

ARCHIVED REPORT

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Artillery Ammunition (Europe)

Outlook

- Serial production ongoing; international acceptance of NATO-standard 155mm ammunition continues to grow
- Europe remains a major source of advanced artillery ammunition, despite increasing competition on the international market
- We expect production from all European sources to average nearly one million rounds (75mm-203mm) annually through 2019

Orientation

Description. Unguided artillery ammunition, 75mm to 203mm.

Sponsor. Both individual contractors and various governments sponsor the development of artillery ammunition.

Licensees. A number of firms and state-owned organizations around the world produce European pattern artillery ammunition under license. In addition, many European contractors produce U.S. pattern ammunition under license.

Status. Development through serial production.

Total Produced. Through 2009, we estimate the various European contractors produced more than 71.9 million artillery rounds since 1980, inclusive.

Application. Unguided ammunition for tube artillery, supporting offensive and defensive operations with direct and indirect fire.

Price Range. In 2010 U.S. dollars, new-production European unguided artillery ammunition ranges in unit price from \$28.52 for the 76mm OF-350 High Explosive Fragmentation (HE-Frag) round to \$2,252 for the 155mm OGRE F1 submunition-dispensing projectile.

Unit price varies according to the type and quantity of ammunition procured.

Contractors

Prime

BAE Systems Land & Armaments, Global Combat Systems - Munitions	http://www.baesystems.com , The Steel, Ridsdale,, Bellingham, NE48 2EZ Northumberland, United Kingdom, Prime
BAE Systems Land & Armaments, Global Combat Systems - BAE Systems Bofors AB	http://www.baesystems.com , Karlskoga, 691 80 Sweden, Tel: + 46 586 733 000, Fax: + 46 586 850 30, Email: info.bofors@baesystems.se , Prime
Federal State Unitary Enterprise,	http://www.rusarm.ru , 27/3 Stromynka St, Moscow, 107076 Russian Federation,

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Rosoboronexport, Rosoboronexport State Corp	Tel: + 7 495 964 61 40, Fax: + 7 495 963 26 13, Prime
Hellenic Defence Systems (EAS) SA, (EBO-PYRKAL)	http://www.eas.gr , 1 Ilioupoleos Ave, Hymettus, Athens, 17236 Greece, Tel: + 30 210 979 0900, Fax: + 30 210 979 0800, Email: info@eas.gr, Prime

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Nexter Munitions	http://www.nexter-group.fr , 7, route de Guerry, Bourges, 18023 France, Tel: + 33 2 48 21 91 11, Fax: + 33 2 48 21 91 42, Prime
Patria Oy	http://www.patria.fi , Kaivokatu 10 A, Helsinki, 00100 Finland, Tel: + 358 20 469 1, Fax: + 358 20 469 2022, Email: info@patria.fi , Prime
RUAG Ammotec	http://www.ruag.com , Uttigenstrasse 67, Thun, 3602 Switzerland, Tel: + 41 332 282 220, Fax: + 41 332 282 627, Email: info.ammotec@ruag.com , Prime
Rheinmetall Defence	http://www.rheinmetall-defence.com , Rheinmetall Platz 1, Düsseldorf, 40476 Germany, Tel: + 49 211 473 01, Fax: + 49 211 473 4727, Email: info@rheinmetall-defence.com , Prime
S.C. Arsenal-Resita SA, (formerly Arsenal Armatei)	http://www.arsenal.ro , Barzavitei St, 4, Resita, 1700 Jud. Caras-Severin, Romania, Tel: + 40 0255 250502, Fax: + 40 0255 225011, Email: factory@arsenal.ro , Prime

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Note: This report addresses artillery projectiles only; it does not list separate cartridge or bag propellant components.

<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
<u>Manufacturer – S.C. Arsenal-Resita SA</u>		
76mm	OF-350	High Explosive Fragmentation
76mm	OF-350A	High Explosive Fragmentation
76mm	BR-350B	Armor Piercing-Tracer
76mm	MK-354	Blank
76mm	BK-354M	High Explosive Anti-Tank Fin Stabilized-Tracer
76mm	unknown	High Explosive
76mm	unknown	High Explosive Anti-Tank
76mm	D-350	Smoke
76mm	POR-350	Target Practice-Tracer
98mm	OF-402	High Explosive
98mm	OF-403	High Explosive
98mm	BK-1	High Explosive Anti-Tank
122mm	OF-462	High Explosive Fragmentation
122mm	S-463	Illumination
122mm	Starshel 122	Cargo (radio jamming)
130mm	unknown	High Explosive
152mm	OF-550	High Explosive
152mm	M350/1	Cargo (Improved Conventional Munition)
152mm	M350/1 ER	Cargo (Improved Conventional Munition)
152mm	unknown	High Explosive Anti-Tank-Tracer
<u>Manufacturer – BAE Systems Land & Armaments</u>		
105mm	L31A1/A2/A3	High Explosive
105mm	L37A1/A2	Red Smoke
105mm	L38A1/A2	Orange Smoke
105mm	L42A3	High Explosive Squash Head
105mm	L43A2	Illumination
105mm	L45A2	White Smoke
105mm	RO 37-05A1	Target Practice (flash)
105mm	RO 38-05A1	Target Practice (flash)
105mm	ERM 1-HE BBU	High Explosive Base Bleed
105mm	ERHE2 BB	High Explosive Base Bleed
105mm	HE X/RO 03E1	High Explosive (extended range)
155mm	RO 18-05A1/A2	Target Practice (flash)

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Caliber	Designation	Type
155mm	RO 22 (M107)	High Explosive
155mm	RO 23-05A1	Target Practice (flash)
155mm	RO 24 (L15A2)	High Explosive
155mm	RO 24-05A1	Target Practice (flash)
155mm	RO 25A1	Target Practice (flash)
155mm	RO 30	High Explosive Base Bleed
155mm	M110	White Phosphorous Smoke
155mm	M116B	White Phosphorous Smoke
155mm	M118A2	Illumination
165mm	L33A3	High Explosive Squash Head
175mm	M437	High Explosive
203mm	M106	High Explosive
Manufacturer – BAE Systems Bofors		
105mm	LUMA Mark 2	Illumination
105mm	M60	White Phosphorous Smoke
105mm	Mona	Illumination
105mm	Type 4140	High Explosive
120mm	SGR M/70	High Explosive
120mm	SMGR M/70	High Explosive Armor Piercing
120mm	HCER	High Explosive Armor Piercing
155mm	MIRA	Illumination
155mm	MIRA ER	Illumination (extended range)
155mm	F1	High Explosive Base Bleed
155mm	M/60	High Explosive
155mm	M/77B	High Explosive
155mm	PRB Mark 10	High Explosive (Extended Range Full Bore)
155mm	BOSS	High Explosive Anti-Tank
155mm	JUSTUS	Illumination
155mm	HEER	High Explosive Base Bleed
155mm	BONUS	Cargo (submunition dispensing)
155mm	FFV 431	Smoke
155mm	FFV 007	Smoke
155mm	FFV 007 IR	Smoke (infrared screening)
155mm	FFV 007 ER	Smoke
Manufacturer – Rheinmetall Defence (includes former Eurometaal line)		
105mm	M1	High Explosive
105mm	WP M60	White Phosphorous Smoke
105mm	BE M84	Hexachlorethane Smoke
105mm	ERM1-HE BBU	High Explosive Base Bleed
155mm	DM21 (M107)	High Explosive
155mm	DM105	Smoke
155mm	DM106	Illumination
155mm	DM652 (M864)	Cargo (Improved Conventional Munition)
155mm	M107	High Explosive
155mm	M110	White Phosphorous Smoke
155mm	M116	Hexachlorethane Smoke
155mm	M483A1	Cargo (Improved Conventional Munition)
155mm	M864	Cargo (Improved Conventional Munition)
155mm	NR109	Illumination
155mm	ERFB-HE	High Explosive (Extended Range Full Bore)
155mm	ERFB-BB-HE	High Explosive (Extended Range Full Bore Base Bleed)
155mm	ERFB-I	Illumination (Extended Range Full Bore)
155mm	ERFB-I	Illumination (Extended Range Full Bore Base Bleed)
155mm	ERFB-S	White Phosphorous Smoke (Extended Range Full Bore)
155mm	ERFB-S(BE)	White Phosphorous Smoke (Extended Range Full Bore)
155mm	Rh 49	Cargo (submunition dispensing)
155mm	RB 63	Cargo (submunition dispensing)

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<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
175mm	unknown	High Explosive
203mm	M106	High Explosive
<u>Manufacturer – Nexter Munitions</u>		
105mm	HE BT G1	High Explosive
105mm	HE ER G1	High Explosive Base Bleed
105mm	HE ER G2	High Explosive
105mm	M1	High Explosive
105mm	HE BT G1	High Explosive
105mm	WP M60	White Phosphorous Smoke
105mm	WP ER G1	White Phosphorous Smoke Base Bleed
105mm	WP BT G1	White Phosphorous Smoke
105mm	M84A1	Hexachlorethane Smoke
105mm	M314A3	Illumination
105mm	M395	Blank
130mm	unknown	High Explosive (Extended Range Full Bore Base Bleed)
130mm	unknown	White Phosphorous Smoke Base Bleed
142mm	unknown	High Explosive (demolition round)
155mm	NR 265	High Explosive (Extended Range Full Bore Base Bleed)
155mm	NR 267	White Phosphorous Smoke (Extended Range Full Bore)
155mm	NR 269	Cargo (Extended Range Full Bore)
155mm	NR 173	High Explosive (Extended Range Full Bore)
155mm	OE 155 F1	High Explosive
155mm	OE 155 H2	High Explosive Base Bleed
155mm	OE 155 H3	High Explosive Rocket Assisted Projectile
155mm	OE 155 56/69	High Explosive
155mm	OECL 155 F1	Illumination
155mm	OFUM 155 F1A	White Phosphorous Smoke
155mm	OFUM 155 F2A	White Phosphorous Smoke
155mm	OGRE 155 F1	Cargo
155mm	OMI 155 H2	Cargo
155mm	OX 155 F1	Target Practice
155mm	OX 155 56/69	Target Practice
155mm	155 PRAC SRF1	Target Practice
<u>Manufacturer – Nexter Munitions/Luchair</u>		
105mm	OE	High Explosive
105mm	OFUM M60	White Phosphorous Smoke
105mm	M107	High Explosive
105mm	PL/PN	Practice
105mm	ECL	Illumination
155mm	ECL 155 F1	Illumination
155mm	FUM (M110)	White Phosphorous Smoke
155mm	155 LU 111 HB	High Explosive
155mm	155 LU 111 BB	High Explosive Base Bleed
155mm	155 LU 112 HB	Inert
155mm	155 LU 112 BB	Inert
155mm	155 LU 114 HB	White Phosphorous Smoke
155mm	155 LU 114 BB	White Phosphorous Smoke-Base Bleed
155mm	155 LU 118 HB	White Phosphorous Smoke
155mm	155 LU 118 BB	White Phosphorous Smoke-Base Bleed
155mm	M107	High Explosive
155mm	M118A2	Illumination
155mm	OE	High Explosive
155mm	OFUM 155 F1A	Smoke
155mm	OFUM 155 F2A	Smoke
155mm	PL/PN	Practice
155mm	PRAC SR F1	Target Practice
155mm	X ECO	Target Practice (reduced range)

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<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
175mm	M437A1/A2	High Explosive
203mm	M106	High Explosive
<u>Manufacturer – Hellenic Defence Systems (EAS) SA</u>		
105mm	M1	High Explosive
155mm	M107	High Explosive
155mm	M110A2	White Phosphorous Smoke
203mm	M106	High Explosive
<u>Manufacturer – RUAG Ammotec (former Hirtenberger Defence Systems line)</u>		
105mm	BE M84	White Phosphorous Smoke
105mm	M1	High Explosive
105mm	M60	White Phosphorous Smoke
105mm	M314A2	Illumination
105mm	M395	Blank
122mm	unknown	High Explosive
122mm	unknown	White Phosphorous Smoke
122mm	unknown	Illumination
130mm	SEN-HE	High Explosive (Extended Range Full Bore)
130mm	unknown	White Phosphorous Smoke
130mm	unknown	Illumination
155mm	M107	High Explosive
155mm	M110	White Phosphorous Smoke
155mm	M116B	White Phosphorous Smoke
155mm	M118A2	Illumination
155mm	SEN-HE	High Explosive (Extended Range Full Bore)
155mm	SEN-HE/BB	High Explosive (Extended Range Full Bore Base Bleed)
<u>Manufacturer – Patria plc</u>		
122mm	unknown	High Explosive
122mm	unknown	Illumination
122mm	unknown	White Phosphorous Smoke
122mm	unknown	Cargo
130mm	unknown	High Explosive
130mm	unknown	Illumination
130mm	unknown	White Phosphorous Smoke
152mm	unknown	High Explosive (Extended Range Full Bore)
152mm	unknown	High Explosive (Extended Range Full Bore Base Bleed)
152mm	unknown	High Explosive
155mm	unknown	High Explosive (Extended Range Full Bore)
<u>Manufacturer – FSUE Rosoboronexport</u>		
76mm	BK-354M	High Explosive Anti-Tank - Fin Stabilized-Tracer
76mm	BR-354P	High Explosive Armor Piercing
76mm	OF-350/350A	High Explosive Fragmentation
76mm	BR-350B	Armor Piercing Tracer
85mm	BK-2M	High Explosive Anti-Tank - Fin Stabilized
85mm	BR-365	Armor Piercing-Tracer
85mm	BR-365P	High Velocity Armor Piercing-Tracer
85mm	O-365K	High Explosive Fragmentation
100mm	BM-8	High Velocity Armor Piercing Discarding Sabot -Tracer
100mm	BR-412	Armor Piercing Capped Tracer
100mm	BR-412B	Armor Piercing Capped Tracer
100mm	3UOF32	High Explosive Fragmentation
100mm	OF-214	High Explosive Fragmentation
100mm	ZBK-5M	High Explosive Anti-Tank - Fin Stabilized
120mm	unknown	High Explosive
120mm	unknown	High Explosive Anti-Tank
120mm	unknown	High Explosive Rocket Assisted Projectile
122mm	G-462	Cargo (leaflet)
122mm	G-463	Cargo (leaflet)

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<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
122mm	BK-6M	High Explosive Anti-Tank - Fin Stabilized
122mm	BK-13	High Explosive Anti-Tank - Fin Stabilized Tracer
122mm	BK-13M	High Explosive Anti-Tank - Fin Stabilized Tracer
122mm	BP-463	High Explosive Anti-Tank
122mm	BR-472	Armor Piercing Capped Tracer
122mm	unknown	High Explosive Rocket Assisted Projectile
122mm	D-462	Smoke
122mm	OF-462	High Explosive Fragmentation
122mm	OF-471N	High Explosive Fragmentation
122mm	OF-472	High Explosive Fragmentation
122mm	3OF56	High Explosive Fragmentation
122mm	PVM-ZA	Target Practice Tracer
122mm	PVM-ZRU	Target Practice Tracer
122mm	PVM-ZRB	Target Practice Tracer
122mm	S-462	White Phosphorous Smoke
122mm	S-463	Illumination
122mm	unknown	Incendiary
122mm	unknown	Chemical
122mm	unknown	Anti-Personnel (flechette)
130mm	BR-482B	Armor Piercing Capped Tracer
130mm	DTs-1	Smoke
130mm	3OF33	High Explosive Fragmentation
130mm	OF-482M	High Explosive Fragmentation
130mm	SP-46	Illumination
130mm	unknown	Chemical
130mm	unknown	High Explosive Rocket Assisted Projectile
152mm	BR-540	Armor Piercing Tracer
152mm	D-540	Smoke
152mm	3-O-13	Cargo (submunition dispensing)
152mm	unknown	Cargo (smart submunition dispensing)
152mm	G-530	Concrete Piercing
152mm	G-545	Concrete Piercing
152mm	OF530	High Explosive Fragmentation
152mm	OF530A	High Explosive Fragmentation
152mm	OF540	High Explosive Fragmentation
152mm	3OF9	High Explosive Fragmentation
152mm	3OF25	High Explosive Fragmentation
152mm	3OF45	High Explosive Fragmentation
152mm	3OF56	High Explosive Fragmentation
152mm	3OF59	High Explosive Fragmentation
152mm	3OF61	High Explosive Fragmentation Base Bleed
152mm	3OF64	High Explosive Fragmentation
152mm	3OF66	High Explosive Fragmentation
152mm	S-540	Illumination
152mm	unknown	Chemical
152mm	unknown	High Explosive Rocket Assisted Projectile
152mm	3RB30	Cargo (electronic)
152mm	BR-540	Armor Piercing Tracer
152mm	unknown	Nuclear
180mm	F-372	High Explosive
180mm	G-572	Concrete Piercing
180mm	OF23	High Explosive Fragmentation Rocket Assisted Projectile
180mm	unknown	Nuclear
203mm	3OF43	High Explosive Fragmentation
203mm	3OF44	High Explosive Fragmentation
203mm	3-O-14	Cargo (submunition dispensing)
203mm	unknown	High Explosive Rocket Assisted Projectile

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BAE Systems 155mm AS90 in Action during Operation Telic

Source: U.K. Ministry of Defence

Variants/Upgrades

Variants. Not generally applicable. Upgraded rounds usually carry new designations to distinguish them from other projectiles of a similar design.

Modernization and Retrofit Overview. Not applicable.

Program Review

Background. Since the first cast-iron cannon appeared on the continent in the 14th century, Europe has remained the center of artillery development.

Market Trends

In today's artillery market, ammunition development exhibits three major trends:

- Refinements in ballistics and propellants technology
- Development of delayed-action submunitions
- Development of terminal guidance for artillery projectiles

The NATO Advanced Future Artillery Ammunition Systems (AFAAS) requirement, as the next generation of artillery ammunition for NATO, is quite lucrative, with international sales almost certain. The AFAAS program incorporates the following major features:

- Increased range and accuracy
- Incorporation of insensitive munitions technology

- A reconnaissance and battle damage assessment capability
- An ammunition tagging and tracking system

More than 40 European contractors are currently involved in the artillery ammunition market. In this report, we briefly review only the most active players so as to present a cross-section of the entire market.

Finland

Patria plc. In 1991, the merger of the old government-owned Vammaskoski Works and the Defense Division of Tampella Ltd created this firm, which now operates as the Patria Group. This player has also absorbed the Valmet firm, which produced 122mm and 130mm ammunition. Patria is the major supplier of artillery ammunition to the Finnish Army. Its products include 105mm, 122mm, 130mm, 152mm, and 155mm rounds, including Base Bleed and Hollow Bleed variants.

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Patria ERFB Rounds

More recently, Patria began developing Extended Range Full Bore projectiles in the standard and Base Bleed versions for both Russian-standard 152mm and NATO-standard 155mm artillery. What is unique about the Patria version is that the projectiles do not feature barrel riding nubs. Instead, they have an advanced, streamlined design to reduce drag. The company claims this design feature is easier and less costly to manufacture; it also reportedly offers reduced bore wear and a slightly increased payload. Patria has not reported any sales of this new line of ammunition; unconfirmed reports suggest the Finnish Army may have purchased some of this ammunition.

France

Nexter Munitions. Reorganized as a private entity in 1990, this French firm (formerly the Giat Industries Weapon Systems and Ammunitions Division) has become a major player in the artillery ammunition market.

Corporate Evolution

In October 2006, Giat Industries approved a reorganization and an associated name change to Nexter. Under the restructuring, the group maintains four core operations:

- Nexter Systems
- Nexter Munitions
- Nexter Electronics
- Nexter Mechanics

The move reportedly better prepares the firm for consolidation in the near future, possibly with either Thales or EADS.

In addition to acquiring the assets of Poudres Reunies de Belgique, Giat Industries had also acquired Luchoire. The Luchoire artillery ammunition line remains in production under the Nexter banner.

Extensive Product Line

These acquisitions have allowed Nexter to market an extensive line of standard pattern projectiles and Extended Range artillery ammunition, including standard Base Bleed and hybrid external burning rounds. The OE DTC 155 H2 Base Bleed round has found significant success on the export market, as have other Extended Range Full Bore types.

On a private basis, Nexter has been conducting research into improved-effect cargo ammunition. The two prototypes to emerge from this work are the OMI 155 F2 (an anti-vehicle/anti-personnel bomblet

round carrying 88 submunitions) and the OMI 155 H1 (a round carrying anti-tank mines). Since the introduction of this ammunition with the French Army in 1990 as the OGRE 155 G1, the contractor has secured at least five export orders for the ammunition.

In response to a perceived demand, Nexter has also developed and produced 130mm Base Bleed ammunition for the Russian M-46 field gun. In early 2000, an unidentified African nation reportedly purchased this round.

More recently, (then) Giat Industries and Bofors teamed up for the continued development of the 155 BONUS smart submunition-dispensing projectile. For more information on this round, see our "BONUS" report in Tab G.

The Luchoire Line. As we indicated above, the internationally famous Luchoire firm no longer acts as a distinct entity; it has operated as a component of Giat Industries (now Nexter Munitions) since the early 1990s. Luchoire's ammunition types and Base Bleed units were essentially identical to those of Poudres Reunies de Belgique, another Giat acquisition. These Base Bleed units have the advantage of being "add-on" units compatible with the F1 standard High Explosive round. Luchoire also exported a 130mm variant of the Base Bleed unit for use in the Soviet M-46 towed artillery system.

French industry is also involved in advanced fuze and terminally guided projectile development. Luchoire has been working on optronic fuze development, which is an area of interest to a number of German firms, including AEG, Diehl, and Junghans.

Federal Republic of Germany. The German players continue to be among the world leaders in all aspects of artillery, including the ammunition.

Rheinmetall Defence. The Federal Republic of Germany is sponsoring a wide range of research and development programs related to artillery ammunition, including advanced fuze technology work. Rheinmetall has conducted research into enhanced lethal-effect ammunition, particularly for 155mm and 203mm projectiles. These rounds employ submunition and fragmentation effects to defeat hard and semi-hardened targets.

DM642 ICM Round. In the field of Improved Conventional Munitions (ICM), Rheinmetall (the leading German manufacturer in this field) and Simmel Difesa of Italy have conducted joint development of the DM642 (company designation RB 63) submunition-dispensing round for the German and Italian armies. The current production-standard of this round carries 63 DM1383 submunitions. Germany, Italy, and one

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undisclosed export customer have procured the DM642. A similar but more aerodynamically refined projectile is the DM652 (company designation Rh 49), which carries 49 DM1383 submunitions to a maximum range of 30 kilometers (32,808 yd).

In June 1996, Rheinmetall and Israel Military Industries (IMI) announced that they would cooperate on development of Improved Conventional Munitions projectiles and the associated submunitions.

Acquiring the Eurometaal Line

With its acquisition of Eurometaal Holding NV (Zaandam, the Netherlands), Rheinmetall inherited this Dutch player's extensive line of artillery ammunition products. The former Eurometaal catalog includes a full line of NATO-standard ammunition; Eurometaal also held the European license for production of the U.S. 155mm M483A1 Improved Conventional Munition (ICM) round. This round, along with the company's Extended Range ammunition, gave Eurometaal opportunities for substantial sales, particularly with regard to Europe's growing demand for Extended Range Full Bore ammunition.

Eurometaal also produced (under license) the M864, the follow-on to the M483 projectile. In 1989, Eurometaal began developing the ERM1-HE BBU Extended Range round in conjunction with (then) Royal Ordnance. The round is optimized for the L119, LG1, and enhanced versions of the M101 artillery pieces. Development and qualification were complete in 1997; the round is now available for sale. The ERM1-HE BBU is reportedly 30 percent more lethal than the standard M1 round.

Greece. In 1991, the Greek Powder & Cartridge Company (PYRKAL) and Hellenic Arms Industry (EBO) began a merging process under which Hellenic would absorb PYRKAL under a unified corporate structure.

Hellenic Defence Systems (EAS) SA. This firm has recently developed two extended-range projectiles, ERMIS and ERA. The M107/B ERMIS (Enhanced Range Modified Integration System) is a Base Bleed version of the standard M107 projectile. The ERA (Extended Range Ammunition) utilizes Base Bleed in conjunction with a new aerodynamic shape. Compatible with 39-caliber artillery (such as the 155mm M109 self-propelled howitzer), it forms a complete family of ammunition, featuring extra explosive content for destructive effect at the target.

Hellenic Defence Systems is expanding its activities to such an extent that the factory at Lavrion has become one of the largest in Europe.

Romania

S.C. Arsenal-Resita SA. Formerly the state-owned Arsenalul Armatei organization, this contractor operates four ammunition facilities in Romania. The firm produces several specialized rounds for the Romanian 76mm Mountain Gun (the Russian pattern OF-350) and the 100mm Mountain Howitzer. In addition, the contractor produces a line of unique 98mm rounds for the Model 93 Mountain Howitzer, an indigenous design that the Romanians have not exported.

Arsenal-Resita may also produce some Russian-pattern ammunition. The Romtehnica organization handles international marketing; the Romanians have not released sales data.

Another somewhat mysterious round is the M350/1 cargo (Improved Conventional Munition) round, which dispenses 56 anti-armor/anti-personnel submunitions. This round is available in standard and extended-range (Base Bleed) versions. Israel Military Industries (IMI) may have participated in the development of this round, as it appears in IMI sales literature.

Russian Federation. The Russians offer a significant portion of their huge stock of artillery ammunition on the international market at bargain-basement prices.

The Russian Federation continues to consolidate its ammunition manufacturing infrastructure, while developing new ammunition types employing modern technology. State-owned and -operated facilities still produce the majority of artillery ammunition in the Russian Federation. Over the next several years, semi-private organizations should become increasingly active in the export market.

FSUE 'Rosoboronexport.' This organization acts as the primary conduit between the Russian defense industry and the international market. All Russian defense contractors thus effectively operate under the auspices of Rosoboronexport. Major Russian contractors (under Rosoboronexport) involved in the unguided artillery ammunition market include the following:

The *Engineering Research Institute (NIMI)*, located in Moscow, claims to be the major developer of artillery rounds in the Russian Federation. In addition to conventional designs, this organization has also developed a submunition-dispensing projectile with anti-armor submunitions similar to those of the long-troubled U.S. Sense and Destroy Armor program. NIMI is developing its munition to be compatible with NATO-standard 155mm ordnance.

The *Nitro-Vzryv* organization produces explosive fillings and possibly propelling charges.

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The *State Engineering Research Institute GosNII* develops and produces submunitions (mines) for carrier projectiles.

The *Kotovskiy Zavod Plastmass State Enterprise* develops and produces propellant charges.

The *State Research and Production Enterprise Bazalt* develops and produces 120mm 2A60 gun/mortar ammunition.

One of the latest unguided artillery projectile developments from the Russian Federation is a 152mm projectile dispensing two top-attack anti-armor submunitions. The projectile has a projected weight of 40.7 kilograms (89.54 lb) and a maximum range of 20 kilometers (21,872 yd). The two available submunitions are similar in concept to the now-dead U.S. Sense and Destroy Armor type.

Sweden

BAE Systems Bofors. Formerly Bofors Defence AB, this reorganized Ordnance Division of Bofors again operates under the famous Bofors name. In this latest of several complex acquisitions, mergers, and name changes, Bofors absorbed the Forenade Fabriksverken firm, along with its product line.

Corporate Evolution

In 2000, United Defense Industries purchased Bofors. The contractor then began operating as Bofors Defence AB, a wholly owned subsidiary of UDI. In June 2005, BAE Systems acquired United Defense, and with it, Bofors Defence AB. The prime contractor now operates as BAE Systems Land & Armaments, BAE Systems Bofors.

Focus on NATO Standard

Bofors produces a full line of 105mm and 155mm ammunition, including 105mm projectiles for the Type 4140 light howitzer and NATO-standard 155mm projectiles for the FH-77 and FH-77B. The relevant HE M/77B ammunition is fully compatible with any NATO-standard 155mm artillery system. Bofors continues production of the MIRA illumination round, both in standard and extended-range versions.

Bofors is involved in separate projects to develop an all-Swedish Extended Range Full Bore/Base Bleed round and an Extended Range charge system for standard ammunition. Bofors currently produces the Extended Range Full Poudres Reunies de Belgique Bore Mark 10 round and the Luchaire High Explosive Base Bleed round under contract.

Bofors has also been working on the development of two sophisticated artillery projectiles. As we mentioned earlier, Bofors and Nexter have teamed to further

develop the BONUS dedicated submunition-dispensing anti-armor round in a two-phase deployment system. The HEER (High Explosive Extended Range) round is compatible with all NATO-standard 155mm howitzers; it is available in Boat Tail and Base Bleed versions. By early 2001, Bofors had produced around 414,000 HEER rounds. In 1999, after its self-imposed embargo, India resumed its procurement of ammunition (including the HEER round) from Bofors.

Bofors is increasing its efforts to license its designs around the world.

Switzerland

RUAG Ammotec. With its acquisition of Hirtenberger Defence Systems (Hirtenberger, Austria), RUAG continues to offer the Hirtenberger line of Extended Range Full Bore ammunition, optimized for the extended-range Voest Alpine GHN-45 howitzer. Hirtenberger had originally developed its line of ERFB ammunition from the PRB Mk 10 round. This spawned the advanced model SEN Extended Range Full Bore shell and the SEN-BB, a Base Bleed variant capable of 39.6-kilometer ranges. While the specialized ammunition is no longer in production, it remains in widespread service, especially in the Middle East.

United Kingdom

BAE Systems Land & Armaments. Once the world-famous RO Defence firm, this contractor has been a component of BAE Systems since mid-2000. Its Munitions & Ordnance division continues to produce artillery ammunition for the British Army, despite its loss of preferred status following privatization and the loss of the 155mm modular artillery charge contract to South Africa in 1999.

In addition to producing NATO-standard ammunition for the M107, M109, and new Artillery System 90 Braveheart self-propelled systems, BAE Systems produces 155mm ammunition for the towed FH 155-1 howitzer. This ammunition was the result of trilateral cooperation in the design phase by the United Kingdom, Italy, and Germany. When it was originally introduced, the ammunition had greater lethality and range than most other ammunition of the same caliber. BAE Systems ammunition products enjoy wide use by countries that employ U.S. and British field artillery.

Extended Range Technology

BAE Systems currently devotes its development efforts to Extended Range technology, with work continuing on range-enhancing charge increments. The contractor's latest line of 155mm ammunition – actually a private venture – is being well received on the international market. The High Explosive member of this line is

Artillery Ammunition (Europe)

capable of achieving 30,000-meter (32,808-yd) ranges for use in 39-caliber guns.

BAE Systems also continues its cooperation with the former Eurometaal (now a component of Rheinmetall Defence) on the 105mm ERM1-HE BBU extended-range round. In 1997, RO Defence and Eurometaal completed development of the ERHE2 BB round, offering greater range and lethality than the long-standard L31A3 projectile or the ERM1-HE BBU. This munition, recently redesignated the HE X/RO 03E1, has reportedly scored at least one significant export sale.

A Tough International Market

With the major reductions in ammunition procurement by the U.K. Ministry of Defence, the contractor has

striven to gain more international contracts. This effort received a blow in 1996 when India refused to sign a contract worth \$72 million for 80,000 155mm projectiles on the basis that RO Defence did not include any manufacturing technology transfer support with the contract.

At home, the contractor lost out to Israel Military Industries (IMI) for a 1995 contract worth \$79.2 million to supply the British Army 155mm extended-range submunition-dispensing projectiles.

Most recently, BAE Systems has been addressing the British Army's Tubed Artillery Conventional Ammunition System (TACAS) requirement. For this program, the contractor has teamed with Denel of South Africa.

Related News

Germany Cutting Personnel, Perhaps Programs – Germany will field a smaller military in the future. German Defense Minister Karl-Theodor zu Guttenberg has revealed plans to cut the total number of soldiers to around 165,000 from its current total of 252,000. After the cuts, the German Army will field only three tank battalions, two artillery battalions, and one paratrooper regiment. Germany also plans to eliminate conscription. The German Ministry of Defense aims to cut some EUR8.3 billion (\$10.6 billion) from its budget over the next four years. Minister Guttenberg warned that personnel cuts alone will not be enough to meet this target. Germany must also find savings in new armament projects. (Deutsche Welle, 8/10)

U.K. Eyes Defense Cuts – The new Conservative-led government in the United Kingdom is looking to cut defense spending. The new British coalition government said it must rein in the nation's soaring debt quickly. The government will also initiate a new defense review. Reports say major cuts are coming.

Cutting defense spending will not be easy. The new government is considering cutting civilian defense jobs. The British Ministry of Defence could retire aging tanks, vehicles and artillery. In addition, the Royal Air Force may have to make do with fewer fighters. Also, there may be delays in replacing the Royal Navy's four Vanguard-class ballistic missile submarines. (Defense News, 5/10)

Russia Called on to Arm Afghanistan Security Forces – NATO is planning to ask Russia to donate equipment to the Afghan National Army (ANA), including AK-47 assault rifles, grenade launchers, machine guns, artillery, armored vehicles, fuel and other items. The equipment now used by the ANA is primarily Russian. The ANA numbers close to 100,000 men, but is scheduled to expand to 134,000 by October 2010. A further 100,000 soldiers will be added to the ANA's strength over the next three years. (Townhall, 12/09)

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Funding

Individual contractors and various governments fund the development of ammunition programs.

Timetable

Several European players will likely soon field enhanced guided projectiles using improved forms of guidance such as advanced infrared or millimeter wave. These technologies may also be incorporated in submunition-dispensing rounds.

Artillery Ammunition (Europe)

Worldwide Distribution/Inventories

European artillery ammunition is widely available worldwide.

Forecast Rationale

Serial production of artillery ammunition is ongoing throughout Europe for domestic procurement and export. While Europe remains a leading supplier of advanced artillery systems and ammunition on the international market, European players face increasing competition from non-Western producers.

Consolidate and Survive

To counter their outside competitors, European players are continuing to consolidate, establishing a growing number of teaming arrangements with both European and non-European contractors. With each annual update of this report, we witness an ongoing process of corporate mergers and acquisitions in this market.

NATO-Standard Dominance

The growing acceptance of NATO-pattern 155mm artillery and ammunition as the international standard for both self-propelled and towed field artillery pieces continues to be the single greatest technical factor impacting this market. Still, a secure market for 105mm

ammunition remains because of the large number of pieces still in service worldwide. In fact, force transformation initiatives may give 105mm ordnance a whole new lease on life, as 105mm systems are particularly well-suited for highly mobile medium force requirements.

Europe's Healthy Market Share

The European market for artillery ammunition remains quite healthy even though it is not as large as it once was. Production averages nearly one million rounds per year among the European players. At its height during the Cold War, the European artillery ammunition industry – on both sides of the Iron Curtain – produced millions of artillery projectiles per year.

With the development of enhanced-performance (extended-range and terminally guided) projectiles, the European players will also command an increasingly large share of the total value of the international artillery ammunition market.

Ten-Year Outlook

Given the scarcity of open-source data regarding European artillery ammunition production, developing a viable 10-year production outlook has become increasingly problematic. Nevertheless, the Forecast International Weapons Group expects the combined output of European manufacturers will average nearly 1 million rounds per year through 2019.

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