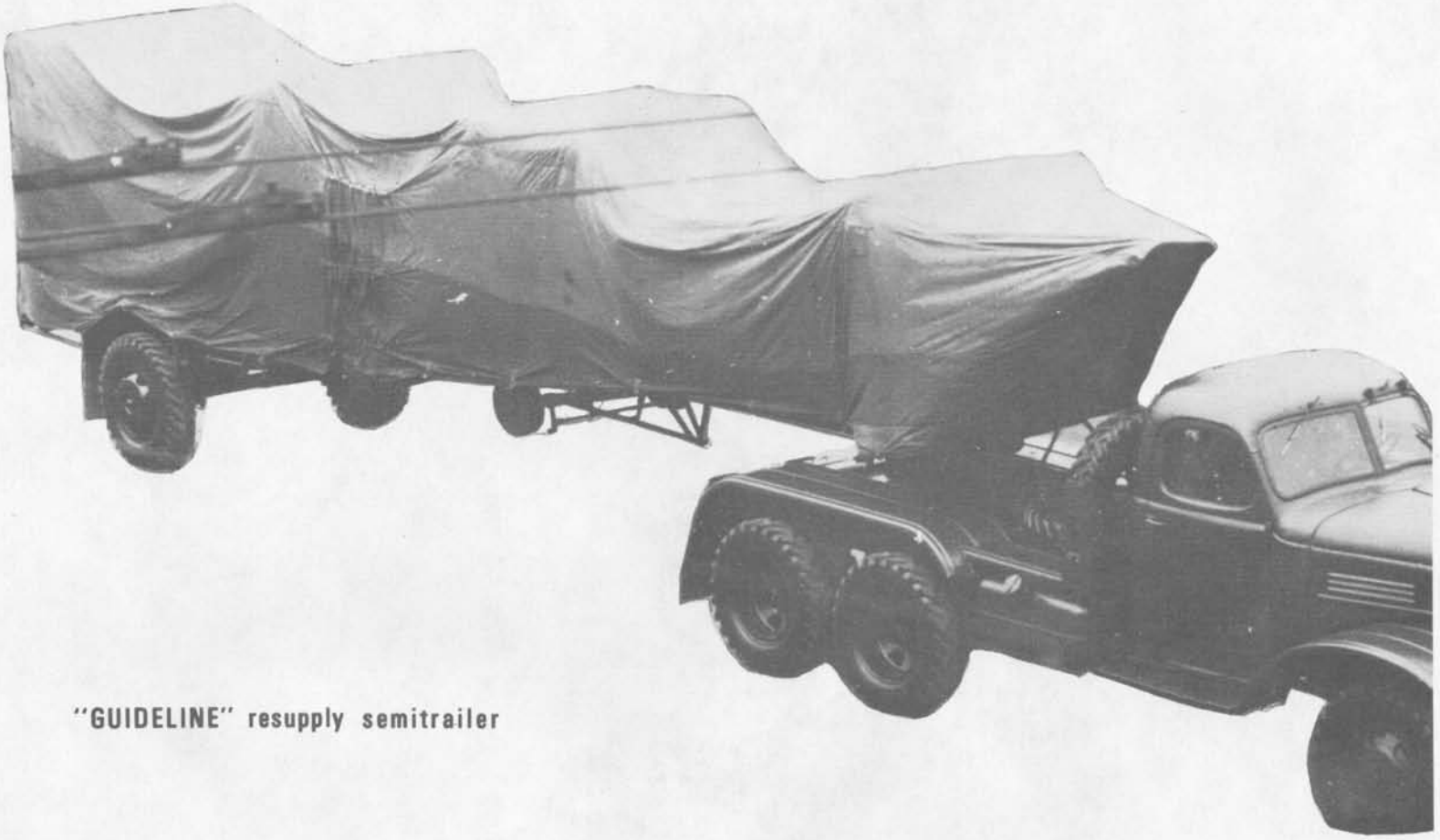
"GUIDELINE" on resupply semitrailer entering firing position



"GUIDELINE" being prepared for transfer to launcher



"GUIDELINE" on launcher. Resupply semitrailer in background



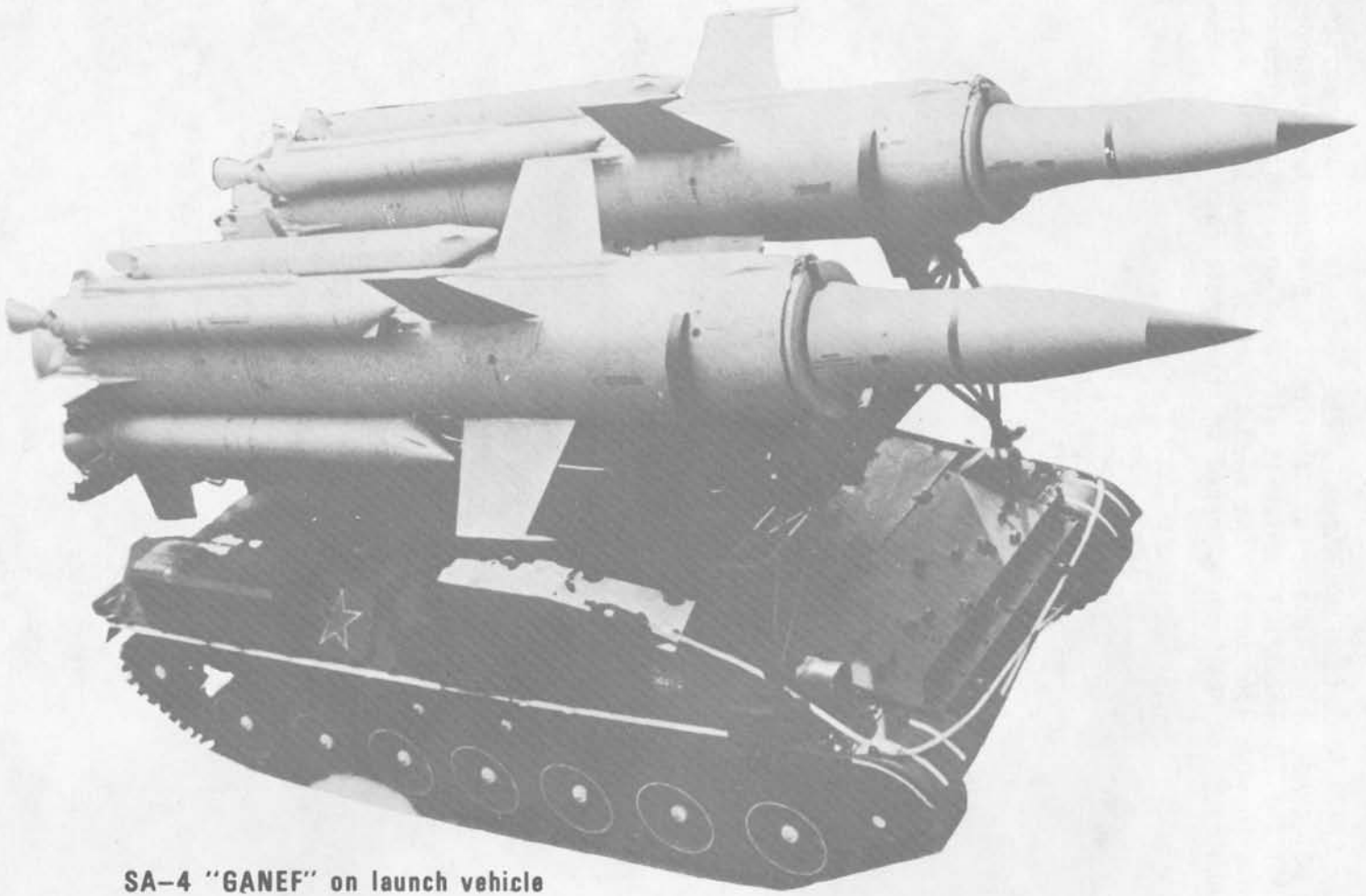
"GUIDELINE" resupply semitrailer



SA–3 "GOA" on transporter–loader

SURFACE-TO-AIR GUIDED MISSILE SA-3 "GOA"

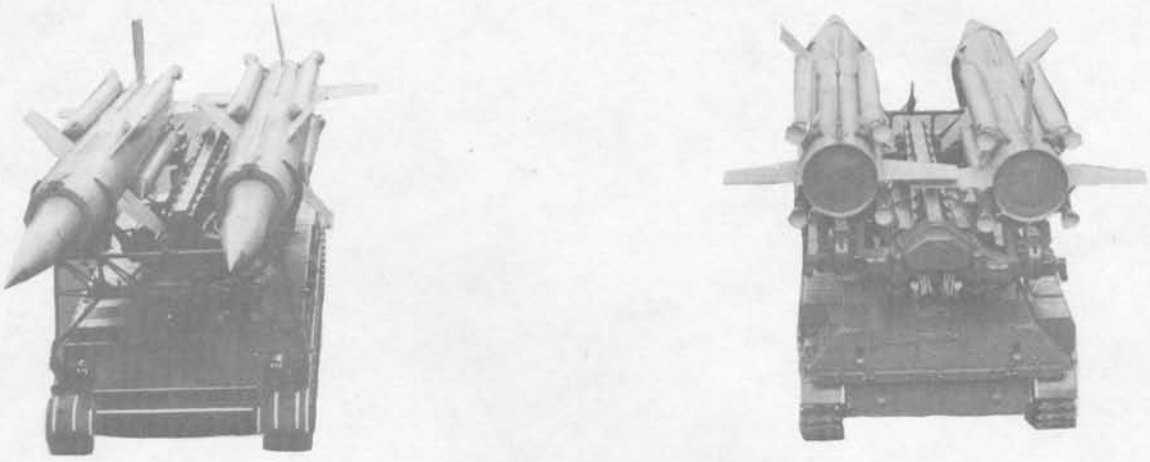
The SA-3 "GOA" is a two-stage, solid fuel, low-altitude surface-to-air guided missile. The ready missiles are transported in tandem on a modified ZIL-157 truck, which is also used to assist in loading them onto the two launchers. The SA-3 system is found in many Warsaw Pact countries and has been exported to the Middle East.



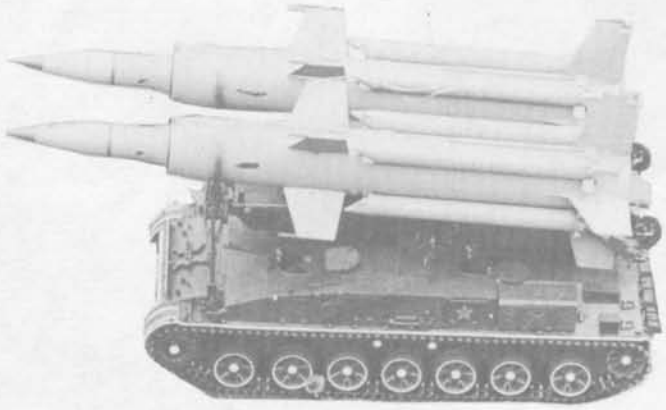
SA–4 "GANEF" on launch vehicle

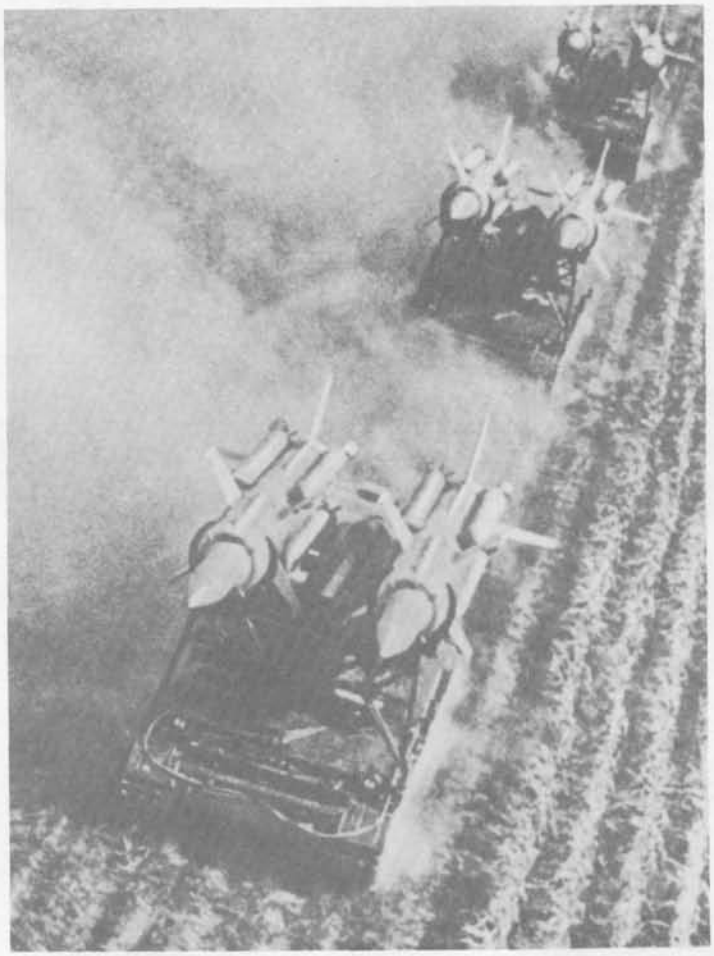
SURFACE-TO-AIR GUIDED MISSILE SA-4 "GANEF"

The SA-4 "GANEF" is a surface-to-air guided missile which very closely resembles the British "BLOODHOUND." The individual missiles are of the liquid-fuel cruise type with four solid-propellant wrap-around boosters. They are transported and launched from a special tracked vehicle with a 360-degree traverse launcher. The SA-4 system, which is designed to accompany the troops in the field, also has its fire-control equipment mounted on tracked vehicles.



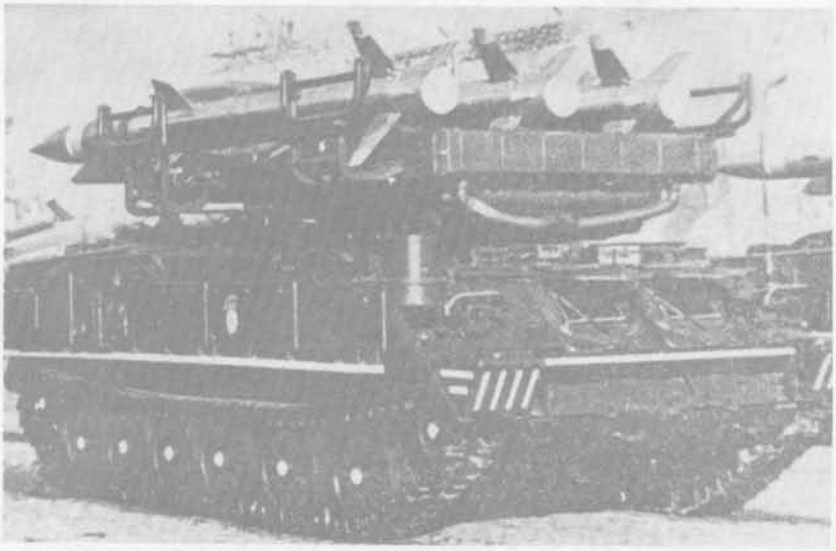
SA–4 "GANEF" on launch vehicle



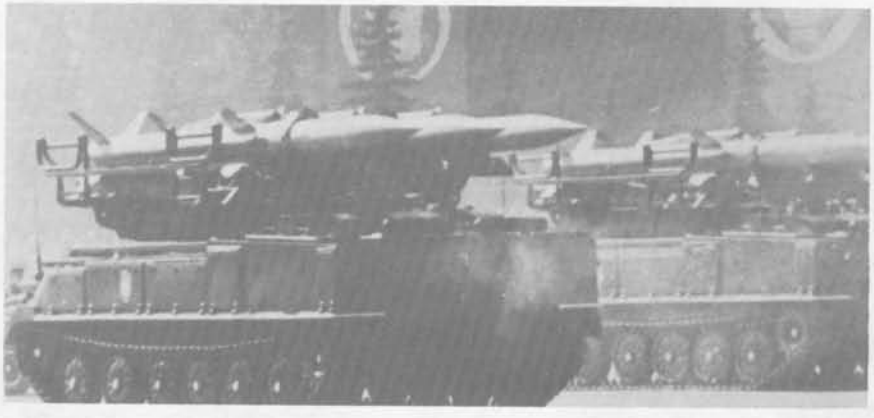


SA–4 "'GANEF'' on launch vehicle





SA–6 "GAINFUL-"



SURFACE-TO-AIR GUIDED MISSILE SA-6 "GAINFUL"

The SA-6 "GAINFUL" is a new-type, low-altitude, surface-to-air guided missile which was first displayed on 7 November 1967 in Moscow. The missiles are carried and launched from a special tracked vehicle which uses components of the ZSU-23-4 chassis. The launcher is capable of considerable elevation and 360-degree traverse. The "SA-6 system" was designed to supplement the "SA-4 system" in defending the field army against air attack.

SURFACE-TO-AIR GUIDED MISSILE SA-7 "GRAIL"

The SA-7 "GRAIL" is a new-type, low-altitude, surface-to-air guided missile bearing close external resemblance to the United States Redeye. It is a shoulder-fired weapon used in forward areas against low flying fixed and rotary wing aircraft.



SA-7 MISSILE COMPLETE WITH BATTERY AND FIRING MECHANISM INSTALLED

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USA CDC - INCSCFD-TS	004
USA CDC - INF AGCY	005
USA CDC - MAINT AGCY	001
USA CDC - MP AGCY	001
USA CDC - SP WF CEN	001
USA CDC - SUPPLY AGCY	001
USACGSC - FT LEAVENWORTH	014
USAEAF CEN EUR - US DOC OFF	001
USA ELE CENTAG	002
USA ELE CENTAG - ENG DIV	005
USA ELE LAND SOUTHEAST	006
USA ELE LIVE OAK	001
USA ELECT PROV GND	001
USA ENGR SCH - MINE WARFARE DIV	010
USA ESTC	128
USA FRANKFORD ARSENAL	005
USAIV & SCH - FT HUACHUCA	001
USAIC & SCH - CCU - FT HUACHUCA	002
USA INF CEN FT BENNING	001
USA INTELCOM - ICPO-I	002
USA JAPAN - G2	001
USA LN GP NORTHAG/BAOR	150
USAMC STIT - EUR	001
USA MISSILE COMD REDSTONE ARSENAL	005
USA MUNITIONS COMD	001
USAREUR & 7A CSTC	001
USAREUR & 7A DCSOPS	005
USAREUR & 7A ODCSI - AEAGB-C(GO)LN	002
USAREUR & 7A COLL DIV	001
USAREUR & 7A ODCSI - IDHS-FMA	001
USAREUR & 7A ODCSI - LNO	007
USAREUR & 7A PDN DIV	030
USAREUR & 7A TC & CAS	050
USAREUR & 7A TNG CTR - AETTG-SC	006
USAREUR LNO TO CCFFA	015
USARPAC G2	007
USASA FLD STA AUGSBURG	010
USA SCTY EVAL GP (LNO)	020
USA SETAF	001
USA SP SCTY DET	001

	NO OF COPIES
USASAFS AUGSBURG OPS	012
USA TANK AUTOMOTIVE COMD	001
USA WAR COLLEGE	001
USA II CT	006
USCONARC DCSI	001
USDAO - AMER EMB - US DOC CON OFF	001
USDAO - AMAN JORDAN	002
USDAO - APO 09159	001
USDAO - APO 09170	001
USDAO - APO 09223	005
USDAO - APO 09285	005
USDAO - APO 09672	002
USDAO - APO 09794	005
USDAO - BOX 36 FPO 09540	001
USDAO - BELGRADE	005
USDAO - BUCHAREST	005
USDAO - BUDAPEST	005
USDAO - HELSINKI	001
USDAO - LISBON	005
USDAO - MOSCOW	005
USDAO - PRAGUE	007
USDAO - SOFIA	001
USDAO - STOCKHOLM	005
USDAO - WARSAW	005
USEUCOM	003
USEUCOM ELEC INTEL CEN	001
USMAC THAILAND	001
USMACV - J2	001
USMLM	020
USNAVEUR	001
USN EOD FAC	001
USN MED RSCH LAB	001
USN WPNS EVAL FAC	001
USN WPNS LAB	001
USN WAR COLLEGE	001
USPACAF & PFIHS & DS	004
USPACOM	001
USPAC FLT NAVY NO 128	002
WATERVLIET ARSENAL	001
TOTAL	3730