

ARCHIVED REPORT

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20 to 57mm Cannon Ammunition (Europe)

Outlook

- Serial production ongoing; international acceptance of NATO-standard 30mm ammunition continues to grow
- European players continue to dominate this market, despite increasing competition from non-U.S. and non-European players
- We expect production of medium-caliber cannon ammunition from all European sources to average about 40 million rounds annually through 2019

Orientation

Description. Ammunition for medium-caliber automatic cannon, 20mm to 57mm.

Sponsor. Both individual contractors and various governments sponsor ammunition development.

Licensees. Due to the unique nature of this market, players rarely, if ever, make licensing arrangements.

Status. Development through serial production.

Total Produced. Through 2009, we estimate the various European contractors produced over 1.62 billion

medium-caliber automatic cannon cartridges since 1980 inclusive.

Application. Ammunition for vehicle- and aircraft-mounted automatic cannon, providing direct-fire and air-defense support for offensive and defensive ground operations.

Price Range. In 2010 U.S. dollars, the unit prices range from \$1.12 for some 20x82mm rounds to \$23.83 for some of the advanced-technology 40x365mm cartridges.

Contractors

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
BAE Systems Land & Armaments, Global Combat Systems - Munitions	http://www.baesystems.com , The Steel, Ridsdale, Bellingham, NE48 2EZ Northumberland, United Kingdom, Prime
Diehl BGT Defence GmbH & Co KG, Plant Überlingen	http://www.diehl-bgt-defence.de , Alte Nussdorfer Strasse 13, Überlingen, 88662 Germany, Tel: + 49 75 51 8901, Fax: + 49 75 51 89 2822, Email: gerhard.dussler@bgt.de , Prime

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FN Herstal SA	http://www.fnherstal.com , Voie de Liège 33, Herstal, 4040 Belgium, Tel: + 32 4 240 81 11, Fax: + 32 4 240 88 99, Email: info@fnherstal.com , Prime
Federal State Unitary Enterprise, Rosoboronexport, Rosoboronexport State Corp	http://www.rusarm.ru , 27/3 Stromynka St, Moscow, 107076 Russian Federation, Tel: + 7 495 964 61 40, Fax: + 7 495 963 26 13, 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
Rheinmetall Air Defence AG	http://www.rheinmetall-defence.com , Birchstrasse 155, Zurich, 8050 Switzerland, Tel: + 41 44 316 2211, Fax: + 41 44 311 3154, Email: info@ocag.ch, 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
Simmel Difesa SpA	http://www.simmeldifesa.com , Via Ariana 5,2, Colleferro, 00034 Italy, Tel: + 39 06 97 09 2400, Fax: + 39 06 97 09 2350, Email: info@simmeldifesa.com, Prime

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

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. Given the wide availability of medium-caliber automatic cannon ammunition of all types worldwide – and in an effort to avoid redundancy and confusion – we only list commonly used medium-caliber ammunition in this report, by caliber.

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
20x82mm		
Unknown	Armor Piercing Incendiary	Nexter Munitions
Unknown	Armor Piercing-Tracer	Nexter Munitions
Unknown	High Explosive Incendiary	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
20x102mm		
DM23A1	Armor Piercing Incendiary	Diehl BGT Defence
M.DN-71	High Explosive Incendiary	Diehl BGT Defence
unknown	Target Practice	Diehl BGT Defence
DM111	Shrapnel	Diehl BGT Defence
FN140	Target Practice	FN Herstal
FN141	Target Practice-Tracer	FN Herstal
FN142	High Explosive Incendiary-Tracer	FN Herstal
FN143	High Explosive Incendiary	FN Herstal
FN144	Armor Piercing Incendiary	FN Herstal
MU10	Target Practice	Nexter Munitions
M56A3	High Explosive Incendiary	Nexter Munitions
M242	High Explosive Incendiary-Tracer	Nexter Munitions
M53	Armor Piercing Incendiary	Nexter Munitions
M55A2	Target Practice	Nexter Munitions
M220	Target Practice-Tracer	Nexter Munitions
unknown	Armor Piercing High Capacity-Tracer	Nexter Munitions
unknown	Armor Piercing-Tracer	Nexter Munitions
M55A2	Target Practice-Tracer	Nexter Munitions
PEA-280	Frangible Armor Piercing	Oerlikon Contraves
M56A3	High Explosive Incendiary	Simmel Difesa
M55A2	Target Practice-Tracer	Simmel Difesa
M53	Armor Piercing Incendiary	Simmel Difesa

20 to 57mm Cannon Ammunition (Europe)

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
20x110mm RB		
FN65	Target Practice	FN Herstal
FN63	Target Practice	FN Herstal
FN60	High Explosive Incendiary	FN Herstal
FN62	High Explosive Incendiary-Tracer	FN Herstal
FN71	High Explosive Incendiary-Tracer	FN Herstal
FN72	Semi-Armor Piercing-Tracer	FN Herstal
HLA	Armor Piercing-Tracer	Oerlikon Contraves
MSA	High Explosive Incendiary	Oerlikon Contraves
MLA	High Explosive Incendiary-Tracer	Oerlikon Contraves
PSA	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
PLA	Semi-Armor Piercing High Explosive Incendiary-Tracer	Oerlikon Contraves
UGA	Target Practice	Oerlikon Contraves
ULA	Target Practice-Tracer	Oerlikon Contraves
HLA	Armor Piercing-Tracer	Simmel Difesa
UGA	Target Practice	Simmel Difesa
MN13	Target Practice	Simmel Difesa
unknown	High Explosive Incendiary	Simmel Difesa
unknown	High Explosive	Simmel Difesa
unknown	High Explosive-Tracer	Simmel Difesa
unknown	Target Practice	Simmel Difesa
20x110mm		
FN85	Target Practice	FN Herstal
FN83	Target Practice-Tracer	FN Herstal
FN80	High Explosive Incendiary	FN Herstal
FN82	High Explosive Incendiary-Tracer	FN Herstal
FN92	High Explosive Incendiary-Tracer	FN Herstal
FN94	Armor Piercing Incendiary-Tracer	FN Herstal
unknown	High Explosive Incendiary	Nexter Munitions
unknown	High Explosive Incendiary-Tracer	Nexter Munitions
unknown	Armor Piercing-Tracer	Nexter Munitions
unknown	Target Practice	Nexter Munitions
unknown	Target Practice-Tracer	Nexter Munitions
unknown	High Explosive Incendiary	Oerlikon Contraves
unknown	High Explosive Incendiary-Tracer	Oerlikon Contraves
unknown	High Explosive	Oerlikon Contraves
unknown	Armor Piercing Incendiary	Oerlikon Contraves
unknown	Armor Piercing Incendiary-Tracer	Oerlikon Contraves
unknown	Target Practice	Oerlikon Contraves
unknown	Target Practice-Tracer	Oerlikon Contraves
unknown	High Explosive Incendiary	Simmel Difesa
Unknown	High Explosive Incendiary-Tracer	Simmel Difesa
Unknown	High Explosive	Simmel Difesa
Unknown	Armor Piercing Incendiary	Simmel Difesa
Unknown	Semi-Armor Piercing Incendiary	Simmel Difesa
Unknown	Armor Piercing-Tracer	Simmel Difesa
Unknown	Target Practice	Simmel Difesa
Unknown	Target Practice-Tracer	Simmel Difesa
Unknown	Blank	Simmel Difesa
Unknown	Blank-Tracer	Simmel Difesa
20x110mm USN		
FN140	Target Practice	FN Herstal
FN141	Inert	FN Herstal
FN142A1	High Explosive Incendiary-Tracer	FN Herstal
FN143A1	High Explosive Incendiary	FN Herstal
FN144	Armor Piercing	FN Herstal

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
20x128mm		
Unknown	High Explosive Incendiary	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer	Nexter Munitions
Unknown	Armor Piercing	Nexter Munitions
Unknown	Armor Piercing-Tracer	Nexter Munitions
Unknown	Semi-Armor Piercing High Explosive Incendiary	Nexter Munitions
Unknown	Semi-Armor Piercing High Explosive Incendiary-Tracer	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
MLA	High Explosive Incendiary-Tracer	Oerlikon Contraves
MSA	High Explosive Incendiary*	Oerlikon Contraves
HLA	Armor Piercing-Tracer	Oerlikon Contraves
Unknown	Armor Piercing Incendiary-Tracer	Oerlikon Contraves
PSA	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
PLA	Semi-Armor Piercing High Explosive Incendiary-Tracer	Oerlikon Contraves
ULA	Target Practice-Tracer	Oerlikon Contraves
UGA	Target Practice	Oerlikon Contraves
20x139mm		
DM101	High Explosive Incendiary	Diehl BGT Defence
M599	High Explosive Incendiary	Diehl BGT Defence
DM81	High Explosive Incendiary	Diehl BGT Defence
DM48A1	Target Practice-Tracer	Diehl BGT Defence
DM111	High Explosive Fragmentation	Diehl BGT Defence
DM78-A1	Target Practice/Break-up*	Nexter Munitions
unknown	Target Practice	Nexter Munitions
unknown	Target Practice-Tracer	Nexter Munitions
unknown	High Explosive Incendiary	Nexter Munitions
unknown	High Explosive Incendiary-Tracer	Nexter Munitions
unknown	Armor Piercing Incendiary	Nexter Munitions
unknown	Armor Piercing Incendiary-Tracer	Nexter Munitions
unknown	Armor Piercing-Tracer	Nexter Munitions
unknown	Semi-Armor Piercing High Explosive Incendiary	Nexter Munitions
unknown	High Explosive Incendiary	Nexter Munitions
ULA	Target Practice-Tracer	Oerlikon Contraves
UGA	Target Practice	Oerlikon Contraves
MSA	High Explosive Incendiary	Oerlikon Contraves
MLA	High Explosive Incendiary-Tracer	Oerlikon Contraves
PLA	Semi-Armor Piercing High Explosive Incendiary-Tracer	Oerlikon Contraves
PSA	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
HLA	Armor Piercing-Tracer	Oerlikon Contraves
20x139mm		
DM63	Armor Piercing Discarding Sabot-Tracer	Rheinmetall Defence
DM43-A1	Armor Piercing Incendiary-Tracer	Rheinmetall Defence
Unknown	High Explosive Incendiary	Rheinmetall Defence
DM78-A1	Target Practice/Break-up*	Rheinmetall Defence
DM48	Target Practice	Rheinmetall Defence
DM48-A1	Target Practice-Tracer	Rheinmetall Defence
DM51-A2	High Explosive Incendiary-Tracer	Rheinmetall Defence
DM81	High Explosive Incendiary-Tracer	Rheinmetall Defence
DM111	High Explosive Fragmentation	Rheinmetall Defence
ULA	Target Practice-Tracer	BAE Systems
UGA	Target Practice	BAE Systems
MLA	High Explosive Incendiary-Tracer	BAE Systems
MSA	High Explosive Incendiary	BAE Systems
PLA	Semi-Armor Piercing High Explosive Incendiary-Tracer	BAE Systems
PSA	Semi-Armor Piercing High Explosive Incendiary	BAE Systems
HLA	Armor Piercing-Tracer	BAE Systems

20 to 57mm Cannon Ammunition (Europe)

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
HLA	Armor Piercing-Tracer	Simmel Difesa
UGA	Target Practice	Simmel Difesa
20x145mm		
Unknown	High Explosive-Tracer	BAE Systems Bofors
Unknown	Armor Piercing-Tracer	BAE Systems Bofors
Unknown	Target Practice-Tracer	BAE Systems Bofors
23x115mm		
F3	High Explosive Incendiary	Rosoboronexport
OF3	High Explosive Fragmentation	Rosoboronexport
OF3T	High Explosive Fragmentation-Tracer	Rosoboronexport
B3T	Armor Piercing Incendiary-Tracer	Rosoboronexport
BT	Armor Piercing-Tracer	Rosoboronexport
BP	Armor Piercing	Rosoboronexport
MZ	High Explosive Submunition Dispensing	Rosoboronexport
NPL	Window dispensing	Rosoboronexport
IK	Infrared Jamming	Rosoboronexport
OZT	High Explosive Incendiary-Tracer	Rosoboronexport
OZT/NZ	High Explosive Incendiary-Tracer	Rosoboronexport
OZ	High Explosive Incendiary	Rosoboronexport
BZ	Armor Piercing Incendiary	Rosoboronexport
BZ-A	Armor Piercing Incendiary-Tracer	Rosoboronexport
23x152mm B		
Unknown	Armor Piercing Incendiary	Rosoboronexport
PMA276	Frangible Armor Piercing	Oerlikon Contraves
OF3	High Explosive Incendiary	Rosoboronexport
OF3T	High Explosive Incendiary-Tracer	Rosoboronexport
B3T	Armor Piercing-Tracer	Rosoboronexport
OZT	High Explosive Incendiary	Rosoboronexport
BZ	Armor Piercing Incendiary	Rosoboronexport
25x137mm		
PMB-050	High Explosive Incendiary-Tracer	S.C. Arsenal-Resita
Unknown	Semi-Armor Piercing High Explosive Incendiary-Tracer	S.C. Arsenal-Resita
PMB-054	Armor Piercing Incendiary-Tracer	S.C. Arsenal-Resita
PMB-091	Armor Piercing Discarding Sabot-Tracer	S.C. Arsenal-Resita
PMB-073	Armor Piercing Discarding Sabot-Tracer	S.C. Arsenal-Resita
PMB-090	Armor Piercing Fin Stabilized Discarding Sabot-Tracer	S.C. Arsenal-Resita
PMB-052	Target Practice-Tracer	S.C. Arsenal-Resita
PMB-072	Target Practice Discarding Sabot-Tracer	S.C. Arsenal-Resita
Unknown	High Explosive Incendiary	Diehl BGT Defence
Unknown	Armor Piercing High Explosive	Diehl BGT Defence
Unknown	Semi-Armor Piercing High Explosive	Diehl BGT Defence
unknown	Target Practice-Tracer	Diehl BGT Defence
unknown	High Explosive Incendiary	Nexter Munitions
unknown	High Explosive Incendiary-Tracer	Nexter Munitions
unknown	Armor Piercing Incendiary-Tracer	Nexter Munitions
unknown	Armor Piercing Incendiary	Nexter Munitions
unknown	Semi-Armor Piercing High Explosive Incendiary-Tracer	Nexter Munitions
unknown	Semi-Armor Piercing High Explosive Incendiary	Nexter Munitions
unknown	Armor Piercing Discarding Sabot	Nexter Munitions
unknown	Armor Piercing Discarding Sabot-Tracer	Nexter Munitions
unknown	Target Practice-Tracer	Nexter Munitions
unknown	Target Practice	Nexter Munitions
PMB 050	High Explosive Incendiary-Tracer	Oerlikon Contraves
unknown	Semi-Armor Piercing High Explosive Incendiary-Tracer	Oerlikon Contraves
PMB-054	Armor Piercing Incendiary-Tracer	Oerlikon Contraves
PMB-091	Armor Piercing Discarding Sabot-Tracer	Oerlikon Contraves
PMB-073	Armor Piercing Discarding Sabot-Tracer	Oerlikon Contraves

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
PMB-090	Armor Piercing Fin Stabilized Discarding Sabot-Tracer	Oerlikon Contraves
PMB-090/098	Frangible Armor Piercing Discarding Sabot	Oerlikon Contraves
PMB-052	Target Practice-Tracer	Oerlikon Contraves
PMB-072	Target Practice Discarding Sabot-Tracer	Oerlikon Contraves
SLB-050	High Explosive Incendiary-Tracer	BAE Systems
PLB-054	Armor Piercing Incendiary-Tracer	BAE Systems
TLB-073	Armor Piercing Discarding Sabot-Tracer	BAE Systems
25x184mm		
ULB-066	Armor Piercing	S.C. Arsenal-Resita
SSB-064	High Explosive Incendiary	S.C. Arsenal-Resita
TLB-067	Armor Piercing Discarding Sabot-Tracer	S.C. Arsenal-Resita
TKB-075	Anti-Missile Discarding Sabot	S.C. Arsenal-Resita
Unknown	Target Practice	S.C. Arsenal-Resita
Unknown	Target Practice-Tracer	S.C. Arsenal-Resita
Unknown	Target Practice Discarding Sabot-Tracer	S.C. Arsenal-Resita
ULB-066	Armor Piercing-Target Practice	Oerlikon Contraves
SSB-064	High Explosive Incendiary	Oerlikon Contraves
TLB-067	Armor Piercing Discarding Sabot-Tracer	Oerlikon Contraves
TKB-075	Anti-Missile Discarding Sabot	Oerlikon Contraves
Unknown	Target Practice	Oerlikon Contraves
Unknown	Target Practice-Tracer	Oerlikon Contraves
Unknown	Target Practice Discarding Sabot-Tracer	Oerlikon Contraves
ULB-066	Target Practice	BAE Systems
SSB-064	High Explosive Incendiary	BAE Systems
TLB-067	Armor Piercing Discarding Sabot-Tracer	BAE Systems
TKB-075	Anti-Missile Discarding Sabot	BAE Systems
25x205mm		
UOZR-132	High Explosive Incendiary-Tracer	Rosoboronexport
UZR-132	Armor Piercing-Tracer	Rosoboronexport
25x218mm		
UOZR-132	High Explosive Incendiary-Tracer	Rosoboronexport
Unknown	High Explosive Incendiary-Tracer	Rosoboronexport
OZR-85M	High Explosive Incendiary	Rosoboronexport
BR-85	Armor Piercing-Tracer	Rosoboronexport
27x145mm B		
DM21	High Explosive	Diehl BGT Defence
DM11	High Explosive*	Diehl BGT Defence
DM33	Armor Piercing	Diehl BGT Defence
DM13	Armor Piercing High Explosive Incendiary	Diehl BGT Defence
DM23	Armor Piercing High Explosive*	Diehl BGT Defence
DM18	Target Practice	Diehl BGT Defence
DM28	Target Practice	Diehl BGT Defence
DM72	Target Practice (marker)	Diehl BGT Defence
Unknown	Target Practice/Break-up	Diehl BGT Defence
DM10	Inert	Diehl BGT Defence
PEB 299	Frangible Armor Piercing	Rheinmetall Defence
Unknown	Armor Piercing	BAE Systems
Unknown	Armor Piercing High Explosive Incendiary	BAE Systems
Unknown	High Explosive Incendiary	BAE Systems
Unknown	Target Practice-Tracer	BAE Systems
Unknown	Armor Piercing	Simmel Difesa
Unknown	Armor Piercing High Explosive Incendiary	Simmel Difesa
Unknown	High Explosive Incendiary	Simmel Difesa
Unknown	Target Practice-Tracer	Simmel Difesa

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
30x113mm B (ADEN)		
FN2	Target Practice	FN Herstal
FN3	High Explosive Incendiary	FN Herstal
Type 5879	Armor Piercing-Tracer	Nexter Munitions
Type 2469	Target Practice	Nexter Munitions
Type 5478	High Explosive Incendiary	Nexter Munitions
Type 5479	High Explosive Incendiary	Nexter Munitions
Type 7478	High Explosive Incendiary	Nexter Munitions
Type 7479	High Explosive Incendiary	Nexter Munitions
MSC	High Explosive Incendiary	Oerlikon Contraves
PSC	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
UGC	Target Practice	Oerlikon Contraves
MSC	High Explosive Incendiary	BAE Systems
RO376	High Explosive Incendiary	BAE Systems
PSC	Semi-Armor Piercing High Explosive Incendiary	BAE Systems
UGC	Target Practice	BAE Systems
RO379	High Explosive-Tracer	BAE Systems
30x113mm B (DEFA)		
FN21	Armor Piercing High Explosive Incendiary	FN Herstal
FN23	High Explosive Incendiary*	FN Herstal
FN24	High Explosive Incendiary	FN Herstal
FN45	Target Practice	FN Herstal
FN46	Target Practice-Tracer	FN Herstal
FN47	Target Practice	FN Herstal
Type 7570	Mine-High Explosive Incendiary	Nexter Munitions
Type 7571	Mine-High Explosive Incendiary	Nexter Munitions
Type 7572	Mine-High Explosive Incendiary	Nexter Munitions
Type 5270	Armor Piercing Incendiary	Nexter Munitions
Type 5271	Armor Piercing Incendiary	Nexter Munitions
Type 5272	Armor Piercing Incendiary	Nexter Munitions
Type 5870	Semi-Armor Piercing High Explosive Incendiary	Nexter Munitions
Type 5970	Armor Piercing-Tracer	Nexter Munitions
Type 2570	Target Practice	Nexter Munitions
Type 2270	Target Practice	Nexter Munitions
Type 3170	Target Practice-Tracer	Nexter Munitions
Type 6171	High Explosive Indicator	Nexter Munitions
Type 6172	Smoke Indicator	Nexter Munitions
Type 3171	Target Practice Indicator	Nexter Munitions
Type 3172	Target Practice Indicator	Nexter Munitions
Unknown	Target Practice	BAE Systems
Unknown	Target Practice-Tracer	BAE Systems
Unknown	High Explosive Incendiary	BAE Systems
Unknown	High Explosive Incendiary*	BAE Systems
Unknown	Armor Piercing High Explosive Incendiary	BAE Systems
30x150mm B		
OEIFC	High Explosive Incendiary	Nexter Munitions
TP(OX)	Target Practice	Nexter Munitions
Unknown	Armor Piercing-Tracer	Nexter Munitions
Unknown	Armor Piercing Discarding Sabot-Tracer	Nexter Munitions
30x170mm KCB		
OEI-76	High Explosive Incendiary	Nexter Munitions
OEIT-76	High Explosive Incendiary-Tracer	Nexter Munitions
OX-59	Target Practice	Nexter Munitions
OXT-59	Target Practice-Tracer	Nexter Munitions
MN17	Target Practice*	Nexter Munitions
30-831-L	Target Practice	Nexter Munitions
30-831-L	Target Practice-Tracer	Nexter Munitions
30-831-L	High Explosive Incendiary	Nexter Munitions

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
30-831-L	High Explosive Incendiary-Tracer	Nexter Munitions
30-831-L	Armor Piercing-Tracer	Nexter Munitions
30-831-L	Semi-Armor Piercing High Explosive Incendiary	Nexter Munitions
MSC	High Explosive Incendiary	Oerlikon Contraves
MLC	High Explosive Incendiary-Tracer	Oerlikon Contraves
PSC	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
UGC	Target Practice	Oerlikon Contraves
ULC	Target Practice-Tracer	Oerlikon Contraves
L14A2	Armor Piercing Discarding Sabot	BAE Systems
L5A2	Armor Piercing	BAE Systems
L13A1	High Explosive Incendiary-Tracer	BAE Systems
L12A1	Target Practice-Tracer	BAE Systems
30x170mm RARDEN		
Unknown	High Explosive Incendiary*	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer*	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
L13A1	High Explosive-Tracer	BAE Systems
L5A2	Armor Piercing	BAE Systems
L14A2/A3	Armor Piercing Discarding Sabot	BAE Systems
L12A1	Target Practice-Tracer	BAE Systems
RO-275	Target Practice	BAE Systems
Unknown	Armor Piercing Fin Stabilized Discarding Sabot	BAE Systems
30x173mm KCA		
Unknown	High Explosive Incendiary	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
Unknown	High Explosive Incendiary	Oerlikon Contraves
Unknown	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
Unknown	Target Practice	Oerlikon Contraves
PMC-283	Frangible Armor Piercing Discarding Sabot	Oerlikon Contraves
PMC-287	Armor Piercing Fin Stabilized Discarding Sabot-Tracer	Oerlikon Contraves
PMC-307	Target Practice Fin Stabilized Discarding Sabot-Tracer	Oerlikon Contraves
PMC-308	High Explosive Fragmentation (AHEAD)	Oerlikon Contraves
ABM	High Explosive Fragmentation (AHEAD)	Oerlikon Contraves
FAPDS	Frangible Armor Piercing Discarding Sabot	Rheinmetall Defence
FMPDS	Frangible Discarding Sabot	Rheinmetall Defence
MPDS	Armor Piercing Discarding Sabot	Rheinmetall Defence
30x178mm		
Unknown	High Explosive Incendiary-Tracer	Rosoboronexport
F3	High Explosive Incendiary	Rosoboronexport
Unknown	Semi-Armor Piercing High Explosive Incendiary	Rosoboronexport
OF3	High Explosive Fragmentation	Rosoboronexport
OF3T	High Explosive Fragmentation-Tracer	Rosoboronexport
BT	Armor Piercing-Tracer	Rosoboronexport
BP	Armor Piercing High Explosive	Rosoboronexport
MZ	High Explosive Submunition	Rosoboronexport
Unknown	Target Practice-Tracer	Rosoboronexport
Unknown	Target Practice	Rosoboronexport
35x228mm		
MLD-040	High Explosive Incendiary-Tracer	S.C. Arsenal-Resita
MSD-042	High Explosive Incendiary	S.C. Arsenal-Resita
MSD-054	High Explosive Incendiary	S.C. Arsenal-Resita
SSD-048	High Explosive Incendiary	S.C. Arsenal-Resita
SSD-052	High Explosive Incendiary	S.C. Arsenal-Resita
PLD-044	Semi-Armor Piercing High Explosive Incendiary	S.C. Arsenal-Resita

20 to 57mm Cannon Ammunition (Europe)

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
TLD-038	Armor Piercing Discarding Sabot-Tracer	S.C. Arsenal-Resita
UGD-035	Target Practice	S.C. Arsenal-Resita
KLD-045	Target Practice-Tracer	S.C. Arsenal-Resita
ULD-034	Target Practice-Tracer	S.C. Arsenal-Resita
DM11	High Explosive Incendiary*	Diehl BGT Defence
DM13	Armor Piercing High Explosive Incendiary	Diehl BGT Defence
DM23	High Velocity Armor Piercing Discarding Sabot-Tracer	Diehl BGT Defence
DM18	Target Practice	Diehl BGT Defence
DM31	High Explosive Incendiary	Diehl BGT Defence
DM68	Target Practice-Tracer	Diehl BGT Defence
DM78	Target Practice-Tracer	Diehl BGT Defence
DM88	Target Practice-Tracer	Diehl BGT Defence
MSD-042	High Explosive Incendiary*	Nexter Munitions
unknown	High Explosive Incendiary-Tracer*	Nexter Munitions
unknown	Semi-Armor Piercing High Explosive Incendiary-Tracer	Nexter Munitions
unknown	Target Practice	Nexter Munitions
KLD-045	Target Practice-Tracer	Nexter Munitions
MLD-040	High Explosive Incendiary-Tracer	Oerlikon Contraves
MSD-042	High Explosive Incendiary	Oerlikon Contraves
MSD-054	High Explosive Incendiary	Oerlikon Contraves
SSD-048	High Explosive Incendiary	Oerlikon Contraves
SSD-052	High Explosive Incendiary	Oerlikon Contraves
PLD-044	Semi-Armor Piercing High Explosive Incendiary	Oerlikon Contraves
AHEAD	Armor Piercing (sub-projectile)	Oerlikon Contraves
TLD-038	Armor Piercing Discarding Sabot-Tracer	Oerlikon Contraves
UGD-035	Target Practice	Oerlikon Contraves
KLD-045	Target Practice-Tracer	Oerlikon Contraves
unknown	Target Practice/Break-up*	Oerlikon Contraves
ULD-034	Target Practice-Tracer	Oerlikon Contraves
unknown	High Explosive	Rheinmetall Defence
DM33	Frangible Armor Piercing Fin Stabilized Discarding Sabot	Rheinmetall Defence
PMD 040/042	High Explosive Incendiary	Rheinmetall Defence
PMD 048/074	High Explosive Incendiary	Rheinmetall Defence
PMD 064	Target Practice-Tracer	Rheinmetall Defence
PMB 058	Break Up Test Round	Rheinmetall Defence
MSD-042	High Explosive Incendiary	BAE Systems
MLD-040	High Explosive Incendiary-Tracer	BAE Systems
MSD-054	High Explosive Incendiary	BAE Systems
SSD-052	High Explosive Incendiary	BAE Systems
SSD-048	High Explosive Incendiary	BAE Systems
PLD-044	Semi-Armor Piercing High Explosive Incendiary	BAE Systems
TLD-038	Armor Piercing Discarding Sabot-Tracer	BAE Systems
UGD-035	Target Practice	BAE Systems
ULD-034	Target Practice-Tracer	BAE Systems
KLD-045	Target Practice-Tracer	BAE Systems
37x210mm		
OR-167	Fragmentation	Rosoboronexport
OR-167N	Fragmentation-Tracer	Rosoboronexport
unknown	High Explosive	Rosoboronexport
BR-167	Armor Piercing-Tracer	Rosoboronexport
40x311mm		
Unknown	High Explosive-Tracer	BAE Systems Bofors
Unknown	Target Practice-Tracer	BAE Systems Bofors
Unknown	Armor Piercing High Capacity-Tracer	BAE Systems Bofors
Unknown	Pre-Fragmented High Explosive	BAE Systems Bofors
L/60-MPT	High Explosive Incendiary-Tracer	BAE Systems Bofors
DM71	High Explosive Incendiary-Tracer	Diehl BGT Defence
Unknown	Armor Piercing-Tracer	Diehl BGT Defence
Unknown	Target Practice-Tracer	Diehl BGT Defence

20 to 57mm Cannon Ammunition (Europe)

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
FN110	Armor Piercing-Tracer	FN Herstal
FN113	Target Practice-Tracer	FN Herstal
FN116	High Explosive Incendiary-Tracer	FN Herstal
FN117	High Explosive Incendiary-Tracer*	FN Herstal
FN108	Pre-Fragmented High Explosive	FN Herstal
FN109	Pre-Fragmented Spotter	FN Herstal
Unknown	Target Practice/Break-up*	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer	Nexter Munitions
Unknown	Armor Piercing-Tracer	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
Unknown	Target Practice/Break-up*	Oerlikon Contraves
Unknown	High Explosive-Tracer	Simmel Difesa
Unknown	High Explosive Incendiary-Tracer	Simmel Difesa
Unknown	Target Practice	Simmel Difesa
Unknown	Target Practice	Simmel Difesa
Unknown	Target Practice-Tracer	Simmel Difesa
Unknown	High Explosive Incendiary	Simmel Difesa
Unknown	High Explosive Incendiary-Tracer	Simmel Difesa
Unknown	High Explosive	Simmel Difesa
Unknown	High Explosive-Tracer	Simmel Difesa
Unknown	Armor Piercing Capped Tracer	Simmel Difesa
Unknown	Pre-Fragmented High Explosive	Simmel Difesa
40x365mm		
Unknown	High Explosive-Tracer	BAE Systems Bofors
unknown	Multi-Purpose-Tracer	BAE Systems Bofors
Unknown	Target Practice-Tracer	BAE Systems Bofors
Unknown	Armor Piercing Fin Stabilized Discarding Sabot-Tracer	BAE Systems Bofors
Unknown	Target Practice Discarding Sabot-Tracer	BAE Systems Bofors
Unknown	Pre-Fragmented High Explosive	BAE Systems Bofors
TRINITY-3P	Proximity Fuzed Pre-Fragmented High Explosive	BAE Systems Bofors
Unknown	High Explosive	BAE Systems Bofors
L/70 MPT	High Explosive Incendiary-Tracer	BAE Systems Bofors
Unknown	High Capacity High Explosive	BAE Systems Bofors
Unknown	Armor Piercing Capped-Tracer	BAE Systems Bofors
DM68	Target Practice-Tracer	Diehl BGT Defence
DM81-A2	High Explosive Incendiary-Tracer	Diehl BGT Defence
DM31-A3	High Explosive Incendiary-Tracer	Diehl BGT Defence
M-DN-81	Pre-Fragmented High Explosive	Diehl BGT Defence
M-DN-71	Pre-Fragmented High Explosive-Tracer	Diehl BGT Defence
M-DN-61	Pre-Fragmented High Explosive	Diehl BGT Defence
M-DN-51	Pre-Fragmented High Explosive-Tracer	Diehl BGT Defence
FN120	Armor Piercing-Tracer	FN Herstal
FN125	High Explosive Incendiary*	FN Herstal
FN123	High Explosive Incendiary-Tracer*	FN Herstal
FN124	Target Practice-Tracer	FN Herstal
FN126	Target Practice	FN Herstal
FN131	Target Practice	FN Herstal
FN128-A1	Pre-Fragmented High Explosive	FN Herstal
FN129-A1	Pre-Fragmented Spotter	FN Herstal
Unknown	Break-up*	Nexter Munitions
Unknown	High Explosive Incendiary*	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer*	Nexter Munitions
Unknown	Armor Piercing-Tracer	Nexter Munitions
Unknown	Target Practice	Nexter Munitions
Unknown	Target Practice-Tracer	Nexter Munitions
Unknown	Pre-Fragmented High Explosive Incendiary	Nexter Munitions
Unknown	High Explosive Incendiary-Tracer	Simmel Difesa
Unknown	Target Practice-Tracer	Simmel Difesa
Unknown	Pre-Fragmented High Explosive	Simmel Difesa

20 to 57mm Cannon Ammunition (Europe)

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
Unknown	Target Practice-Tracer	Simmel Difesa
Unknown	High Explosive Incendiary	Simmel Difesa
Unknown	High Explosive Incendiary-Tracer	Simmel Difesa
Unknown	High Explosive	Simmel Difesa
Unknown	High Explosive-Tracer	Simmel Difesa
Unknown	Armor Piercing Fin Stabilized Discarding Sabot	Simmel Difesa
Unknown	Target Practice	Simmel Difesa
57x401mm		
3P	Proximity Fuzed Pre-Fragmented High Explosive	BAE Systems Bofors
BR-281	Armor Piercing Capped Tracer	Rosoboronexport
BR-281U	Armor Piercing Capped Tracer	Rosoboronexport
UOR-281	High Explosive Fragmentation-Tracer	Rosoboronexport
UOR-281U	High Explosive Fragmentation-Tracer	Rosoboronexport
Unknown	Target Practice-Tracer	Rosoboronexport
Mk 281	Blank	Rosoboronexport

*Self-destruct type ammunition



Belgian Army CVR(T) Scimitar Live-Fire Training

Source: Belgian Army

Variants/Upgrades

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

Modernization and Retrofit Overview. Not applicable. The contractors integrate product improvements as production cut-ins.

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Program Review

Background. The medium-caliber automatic cannon provides a cost-effective means of outfitting light combat vehicles and aircraft with effective firepower. Since the 1980s, medium-caliber automatic cannon have become firmly established in four areas:

- Light armored vehicle armament
- Light anti-aircraft systems
- Naval secondary/anti-aircraft ordnance
- Aircraft armament systems

While development work in medium-caliber automatic cannon ammunition has typically concentrated on the interface of fuze and ammunition types, the development of course-corrected and even fully guided projectiles for automatic cannon is rapidly accelerating. In the field of air defense, such developments are essential; the new Oerlikon AHEAD and Bofors 3P ammunition systems represent major steps in this direction.

In other mission areas, such as combat vehicle-mounted ordnance, the requirements for high rates of fire coupled with good critical hit probability effectively trump the potential benefits of advanced "smart" munitions.

Case-Telescoped Technology

One of the most significant advances in medium-caliber ammunition for automatic cannon is the development of case-telescoped technology. This technology, which enables the employment of much lighter and more compact weapons systems, is of particular significance to rotary-wing aircraft and armored vehicles. As France, Germany, the United Kingdom, and the United States are already heavily involved in the development of this technology, it seems a foregone conclusion that a significant demand for case-telescoped ordnance and ammunition will emerge on the international market in the foreseeable future.

At present, more than 35 European contractors are involved in the medium-caliber automatic cannon ammunition market. In this report, we briefly review only the most active players in the European market, so as to present a cross-section of the market.

Belgium

FN Herstal SA. The internationally famous Fabrique Nationale Herstal firm continues to produce and market a comprehensive range of automatic cannon ammunition, including:

- 20mm ammunition for the Vulcan, Oerlikon, and Hispano-Suiza cannon
- 30mm ammunition for the ADEN and DEFA aircraft cannon
- 40mm ammunition for the L/60 and L/70 Bofors cannon

The firm has exported all of these ammunition types, in addition to producing cannon ammunition for the Belgian armed forces. The main export market for the Belgian company has been in Africa, where many nations continue their traditional policy of purchasing from the former colonial powers.

Advanced 40mm Ammunition

More recently, FN Herstal has concentrated development efforts on the manufacture of advanced patterns of 40mm ammunition. In cooperation with Thomson-DASA Armements and Thales (formerly Thomson-CSF), FN Herstal recently launched its new-generation, shorter, pre-fragmented proximity-fuzed ammunition for the popular Bofors L/70 cannon. This new-generation ammunition is particularly effective against low-altitude targets.

By developing improved ammunition and involving itself in a product improvement program for the Bofors L/60 cannon, FN Herstal intends to increase its market share and possibly create additional markets for its ammunition. Given the large numbers of Bofors L/60 weapons still in service around the world, this is hardly a wildly speculative goal. By granting the L/60 a new lease on life, FN Herstal is creating an extended life for its ammunition products.

France

Nexter Munitions. Formerly Giat Industries, this organization continues to dominate the production of automatic cannon ammunition in France. Nexter, along with its Luchaire and Manurhin Defense subsidiaries, is among the world's largest sources of 20mm to 57mm ammunition. In addition, CTA International operates as a company jointly held by Nexter and BAE Systems.

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

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- Nexter Electronics
- Nexter Mechanics

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

Nexter – Luchaire

Nexter (Luchaire) has produced many ammunition components, developed and tested new ammunition types, and produced ammunition for practice. Nexter (Luchaire) markets 20mm, 30mm, and 40mm self-disintegrating practice ammunition, as well as the Mine-High Explosive Incendiary round for the 30mm HS831A.

Nexter – Manurhin

Manurhin Defense has long been the source for a good portion of France's automatic cannon ammunition. The firm produces the following ammunition types:

- 20mm ammunition for the F2, HS820, M621, CN MIT, M39/M61, and HS404 cannon
- 30mm ammunition for the HS831A (KCB) cannon
- 40mm ammunition for the Bofors L/60 and L/70 cannon

Nexter (Manurhin) also produces Oerlikon 35mm ammunition under license from Nexter (Luchaire). Before becoming a component of then-Giat, Manurhin also cooperated closely with Giat in the production of all types of 20mm ammunition.

Established Export Base

In itself, Nexter Munitions produces a full range of 20x102mm, 20x110mm, 20x110mm RB, and 20x139mm ammunition. The contractor has exported its ammunition to most of the former French colonies in Africa. Nexter ammunition is also in wide use in the Middle East. The strong emphasis on automatic cannon systems in French vehicle and helicopter design indicates the strength of this segment of the armaments industry in France and where French influence is still strong.

Federal Republic of Germany

Diehl BGT Defence GmbH & Co KG. The Ammunition Division of this diversified firm produces a great variety and quantity of ammunition. Its subsidiary operation, Junghans Feinwerktechnik, produces advanced fuze technology for automatic cannon ammunition. Junghans has developed the Telemetrical Measuring Projectile 35 (TMP-35), a specialized projectile that precisely measures the internal ballistics of 35mm ammunition. This device is an electronics unit

that collects and stores the information for later retrieval or transmission while in flight.

The 40mm ammunition that Diehl produces for the L/70 cannon is largely of standard specifications, except for Diehl's pre-fragmented rounds.

35mm Training Rounds

Diehl produces three specialized 35x228mm rounds for Mauser's Tank Precision Gunnery In-Bore Device. This equipment is a realistic live-fire training device that simulates firing High Explosive Anti-Tank (HEAT) rounds from 105mm and 120mm tank cannon. The DM68 is for the 105mm L7/M68/Rh105 tank cannon; the DM88 is for the 120mm Rh120/M256 ordnance. The DM78 simulates Armor Piercing Fin Stabilized Discarding Sabot (APFSDS) rounds for both 105mm and 120mm tank cannon. In addition to Germany, the United States and at least one other nation have procured this specialized ammunition.

Testing the U.S. Market?

Diehl and Oerlikon are jointly developing a 20mm round to replace the PGU-28B currently in use with the U.S. Air Force. Though functional, the PGU-28B round is prone to malfunction and to detonation within the weapon barrel.

Rheinmetall Defence. Rheinmetall produces frangible and break-up practice ammunition, as well as the full range of ammunition types for the HS820, KAD, M139, and F2 (M693) cannon.

Rh503 Program

Rheinmetall has stirred up the automatic cannon and ammunition industry worldwide with its unique externally powered Rh503 dual-caliber cannon and ammunition. While the advanced-design 35x228mm ammunition is the same as used in a variety of other cannon of the same caliber, the 50mm Supershot round has generated considerable interest. This fixed round, available in High Explosive (HE) and APFSDS types, features an elongated version of the 35x228mm cartridge case.

Rheinmetall originally developed the Rh503 cannon and the related ammunition for the now-defunct Marder 2 mechanized infantry combat vehicle program of the 1980s. As the Bundeswehr's next-generation Igel/Puma infantry fighting vehicle mounts the Mauser 30x173mm Mk 30-2/ABM ordnance, the future of the Rh503 and its ammunition remains unclear.

Expanding Market Potential

In 2000, Rheinmetall acquired Oerlikon Contraves, a move expected to greatly enhance the position of

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Rheinmetall in the 20mm to 35mm market segment. To avoid confusion in this report, we continue to treat Oerlikon Contraves as a separate player (see below).

Rheinmetall now produces 30x173mm tactical frangible rounds (developed by NWM de Kruihoorn) for the Bushmaster II and Mauser Mk 30-2/ABM applications.

The new 30x280mm ammunition, in two types, has yet to enter serial production. This case-telescoped round fires from the RMK-30 recoilless cannon, as mounted in prototype form on the Wiesel 2 vehicle and Tiger attack helicopter.

Italy

Simmel Difesa SpA. This firm produces significant quantities of cannon ammunition. Production includes 20mm ammunition for both the KAD and HS820 cannon, as well as U.S. pattern rounds for the M61/M61A Vulcan anti-aircraft artillery system. This production is exclusively for the Italian armed forces. While the firm has explored more involvement with 35mm ammunition, it has taken no action to date.

In 2003, the Italian Ministry of Defense ordered 16,000 NATO-standard 25x137mm FAPD-T cartridges for the Italian Army's Oerlikon KBA-B cannon.

Romania

S.C. Arsenal-Resita SA. Formerly the state-owned Arsenalul Armatei organization, this contractor controls most of the weapons industry in Romania. Arsenal-Resita produces automatic cannon ammunition at two facilities, the Mechanical Factory Sadu and Mechanical Factory Dragomiresti. The Arsenal-Resita organization also has secured a licensed-production agreement with Oerlikon Contraves for the Swiss firm's 25mm and 35mm ammunition and ordnance.

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

An Evolving Player

The Russian Federation continues to consolidate its ammunition manufacturing infrastructure while developing new ammunition types employing modern technology. State-owned facilities still produce the majority of medium-caliber ammunition in the Russian Federation, albeit at a precipitously lower pace than in the past. Over the next several years, semi-private organizations should become increasingly active in the export market.

Emphasis on 30mm Rounds

The emphasis is currently on the production of modern 30mm ammunition for the vehicle-mounted cannon

(2A38/2A42/2A72) of the BMP-2 and BMP-3 mechanized infantry combat vehicles. The 30mm 2S6 Tunguska anti-aircraft artillery system also fires this ammunition.

Russian contractors also produce modern 23mm and 30mm ammunition for a variety of aircraft cannon. In addition, the Russian Federation continues to produce several older-pattern rounds for various cannon on an as-needed basis.

FSUE Rosoboronexport. This organization acts as the primary conduit between the Russian defense industry and the international market. All individual Russian contractors effectively operate under the auspices of Rosoboronexport.

Rosoboronexport's Suppliers

Major Russian contractors (under Rosoboronexport) involved in the medium-caliber automatic cannon ammunition market include the following:

State Scientific Production Enterprise Pribor. This state-owned entity, located in Moscow, is the main organization developing and producing 20mm to 57mm cannon ammunition in the Russian Federation. Formed in 1945 from an amalgamation of wartime development and production bureaus, Pribor designs, develops, and produces 23mm, 25mm, and 30mm ammunition for all platforms.

Production Association Zavod Imeni Sergo. Unconfirmed reports suggest this firm, in existence for over 80 years, has been operating some of the state-owned ammunition manufacturing plants. It has also been active in the international export market, promoting its products under the POZIS brand name in various military journals. The organization states that it has sold or otherwise transferred its ammunition to at least 33 nations around the world.

Kemerovo Mechanical Plant. In 2000, this new firm emerged as a developer and producer of Russian automatic cannon ammunition. Headquartered in Moscow, Kemerovo produces 23x152mm B rounds, apparently in an improved Armor Piercing Incendiary-Tracer (API-T) pattern.

Sweden

BAE Systems Bofors. Formerly Bofors Defence AB, the recently reorganized Ordnance Division of Bofors again operates under the famous Bofors name. In recent years, Bofors has granted licenses for ammunition production worldwide; development of these calibers of ammunition is no longer restricted to Bofors activities.

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Corporate Evolution

In 1998, Bofors Defence-LIAB joined the new Nordic Ammunition (Raufoss, Norway) organization, a consolidation of several Scandinavian ammunition manufacturing firms. In 2001, Bofors became a wholly owned subsidiary of United Defense Limited Partnership. As such, Bofors Defence AB became part of BAE Systems in June 2005 with the BAE Systems acquisition of UDLP.

The Norwegian Air Command placed an initial order worth \$5.9 million for the Bofors 40mm pre-fragmented proximity-fuzed high-explosive rounds in 1987; two subsequent options totaled the equivalent of \$7.5 million. To date, Bofors has produced over 1.4 million of these rounds.

Staying Ahead of the Curve

Bofors is involved in the entire life cycle of its products, with an emphasis on offering improved components to enhance the serviceable life of L/60 and L/70 cannon. Bofors and Raufoss developed state-of-the-art 40mm (L/60 and L/70) High Explosive Fragmentation Incendiary Tracer (multipurpose) rounds that, because of the use of advanced pyrotechnics, negate the need for conventional electro-mechanical fuzes containing detonators and sensitive high explosives.

Even more recent developments have been related to the TRINITY 3P (Pre-fragmented Programmable Proximity fuzed) ammunition. In conjunction with the fire control components of the TRINITY air defense system, this new-generation round provides existing L/70 cannon with greatly enhanced performance against the latest generation aerial targets.

In May 1995, Bofors placed the new 40mm Armor Piercing Fin Stabilized Discarding Sabot-Tracer (APFSDS-T) round into production for the L/70B cannon of the Stridsfordon 90 (CV90) vehicle. This new round features insensitive munitions filling, an important marketing feature. Even newer is the Target Practice Discarding Sabot-Tracer (TPDS-T) round, a training round simulating APFSDS-T ammunition.

EX-57 Mk 3 Program

Bofors has incorporated its 3P technology into 40mm and 57mm rounds, including the new 3P All-Target ammunition for the EX-57 Mk 3 naval gun. The 3P ammunition is pre-fragmented and programmable; the proximity fuze (3P) is reportedly secure from electronic countermeasures (ECM). An airburst capability increases operational flexibility.

Approximately 15 nations worldwide use the EX-57 Mk 3 gun mount in various naval applications. The

Mexican Coast Guard ordered this ordnance and ammunition in April 2003. The Finnish Navy ordered two of these gun systems for delivery in mid-2004. In addition, Sweden has awarded Bofors a contract worth SEK120 million to deliver 3P ammunition for Sweden's Visby class corvettes.

In 2004, the U.S. Coast Guard awarded Northrop Grumman Ship Systems a contract worth a potential \$79 million for the EX-57 Mk 3 system. Testing began in January 2004, with encouraging results thus far. Congress has appropriated \$13.1 million to qualify the gun system for the U.S. Coast Guard.

Switzerland

Oerlikon Contraves AG. In 2000, Rheinmetall acquired this world-famous firm, which continues to unofficially operate as Oerlikon Contraves.

Development of APFSDS ammunition in a range of calibers is ongoing. Also in development is what the company calls its "frangible kinetic energy round," an advanced-design Armor Piercing Discarding Sabot type. Recently, Oerlikon Contraves has been enhancing the design and performance of its linkless ammunition feed technology, making it applicable to a wider variety of platforms.

AHEAD System

Over the past decade, the development that has aroused the greatest worldwide interest is the Advanced Hit Efficiency and Destruction (AHEAD) round. Originally designed for use with a slightly modified GDF series anti-aircraft artillery system, the AHEAD system integrates a muzzle velocity gauge on each barrel of the weapon system. The fire control system then integrates velocity measurements into each round's fuze as the round feeds into the chamber, essentially programming the fuze timing mechanism. This feature greatly enhances the probability of a hit. The 152 heavy metal penetrators in each AHEAD round ensure a high degree of lethality; a 25-round burst of AHEAD rounds yields 3,800 subcaliber projectiles on the target.

Oerlikon completed development of the AHEAD system and ammunition in 1999; the system is also NATO-qualified. The AHEAD system is now available for orders.

Reaching Out to Other Players

In 1992, Oerlikon Contraves announced that it had reached an agreement with (then) Giat Industries to develop and produce new types of 20mm to 57mm ammunition.

Oerlikon Contraves has also recently completed the development of the 25mm PMB-090 APFSDS round for use in the popular M242 Bushmaster cannon. The

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PMB-090, featuring a tungsten penetrator, has much better performance than the M791 round used by the U.S. Army. Canada has been procuring both the PMB-090 and PMB-090/098 APFSDS rounds since 1996.

In cooperation with the now-defunct Dutch NWM de Kruithoorn firm, Oerlikon Contraves has further developed frangible technology for 20mm rounds (for the M61 cannon) and 23mm rounds (for Russian-pattern cannon). Regarding the latter ammunition, Oerlikon Contraves has developed the 23mm PMA-276 frangible APFSDS round for the ZSU-23-4 as part of a Finnish (Sako) upgrade program for that weapon.

Advanced 30mm Ammunition

One of the more recent developmental efforts by Oerlikon Contraves has been a new line of 30x173mm ammunition. Developed in cooperation with Mauser-Werke, these new rounds offer the latest in automatic cannon ammunition technology. Available ammunition types include:

- PMC-287 APFSDS-T, based on Oerlikon's efforts to produce a long rod penetrator that releases at full spin
- PMC-283, an advanced-design Frangible Armor Piercing Discarding Sabot (FAPDS) round for general-purpose use against both hard and soft targets
- PMC-307 Target Practice-Fin Stabilized Discarding Sabot-Tracer (TP-FSDS-T), which is ballistically matched to the PMC-287 and PMC-283

The most advanced munition of the new line is the PMC-308 Air Bursting Munition, which is in development for the U.S. Marine Corps 30mm Bushmaster II/Mk 44 automatic cannon of the next-generation Expeditionary Fighting Vehicle (EFV). This round integrates the AHEAD technology in an advanced High Explosive Fragmentation (HE-Frag) round, which contains 156 cylindrical spin-stabilized subprojectiles. The round also incorporates a self-destruct feature. In October 1999, Oerlikon Contraves and Mauser-Werke reached an agreement with Alliant Techsystems for the licensed production of this new ammunition in the United States.

Additional Programs

OerlikonContraves has assumed the rights to the 40mm (L/60 and L70 pattern) break-up training ammunition originally developed by NWM de Kruithoorn.

Diehl and Oerlikon are jointly developing a 20mm round to replace the PGU-28B currently in use with the U.S. Air Force. Though functional, the PGU-28B round

is prone to malfunction and to detonation within the weapon barrel.

United Kingdom

BAE Systems Land Systems. Once the world-famous RO Defence firm, this contractor has been a component of BAE Systems since mid-2000. Its Munitions & Ordnance division produces the entire line of Oerlikon-pattern ammunition, as well as new types of 20mm to 40mm ammunition.

30mm RARDEN Ammunition

BAE Systems also produces L14 series 30mm RARDEN ammunition for British Army requirements. The demand for 30mm RARDEN ammunition has expanded tremendously since the British Army adopted the FV510 Warrior, mounting the 30mm RARDEN cannon. In 1996, following a competitive evaluation, the firm won a development/production contract for a new enhanced-performance APFSDS round for the RARDEN cannon. This new round entered production in 1998, with an initial procurement objective of 225,000 rounds by 2000. The round incorporates a penetrator manufactured by (the former) Royal Ordnance Specialty Metals; assembly occurs at the BAE Systems Faldingworth facility.

A Varied Line

BAE Systems continues to produce Oerlikon-pattern ammunition for the 35mm GDF-002 systems captured in the Falkland Islands (1982); the British Manufacture & Research firm reconditioned these cannon for service with the Royal Air Force (RAF).

BAE Systems is carrying on with the original 1987 Royal Ordnance program to develop 30mm tubular ammunition for the RARDEN cannon. This type of ammunition features a hole through the middle of the projectile. It is consequently light for its diameter and features a very low drag coefficient; it can thus achieve high velocities similar to those of sabot subcaliber projectiles. Although this concept has caused some controversy, BAE Systems is reportedly pleased with test results thus far, including the results of testing of the annular tracers.

Another recent development from this contractor is the RO 275 Reduced Range Training Round. This round provides cost-effective yet realistic training in limited range areas. This ammunition is in production to meet a British Army order for 600,000 rounds.

A major market segment for BAE Systems continues to be aircraft cannon systems ammunition. The firm produces ADEN 25, ADEN, and DEFA ammunition for the RAF, as well as for extensive export.

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In 1994, Royal Ordnance and (then) Giat Industries formed a jointly held company – CTA International (Bourges, France) – for the study, development, marketing, sales, and manufacture of ammunition and weapons using case-telescoped ammunition technology.

Alliant Techsystems of the United States is also involved in this development. The creation of this firm followed a number of years of development by the British Defence Research Agency.

Related News

Denmark Offers Surplus Equipment for Sale – Denmark is offering surplus military equipment left over from the Cold War for sale. Items include seven rescue helicopters, 140 armored personnel carriers (APCs), and three frigates, as well as spare parts and various types of ammunition. Denmark could earn more than \$18 million from these sales. The Danish government has already sold 230 Leopard 1 tanks for \$3.7 million. (*Copenhagen Post*, 10/10)

Allied Defense Completes Asset Sale to Chemring – The Allied Defense Group has completed the sale of its two subsidiaries to Chemring Group, plc, for \$59.6 million in cash. Under the terms of the deal, Chemring acquired all the stock in Mecar SPRL, which manufactures ammunition. It also obtained substantially all the assets of Mecar USA Inc., which provides load, assembly, pack, and procurement services for the U.S. government and other contractors. (Allied Defense Group, 9/10)

Nammo and Thales Australia to Cooperate on Next-Generation Aircraft Ammunition – Nammo and Thales Australia signed a Letter of Intent (LoI) at Eurosatory for a planned cooperation on next-generation aircraft ammunition. This is driven by Norway and Australia's involvement in the F-35 fighter program and the need for a new ammunition round capable of meeting all requirements and ensuring lethality against both soft and hard targets. This will include cooperation on the Norwegian ammunition concept, APEX, and a special training round as well as Thales' frangible ammunition round called APFI. The APEX development and qualification effort is now fully funded by the Norwegian Ministry of Defense and Nammo. (Nammo, 6/10)

Sales Revenue Shortfall from Military Planning Law May Hold up Portuguese Projects – The Portuguese government has been forced to reduce its anticipated revenue windfall from the sale of surplus defense matériel as planned under its Military Planning Law (MPL). Within the outline of the six-year MPL (2006-2011), the government forecast revenues of EUR290 million (\$385 million). These would result from the sale of 10 F-16 fighter jets, four Puma helicopters, 14 Aviocar transport aircraft, 56 M-60 tanks, two *João Belo* frigates, and excess ammunition. However, Portugal has only concluded one sale from these items: that of the *João Belo* frigates to Uruguay. This has left Portugal with a shortfall of EUR273 million (\$362 million) of a total planned EUR2.119 billion (\$2.817 billion) allocated to the armed forces under the Military Planning Law for the purchase of equipment.

The government has since revised its previous sales assumptions down to EUR110 million (\$146 million). However, to move forward with select procurement items during the next Military Planning Law (to be approved later this year), the lowered revenue figure must still be attained via sales of the aforementioned equipment. The planned acquisitions that will be held up unless military sales plug the revenue gap include new Coast Guard launches for the Navy, plus 18 Leopard 2A6 tanks, six light helicopters for the Air Force that would be used to replace the Aerospatiale SA.316 Alouette IIIs, and one Lynx helicopter for the Navy.

Portugal has been dragged down by the eurozone recession and the Greece default panic. Its economy, which remained largely stagnant over much of the past decade, is not growing fast enough to overcome its fiscal problems. The country has a public debt of 77 percent of national GDP (expected to reach 86 percent by the end of the year) and a budget deficit of 9.4 percent of GDP. Both figures are in excess of the EU Stability and Growth Pact rules, which mandate a debt ceiling of 60 percent of GDP and a budget deficit of 3 percent of GDP. As such, the center-left Socialist government of Prime Minister José Sócrates has been scrambling to plug deficit holes and cut public expenses.

But fears have grown that Portugal will join Greece as a likely candidate to default on its debt obligations. PM Sócrates is planning to meet the Stability and Growth Pact deficit target figure of 3 percent by 2013. The defense budget will not be spared: It is expected to be reduced by 40 percent through 2013. Despite the cuts, other planned projects under the next Military Planning Law will go forward. These include light weaponry, light helicopters, and four-wheel armored vehicles for the Army, a new multirole support ship for the Navy, and a C-130

20 to 57mm Cannon Ammunition (Europe)

modernization program for the Air Force. Portugal's equipment budget will be stressed by such purchases, as its annual defense allocations prior to PM Sócrates' spending cuts represented only 1.3 percent of GDP. (*Diário de Notícias*, 5/10)

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Funding

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

Timetable

A number of cartridges incorporating advanced-design ballistics, fuze, and warhead/projectile technology are in development for the medium-caliber automatic cannon ammunition market. Aside from the continued development of the AHEAD and 3P systems, the main advance in technology during the forecast period will involve case-telescoped ammunition technology.

Worldwide Distribution/Inventories

European medium-caliber automatic cannon ammunition is widely available worldwide.

Forecast Rationale

Serial production of medium-caliber cannon ammunition is ongoing throughout Europe for domestic procurement and export.

Consolidation for Survival

Although Europe remains a significant supplier of medium-caliber automatic cannon and ammunition on the international market, European players face increasing competition from non-Western producers.

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.

Pushing Advanced Technology

In their pursuit of advanced-technology munitions and case-telescoped technology, European players are

poised to take the medium-caliber automatic cannon ammunition market to the next level of development. Force transformation initiatives may provide a particularly lucrative market for advanced-technology medium-caliber automatic cannon and their associated ammunition.

Stable European Market

The European market for artillery ammunition remains generally stable. We expect the European players will maintain a combined annual production rate averaging about 40 million rounds during the forecast period

While this level of production is but a shadow of Cold War levels – on both sides of the Iron Curtain, European players nevertheless remain the potent force in the international medium-caliber automatic cannon ammunition market.

Ten-Year Outlook

Given the scarcity of open-source data regarding European medium-caliber cannon 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 about 40 million rounds per year through 2019.

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