

ARCHIVED REPORT

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20 to 57mm Cannon Ammunition

Outlook

- Combined production of medium-caliber cannon ammunition from all European sources will average 40 million rounds annually
- Combined production of medium-caliber cannon ammunition from all non-U.S. and non-European sources will average nearly 43 million rounds annually
- U.S. production for U.S. DoD procurement will average over 10 million rounds annually

Orientation

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

Sponsor. Both individual contractors and various governments sponsor the development of medium-caliber automatic cannon ammunition.

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

Status. Development through serial production.

Total Produced. Through 2022, we estimate that the various European contractors produced over 2.51 billion medium-caliber automatic cannon cartridges since 1980 inclusive.

Through 2022, we estimate that the various non-U.S. and non-European contractors produced over 1.88 billion medium-caliber automatic cannon cartridges since 1980 inclusive.

Through 2022, we estimate that U.S. contractors produced over 2.22 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 both offensive and defensive ground operations.

Price Range. In 2022 U.S. dollars, the unit prices range from \$1.08 for 20x120mm rounds to \$23.83 for some of the advanced-technology 40x365mm cartridges.

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According to U.S. Department of Defense budget request documentation, unit prices for medium-caliber cannon ammunition are as follows:

20mm Ammunition (U.S. Navy)

- Linkless TP-T: \$16.39
- Linkless TP PGU-27: \$10.54
- Linked TP PGU-27: \$16.45
- Linkless HEI PGU-28: \$26.01
- Linked HEI PGU-28: \$23.39

20mm Ammunition (U.S. Air Force)

- TP PGU-27A/B: \$11.77

25mm Ammunition (U.S. Army)

- Dummy M794: \$138.65
- TP-T M793: \$33.39
- TPDS-T M910: \$50.91

25mm Ammunition (U.S. Navy)

- Linkless HEI: \$42.27

- Linkless TP: \$19.23

25mm Ammunition (U.S. Marine Corps)

- TPDS-T M910 Linked: \$46.62
- TP-T M793 Linked: \$18.88

25mm Ammunition (U.S. Air Force)

- TP PGU-23/U: \$19.82
- TP-T M793 Linked: \$18.88

30mm Ammunition (U.S. Army)

- Dummy M848: \$25.40
- HPT M883: \$112.79
- TP M788: \$23.68
- HEDP M789: \$113.00

30mm Ammunition (U.S. Air Force)

- TP PGU-15/B: \$34.85
- HEI PGU-13/B: \$58.53

Contractors

Prime

BAE Systems, Combat Vehicles (UK)	http://www.baesystems.com , Golf Course Ln, New Filton House, Filton, S Gloucestershire, United Kingdom, Tel: + 44 0117 9888560, Fax: + 44 0117 9888502, Prime
BAE Systems Inc, Platforms & Services	http://www.baesystems.com , Bofors Ind Omr, Karlskoga, Sweden, Tel: + 46 586 733 000, Fax: + 46 586 733 0012, Email: info.bofors@baesystems.se , Prime
China North Industries Corp (NORINCO)	http://www.norinco.cn , 12A Guang An Men Nan Jie, PO Box 100053, Beijing, China, Tel: + 86 10 6352 9988, Fax: + 86 10 6354 0398, Email: norinco@norinco.cn , Prime
Companhia Brasileira de Cartuchos, CBC Magtech	http://www.cbc.com.br , Av. Humberto de Campos 3220, Guapituba, Ribeirao Pires, Brazil, Tel: + 55 11 2139 8378, Fax: + 55 11 2139 8323, Email: export@cbc.com.br , Prime
Denel SOC Ltd	http://www.denel.co.za , Nellmapius Dr, Irene, South Africa, Tel: + 27 12 671 2700, Fax: + 27 12 671 2751, Email: marketing@denel.co.za , Prime
Diehl Defence GmbH & Co KG, Plant Überlingen	http://www.diehl.com/defence/en/ , Alte Nussdorfer Strasse 13, Überlingen, Germany, Tel: + 49 75 51 8901, Fax: + 49 75 51 89 2822, Email: pr@diehl-defence.de , Prime
FN Herstal SA	http://www.fnherstal.com , Voie de Liège 33, Herstal, 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.roe.ru , 27/3 Stromynka St, Moscow, Russian Federation, Tel: + 7 495 534 6183, Fax: + 7 495 534 6153, Prime
Hsing Hua Electric Innovative Corp, Hsing Hua Arsenal	http://www.thh-electric.com.tw , No 7 Alley 29 Ln 29, Sec 1 Anjhong Rd, Tainan City, Annan District, Taiwan, Tel: + 886 6 245 6156, Fax: + 886 6 255 8586, Email: hsinhua.edos@msa.hinet.net , Prime
Nexter Munitions	http://www.nexter-group.fr , Route de Villeneuve, La Chapelle, Saint-Ursin, France,

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	Tel: + 33 02 48 68 71 71, Fax: + 33 02 48 68 70 54, Prime
Northrop Grumman, Federal Cartridge Co	http://www.northropgrumman.com, 900 Bob Ehlen Dr, Anoka, MN 55303 United States, Tel: + 1 (763) 323-2300, Fax: + 1 (763) 323-2506, Email: ammunition.group@atk.com, Prime
Ordnance Factories Organization of India, Ordnance Factory Board - Export Division	http://www.ofb.gov.in, 10 A, S K Bose Rd, Kolkata, India, Tel: + 91 33 2248 5077 80, Fax: + 91 33 2248 9744, Email: ofbtrade@dataone.in, Prime
Pakistan Ordnance Factories	Wah Cantt, Pakistan, Tel: + 92 51 9055 21019, Fax: + 92 51 9316253, Email: exports@pof.gov.pk, Prime
Poongsan Defense	http://www.poongsan.co.kr, Poongsan Bldg, 23 Chungjeong-ro, Seoul, Korea, South, Tel: + 82 2 3406 5114, Fax: + 82 2 3406 5400, Email: jwkang@poongsan.co.kr, Prime
Rheinmetall Air Defence AG	http://www.rheinmetall-defence.com, Birchstrasse 155, Zurich, 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, Germany, Tel: + 49 211 473 01, Fax: + 49 211 473 4746, Email: info@rheinmetall-defence.com, Prime
S.C. Arsenal-Resita SA (formerly Arsenal Armatei)	http://www.arsenal.ro, Barzavitei St, 4, Resita, Jud. Caras-Severin, Romania, Tel: + 40 0255 250502, Fax: + 40 0255 225011, Email: arsenal_resita@yahoo.com, Prime
Simmel Difesa SpA	http://www.nexter-group.fr, Via Ariana 5,200, Colleferro, Italy, Tel: + 39 06 97 09 2400, Fax: + 39 06 97 09 2350, Prime
Thales Australia, Armaments & Ammunition	http://www.thalesgroup.com, 7 Murray Rose Ave, Sydney Olympic Park, New South Wales, Australia, Tel: + 61 2 9562 3333, Email: communications@thalesgroup.com, Prime

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

Technical Data

The following major medium-caliber automatic cannon ammunition types are currently in production or available for production:

Europe

<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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
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
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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
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
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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
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
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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
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
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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
Unknown	High Explosive Incendiary	Simmel Difesa
Unknown	Target Practice - Tracer	Simmel Difesa
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

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<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
30-831-L	Target Practice - Tracer	Nexter Munitions
30-831-L	High Explosive Incendiary	Nexter Munitions
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

20 to 57mm Cannon Ammunition Archived MAY

<u>Designation</u>	<u>Ammunition Type</u>	<u>Contractor</u>
PLD-044	Semi-Armor Piercing High Explosive Incendiary	S.C. Arsenal-Resita
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 Archived MAY

<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 - 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
Unknown	Target Practice - Tracer	Simmel Difesa

20 to 57mm Cannon Ammunition Archived MAY**Designation**

Unknown
 Unknown
 Unknown
 Unknown
 Unknown
 Unknown

Ammunition Type

High Explosive Incendiary
 High Explosive Incendiary - Tracer
 High Explosive
 High Explosive - Tracer
 Armor Piercing Fin Stabilized Discarding Sabot
 Target Practice

Contractor

Simmel Difesa
 Simmel Difesa
 Simmel Difesa
 Simmel Difesa
 Simmel Difesa
 Simmel Difesa

57x401mm

3P
 BR-281
 BR-281U
 UOR-281
 UOR-281U
 Unknown
 Mk 281

Proximity Fuzed Pre-Fragmented High Explosive
 Armor Piercing Capped Tracer
 Armor Piercing Capped Tracer
 High Explosive Fragmentation - Tracer
 High Explosive Fragmentation - Tracer
 Target Practice - Tracer
 Blank

BAE Systems Bofors
 Rosoboronexport
 Rosoboronexport
 Rosoboronexport
 Rosoboronexport
 Rosoboronexport
 Rosoboronexport

*Self-destruct-type ammunition.

20 to 57mm Cannon Ammunition Archived MAY**International**

Caliber	Designation	Ammunition Type
<u>Manufacturer – Thales Australia (formerly ADI Ltd)</u>		
20x102mm	M55A1	Target Practice
20x102mm	M56	High Explosive Incendiary
20x102mm	Mk 149-4 Phalanx	Armor Piercing Discarding Sabot
25x137mm	M793	Semi-Armor Piercing High Explosive Incendiary - Tracer
<u>Manufacturer – FM "FANAZUL"</u>		
20x110mm	FMK 1 Mod 0	High Explosive - Tracer
20x110mm	FMK 7 Mod 0	High Explosive Incendiary
20x110mm	FMK 15 Mod 0	High Explosive Incendiary
20x110mm	Unknown	High Explosive Incendiary - Tracer
20x110mm	FMK 4 Mod 0	Target Practice - Tracer
20x110mm	FMK 6 Mod 0	Target Practice - Tracer
20x110mm	FMK 13 Mod 0	Target Practice - Tracer
20x110mm	Unknown	Dummy
20x139mm	Unknown	High Explosive Incendiary
20x139mm	Unknown	Armor Piercing - Tracer
20x139mm	FMK 8 Mod 0	Target Practice - Tracer
20x139mm	Unknown	Target Practice
30x113mm	SPEINC	Armor Piercing
30x113mm	EINC	High Explosive Incendiary
30x113mm	EINC-AD*	High Explosive Incendiary
30x113mm	EI	High Explosive
30x113mm	EJ	Target Practice
30x113mm	Unknown	Target Practice - Tracer
30x170mm	EINC-AD	High Explosive Incendiary
30x170mm	EINC-T-AD	High Explosive Incendiary - Tracer
30x170mm	SPEINC	Armor Piercing
30x170mm	EJ	Target Practice
30x170mm	EJT	Target Practice - Tracer
40x311mm	Unknown	High Explosive Incendiary - Tracer
40x311mm	FMK 3 Mod 0 EJ	Target Practice
40x311mm	FMK 3 Mod 0 EJT	Target Practice - Tracer
40x311mm	FMK 2 Mod 0 EJT	Armor Piercing - Tracer
<u>Manufacturer – China North Industries Corp (NORINCO)</u>		
20x99mm	Unknown	High Explosive Incendiary
23x115mm	Type 2	High Explosive Incendiary
23x115mm	Unknown	High Explosive - Tracer
23x115mm	Unknown	High Explosive Incendiary - Tracer
23x115mm	Unknown	Armor Piercing Incendiary
23x152mm B	Unknown	High Explosive
23x152mm B	Unknown	High Explosive Incendiary
23x152mm B	Unknown	High Explosive Incendiary - Tracer
23x152mm B	Unknown	Armor Piercing Incendiary
25x218mm	Unknown	High Explosive Incendiary - Tracer
25x218mm	Unknown	Armor Piercing - Tracer
25x218mm	Unknown	Target Practice
30x121mm	Unknown	High Explosive Incendiary
30x121mm	Unknown	High Explosive Incendiary - Tracer
30x121mm	Unknown	Target Practice - Tracer
30x210mm B	Unknown	High Explosive
30x210mm B	Unknown	High Explosive Incendiary
35x228mm	Unknown	High Explosive Incendiary
35x228mm	Unknown	High Explosive Incendiary - Tracer
35x228mm	Unknown	Target Practice - Tracer
37x292mm	Unknown	High Explosive
37x292mm	Unknown	High Explosive - Tracer
37x292mm	Unknown	High Explosive Incendiary - Tracer

20 to 57mm Cannon Ammunition Archived MAY

<u>Caliber</u>	<u>Designation</u>	<u>Ammunition Type</u>
37x292mm	Unknown	Armor Piercing High Explosive
37x292mm	Unknown	Armor Piercing Incendiary - Tracer
37x292mm	Unknown	Armor Piercing - Tracer
37x292mm	Unknown	Target Practice - Tracer
57x348mm	Type 59	High Explosive - Tracer
57x348mm	Unknown	Armor Piercing - Tracer

Manufacturer – Companhia Brasileira de Cartuchos (CBC Magtech)

20x80mm RB	Unknown	High Explosive
20x80mm RB	Unknown	Target Practice
20x80mm RB	Unknown	Target Practice - Tracer
20x80mm RB	Unknown	Dummy
20x102mm	M56A3	High Explosive Incendiary
20x102mm	Unknown	Armor Piercing Incendiary
20x102mm	M220	Target Practice - Tracer
20x102mm	Unknown	Dummy
20x110mm RB	M72E1	High Explosive Incendiary - Tracer
20x110mm RB	M74E1	High Explosive Incendiary
20x110mm RB	Unknown	Target Practice - Tracer
20x110mm RB	Unknown	Target Practice
20x110mm	M74E1	High Explosive Incendiary
20x110mm	M72E1	High Explosive Incendiary - Tracer
20x110mm	Unknown	Target Practice - Tracer
20x110mm	Unknown	Target Practice
30x113mm	Unknown	Armor Piercing Incendiary
30x113mm	Unknown	High Explosive Incendiary
30x113mm	Unknown	High Explosive Incendiary - Tracer
30x113mm	Unknown	Target Practice
30x113mm	Unknown	Target Practice - Tracer

Manufacturer – Denel SOC Ltd

20x82mm	Unknown	High Explosive Incendiary
20x82mm	Unknown	High Explosive Incendiary - Tracer
20x82mm	Unknown	Semi-Armor Piercing High Explosive Incendiary
20x82mm	Unknown	Target Practice
20x82mm	Unknown	Target Practice - Tracer
20x139mm	Unknown	High Explosive Incendiary
20x139mm	Unknown	High Explosive Incendiary - Tracer
20x139mm	Unknown	Semi-Armor Piercing
20x139mm	Unknown	Armor Piercing Capped Tracer
20x139mm	Unknown	Target Practice
20x139mm	Unknown	Target Practice - Tracer
23x152mm B	Unknown*	High Explosive Incendiary - Tracer
23x152mm B	Unknown	Armor Piercing Capped Incendiary - Tracer
23x152mm B	Unknown	Semi-Armor Piercing High Explosive Incendiary
30x113mm	Unknown	High Explosive Incendiary
30x113mm	Unknown	High Explosive Incendiary
30x113mm	M1A1	Armor Piercing Capped Incendiary
30x113mm	Unknown	Target Practice
30x113mm	Unknown	High Explosive Incendiary - Tracer
30x113mm	M1A1-T	Armor Piercing Capped Incendiary - Tracer
30x113mm	Unknown	Target Practice - Tracer
30x173mm	Unknown	Armor Piercing Incendiary
30x173mm	Unknown	Semi-Armor Piercing High Explosive Incendiary
35x228mm	Unknown	High Explosive Incendiary
35x228mm	Unknown	Target Practice - Tracer
35x228mm	M3A1	High Explosive Incendiary
35x228mm	M3A1	High Explosive Incendiary - Tracer
35x228mm	M1A1	Semi-Armor Piercing High Explosive Incendiary
35x228mm	M1A1	Target Practice - Tracer
40x311mm	Unknown	High Explosive Incendiary - Tracer
40x311mm	Unknown	High Explosive

20 to 57mm Cannon Ammunition Archived MAY

<u>Caliber</u>	<u>Designation</u>	<u>Ammunition Type</u>
40x311mm	Unknown	Target Practice
40x311mm	Unknown	Target Practice - Tracer
40x365mm	Unknown	High Explosive Incendiary
40x365mm	Unknown	High Explosive - Tracer
40x365mm	PFF	Pre-Fragmented High Explosive
40x365mm	Unknown	Target Practice
40x365mm	Unknown	Target Practice - Tracer
<u>Manufacturer – Hsing Hua Electric Innovative Corp</u>		
40x365mm	Unknown	High Explosive Incendiary
40x365mm	Unknown	High Explosive Incendiary - Tracer
40x365mm	Unknown	Target Practice
40x365mm	Unknown	Target Practice - Tracer
<u>Manufacturer – Ordnance Factories Organization of India</u>		
23x115mm	Unknown	High Explosive Incendiary - Tracer
23x115mm	Unknown	Armor Piercing Incendiary
23x115mm	Unknown	Target Practice - Tracer
23x115mm	Ghasha	Unknown
23x115mm	Schilka	Unknown
30x113mm	Unknown	High Explosive
30x164mm	Unknown	High Explosive Incendiary
30x164mm	Unknown	High Explosive Incendiary - Tracer
30x164mm	Unknown	Armor Piercing - Tracer
30x164mm	BMP-2K HE/T	High Explosive - Tracer
30x164mm	BMP-2K AP/T	Armor Piercing - Tracer
30x164mm	BMP-2K HE/I	High Explosive Incendiary
30x164mm	Ghasha	Unknown
30x164mm	ADEN	Unknown
40x365mm	Unknown	High Explosive - Tracer
40x365mm	L70 HET	High Explosive - Tracer
40x365mm	L70 TPT	Target Practice - Tracer
<u>Manufacturer – Pakistan Ordnance Factories</u>		
20x102mm	M56A3	High Explosive Incendiary
20x102mm	M53	Armor Piercing Incendiary
20x102mm	M55A2	Target Practice - Tracer
23x115mm	Unknown	High Explosive
23x115mm	Unknown	High Explosive - Tracer
23x115mm	Unknown	High Explosive Incendiary
23x115mm	Unknown	High Explosive Incendiary - Tracer
23x115mm	Unknown	Target Practice - Tracer
23x115mm	Unknown	Armor Piercing
23x115mm	Unknown	Armor Piercing Incendiary
23x115mm	Unknown	Armor Piercing Incendiary - Tracer
23x152mm B	Unknown	High Explosive Incendiary - Tracer
23x152mm B	Unknown	Armor Piercing Incendiary
30x113mm	Unknown	Armor Piercing Incendiary
30x113mm	Unknown	High Explosive Incendiary
30x113mm	Unknown	Target Practice
30x121mm	Unknown	High Explosive Incendiary
30x121mm	Unknown	High Explosive Incendiary - Tracer
30x121mm	Unknown	Semi-Armor Piercing High Explosive Incendiary
30x121mm	Unknown	Target Practice - Tracer
35x228mm	Unknown	High Explosive Incendiary
35x228mm	Unknown	High Explosive Incendiary - Tracer
35x228mm	Unknown	Semi-Armor Piercing High Explosive Incendiary
35x228mm	Unknown	Target Practice - Tracer
37x292mm	Unknown	High Explosive - Tracer
37x292mm	Unknown	Target Practice
40x311mm	Unknown	High Explosive - Tracer
40x365mm	Unknown	High Explosive Incendiary - Tracer

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<u>Caliber</u>	<u>Designation</u>	<u>Ammunition Type</u>
40x365mm	Unknown	Target Practice - Tracer
40x365mm	Unknown	Target Practice
<u>Manufacturer – Poongsan Defense</u>		
20x102mm	M56A3	High Explosive Incendiary
20x102mm	M246	High Explosive Incendiary - Tracer
20x102mm	M220	Target Practice - Tracer
20x102mm	M55A2	Target Practice
20x128mm	Unknown	High Explosive Incendiary
20x128mm	Unknown	High Explosive Incendiary - Tracer
20x128mm	Unknown	Pre-Fragmented High Explosive Incendiary
20x128mm	Unknown	Target Practice - Tracer
30x170mm	Unknown	High Explosive Incendiary
30x170mm	Unknown	High Explosive Incendiary - Tracer
30x170mm	Unknown	Target Practice
30x170mm	Unknown	Target Practice - Tracer
30x173mm	Unknown	High Explosive Incendiary - Tracer
30x173mm	Unknown	High Explosive Incendiary
30x173mm	Unknown	Target Practice - Tracer
35x228mm	K202 KA1	High Explosive Incendiary - Tracer
35x228mm	K203	Target Practice - Tracer
40x311mm	Unknown	Pre-Fragmented High Explosive Incendiary
40x311mm	Mk 2	High Explosive Incendiary - Tracer
40x311mm	Unknown	High Explosive
40x311mm	Unknown	Armor Piercing Capped - Tracer
40x311mm	Unknown	High Explosive Incendiary - Tracer
40x311mm	Unknown	Pre-Fragmented High Explosive
40x365mm	K216	High Explosive Incendiary - Tracer
40x365mm	K219	Armor Piercing - Tracer
40x365mm	K218	Pre-Fragmented High Explosive
<u>Manufacturer – Singapore Technologies Kinetics Ltd</u>		
20x102mm	Unknown	Target Practice
20x102mm	Unknown	High Explosive Incendiary
20x102mm	Unknown	High Explosive Incendiary - Tracer
20x102mm	Unknown	Armor Piercing Incendiary
20x102mm	Unknown	Target Practice
20x102mm	Unknown	Target Practice - Tracer
20x110mm	Unknown	High Explosive Incendiary
20x110mm	Unknown	Armor Piercing Incendiary
20x110mm	Unknown	Target Practice
20x110mm	Unknown	Target Practice - Tracer
20x120mm	Unknown	High Explosive Incendiary
20x120mm	Unknown	Armor Piercing Incendiary
20x120mm	Unknown	Target Practice
20x120mm	Unknown	Target Practice - Tracer
20x128mm	Unknown	Target Practice
20x128mm	Unknown	Target Practice - Tracer
20x128mm	Unknown	High Explosive Incendiary
20x128mm	Unknown	Semi-Armor Piercing High Explosive
20x139mm	Unknown	High Explosive Incendiary
20x139mm	Unknown	High Explosive Incendiary - Tracer
20x139mm	Unknown	Armor Piercing - Tracer
20x139mm	Unknown	Target Practice - Tracer
20x139mm	Unknown	Target Practice
30x113mm	Unknown	High Explosive Incendiary
30x113mm	Unknown	Semi-Armor Piercing High Explosive
30x113mm	Unknown	Armor Piercing Incendiary
30x113mm	Unknown	Target Practice
30x113mm	Unknown	High Explosive Incendiary
30x113mm	Unknown	Semi-Armor Piercing High Explosive
30x113mm	Unknown	Target Practice

20 to 57mm Cannon Ammunition Archived MAY

<u>Caliber</u>	<u>Designation</u>	<u>Ammunition Type</u>
35x228mm	Unknown	High Explosive Incendiary
35x228mm	Unknown	Semi-Armor Piercing High Explosive Incendiary
35x228mm	Unknown	Target Practice - Tracer
35x228mm	Unknown	Target Practice
40x365mm	Unknown	High Explosive - Tracer
40x365mm	Unknown	Pre-Fragmented High Explosive
40x365mm	Unknown	Target Practice
40x365mm	Unknown	Target Practice - Tracer

*Self-destruct-type ammunition.

United States

<u>Designation</u>	<u>Caliber</u>	<u>Ammunition Type</u>
M51A2	20mm	Dummy
M53	20mm	Armor Piercing Incendiary
M54A1	20mm	High Pressure Test
M55A2	20mm	Target Practice
M56A4	20mm	High Explosive Incendiary
M95	20mm	Armor Piercing - Tracer
M96	20mm	Incendiary
M97A2	20mm	High Explosive Incendiary
M99A1	20mm	Target Practice
M204	20mm	Target Practice
M206A1	20mm	Target Practice - Tracer
M210	20mm	High Explosive Incendiary
M220	20mm	Target Practice - Tracer
M221B1	20mm	Target Practice - Tracer
XM239	20mm	High Pressure Test
XM240	20mm	Dummy
M242	20mm	High Explosive Incendiary - Tracer
M246	20mm	High Explosive Incendiary - Tracer
XM254	20mm	Dummy
M330	20mm	High Explosive Incendiary
M426	20mm	High Explosive Incendiary - Tracer
XM599	20mm	High Explosive Incendiary - Tracer
M601	20mm	Armor Piercing Incendiary - Tracer
M775	20mm	Armor Piercing Incendiary - Tracer
M940	20mm	Multi-Purpose Tracer (self-destruct)
Mk 3	20mm	High Explosive Incendiary
Mk 9	20mm	Armor Piercing Tracer
Mk 105	20mm	Target Practice
Mk 149-4	20mm	Armor Piercing Discarding Sabot
Mk 244-O	20mm	Penetrator, Anti-Ship Missile
PGU-27A/B	20mm	Target Practice
PGU-28A/B	20mm	Semi-Armor Piercing High Explosive Incendiary
PGU-30A/B	20mm	Target Practice Tracer
PGU-32/B	20mm	Semi-Armor Piercing High Explosive Incendiary - Tracer
Alliant 25x223	25mm	Frangible Armor Piercing Discarding Sabot - Tracer
M791	25mm	Armor Piercing Discarding Sabot - Tracer
M792	25mm	High Explosive Incendiary - Tracer
M793	25mm	Target Practice - Tracer
M794	25mm	Dummy
M881	25mm	Armor Piercing Fin Stabilized Discarding Sabot - Tracer
M910	25mm	Target Practice Discarding Sabot - Tracer
M919	25mm	Armor Piercing Fin Stabilized Discarding Sabot - Tracer
Mk 2	25mm	Multi-Purpose Self-Destruct
Mk 210-2	25mm	High Explosive Incendiary - Tracer
PGU-20/U	25mm	Armor Piercing Incendiary
PGU-22/B	25mm	High Explosive Incendiary

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<u>Designation</u>	<u>Caliber</u>	<u>Ammunition Type</u>
PGU-23/U	25mm	Target Practice
PGU-23/U	25mm	Target Practice (frangible)
PGU-25/U	25mm	High Explosive Incendiary
PGU-32/U	25mm	Semi-Armor Piercing High Explosive Incendiary - Tracer
PGU-33/U	25mm	Target Practice (frangible projectile)
PGU-38/U	25mm	High Explosive Incendiary
GDOTS 30x113	30mm	Pyrotechnically Initiated Tracer
M788	30mm	Target Practice
M789	30mm	High Explosive Dual Purpose
M799	30mm	High Explosive Incendiary
M848	30mm	Dummy
M833	30mm	High Pressure Test
M883	30mm	High Explosive Dual Purpose
XM977	30mm	Target Practice - Tracer
PGU-13/B	30mm	High Explosive Incendiary
PGU-14/B	30mm	Armor Piercing Incendiary
PGU-15/B	30mm	Target Practice
Olin 30x173	30mm	Armor Piercing Discarding Sabot - Tracer
Olin 30x173	30mm	High Explosive Incendiary Tracer (self-destruct)
Olin 30x173	30mm	Target Practice - Tracer

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 add improvements as production cut-ins.

Program Review

Background. Medium-caliber automatic cannon provide 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.

Europe

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 for 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.

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Belgium

FN Herstal SA. The internationally famous Fabrique 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 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
- Nexter Electronics
- Nexter Mechanics

The move reportedly better prepared the firm for consolidation with another corporate entity.

In 2015, Krauss-Maffei Wegmann and Nexter signed an agreement on a merger plan.

As part of the process, the two companies contributed their shares to a newly incorporated joint holding company based in the Netherlands. They each received 50 percent of the shares of this holding company, which became the sole shareholder in KMW and Nexter. Completion of the merger of KMW and Nexter was formally announced in January 2016.

The merged firm is the third-largest land defense contractor in the world, behind General Dynamics and BAE Systems. Ownership is split between the French government's Giat Industries holding company and KMW parent the Wegmann Group (controlled by Germany's Bode family). At the time of merger, the single entity employed around 6,000 people and had an order book of approximately EUR9 billion (\$9.9 billion), with turnover of around EUR2 billion.

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.

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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 jointly developed 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 malfunctioning 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 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 Kruithoorn) for the Bushmaster II and Mauser Mk 30-2/ABM applications.

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.

In 2014, Nexter Munitions acquired Simmel Difesa. The Italian contractor has kept its identity, but now operates as a component of the Nexter Group.

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

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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 slower pace than in the past. 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 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.

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. Bofors Defence AB thus became part of BAE Systems in June 2005 with the BAE Systems acquisition of UDLP.

In 1987, the Norwegian Air Command placed an initial order with Bofors worth \$5.9 million for 40mm pre-fragmented proximity-fuzed high-explosive rounds; 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.

An even more recent development is 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

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(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 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 2004. In addition, Sweden 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. Congress 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.

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 couple of decades, 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 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 also completed development of the 25mm PMB-090 APFSDS round for use in the popular M242 Bushmaster cannon. The PMB-090, featuring a tungsten penetrator, had much better performance than the M791 round being 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 further developed frangible technology for 20mm rounds (for the M61 cannon) and 23mm rounds (for Russian-pattern cannon). Regarding the latter ammunition, Oerlikon Contraves developed the 23mm PMA-276 frangible APFSDS round for the ZSU-23-4 as part of Finland's Sako upgrade program for that weapon.

Advanced 30mm Ammunition

One of the more recent developmental efforts by Oerlikon Contraves was a new line of 30x173mm ammunition. Developed in cooperation with Mauser-Werke, these 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 this line is the PMC-308 Air Bursting Munition, which was developed for the 30mm Bushmaster II/Mk 44 automatic cannon of the next-generation Expeditionary Fighting Vehicle

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(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

Oerlikon Contraves assumed the rights to the 40mm (L/60 and L/70 pattern) break-up training ammunition originally developed by NWM de Kruithoorn.

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 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).

Also, BAE Systems continues to develop 30mm tubular ammunition for the RARDEN cannon under a Royal Ordnance program begun in 1987. 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 was reportedly pleased with test results, including the results of testing of the annular tracers.

A 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, ADEN 25, and DEFA ammunition for the RAF, as well as for extensive export.

In 1994, Royal Ordnance and (then) Giat Industries formed a jointly held company – CTA International (Bourges, France) – for the study, development, manufacture, marketing, and sale of ammunition and weapons using case-telescoped ammunition technology. Alliant Techsystems of the United States was also involved. The establishment of this firm followed a number of years of development by the British Defence Research Agency.

International

The period of domination over the international medium-caliber automatic cannon ammunition market by a select group of U.S. and European players is clearly coming to an end. The number of non-U.S. and non-European players in this market continues to grow as nations seek to become self-sufficient for political and strategic reasons. Many non-U.S. and non-European players in the international market can take ready advantage of economies of labor and increasingly sophisticated industrial bases to produce highly competitive ammunition products.

Mastering the Learning Curve

In general, ammunition development by countries beyond the U.S. and Europe exhibits the following progression: the importation of American or European munitions leads to licensed production, which in turn serves to establish the technical capability (manufacturing infrastructure and skilled personnel) for indigenous development and production. Given the dynamics of this progression, it comes as no surprise that the international medium-caliber automatic cannon ammunition producers are careful to identify, then follow, the prevalent trends in U.S. and European ammunition development. Witness the growing acceptance of NATO-standard 30mm ammunition as the worldwide standard.

At present, about 20 major non-U.S. and non-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 international market so as to present a cross-section of the entire market.

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AFRICA

Republic of South Africa

Denel SOC Ltd. In 1992, the state-owned umbrella arms firm ARMSCOR reorganized, transferring its manufacturing companies to Denel Ltd. Under Denel, Naschem and Pretoria Metal Pressings produce a full range of medium-caliber cannon ammunition for light anti-aircraft, fighting vehicle, and aircraft applications.

South Africa's military hardware has enjoyed a measure of success on the international arms market, despite the country's years of political and commercial ostracism. Since the lifting of long-standing United Nations sanctions against South Africa in 1994, the country has found its military products to be much easier to export.

New-Generation 35x228mm Line

The most important recent development coming out of the Denel organization is the so-called New Generation 35x228mm line of ammunition. This line is applicable to the popular Oerlikon Contraves KD series cannon, as well as the Gepard, Marksman, ZA-35, and other self-propelled systems. While the ballistics of the new-generation 35x228mm rounds are the same as those of the earlier rounds, the design and manufacturing methods differ, reducing the unit price. This ammunition, available in six types, is compatible with all suitably chambered 35mm cannon.

In 1997, Pretoria Metal Pressings secured a contract worth \$4.47 million for production of an undisclosed number of belted 23x152mm cartridges. This Denel subsidiary also secured an export sale to an unspecified "regional" customer in 1999.

ASIA

India

Ordnance Factories Organization of India. As a component of India's Ministry of Defence, the Indian Ordnance Factories Organization produces a variety of Russian-pattern and Western-pattern medium-caliber cannon ammunition, including:

- Russian-pattern 23x115mm High Explosive Incendiary ammunition (since 2000)
- British-pattern 30x113mm ADEN ammunition for the associated aircraft cannon requirements
- Russian-pattern 30x164mm ammunition for India's license-produced BMP-2 (as the Sareth) mechanized infantry combat vehicle, mounting the 2A42 cannon
- 40x365Rmm High Explosive-Tracer rounds for the L/70, produced under license from Bofors

In 1996, unconfirmed reports suggested that India had conducted negotiations with one or more European cannon ammunition manufacturing firms regarding the development of an improved range of 30mm ammunition. In 1999, India reportedly accelerated its production of 30x164mm ammunition "in a significant manner."

Pakistan

Pakistan Ordnance Factories. As a component of the Pakistan Ministry of Defence, the state-owned Pakistan Ordnance Factories employed around 45,000 people in 2000, making it the largest single industrial organization in Pakistan. This organization satisfies nearly all of Pakistan's ammunition requirements, producing a cross-section of NATO- and Chinese-pattern ammunition.

Increasing Export Share

By the early 1990s, Pakistan Ordnance Factories had become much more active in the export market, with sales of automatic cannon ammunition to nations in Asia (early 2000) and sub-Saharan Africa (early 2002). With 14 facilities in the Wah complex and the potential to expand, Pakistan Ordnance Factories has the capability to increase its export market share.

People's Republic of China

China North Industries Corp (NORINCO). Under the auspices of NORINCO, China's state-owned ammunition factories mainly produce Russian-pattern ammunition for domestic People's Liberation Army (PLA) requirements.

Leveraging Production Capacity

Since the 1970s, the PRC has steadily increased the export of medium-caliber cannon ammunition. NORINCO is reportedly considering the production and marketing of Western-pattern medium-caliber automatic cannon ammunition, including the 25x184mm ammunition of the KBB cannon.

The sheer scale of the PRC's manufacturing capacity makes NORINCO a potentially dominant figure in the international medium-caliber automatic cannon ammunition market.

Republic of China (Taiwan)

Hsing Hua Electric Innovative Corp. While primarily concerned with domestic requirements, the Hsing Hua Arsenal (a component of Hsing Hua Electric Machinery Corp) also produces medium-caliber automatic cannon ammunition for a moderate amount of regional export.

The company produces 40mm ammunition for use in the still-popular M42 self-propelled anti-aircraft system, as well as ammunition for the Bofors L/70 systems.

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Hsing Hua has exported this ammunition to a number of nations in the Middle and Far East, including Saudi Arabia and Thailand. In 1999, the company reported a sale to an undisclosed Latin American nation. The United States has also purchased Hsing Hua ammunition, for regional use by U.S. forces.

Republic of Korea

Poongsan Defense. This firm, formerly Poongsan Metal Corp (PMC), produces a variety of medium-caliber automatic cannon ammunition for domestic requirements and moderate export sales. Products include:

- 30mm ammunition for M167 and Oerlikon Contraves KCB-B cannon, mounted on the Fiat 6614 reconnaissance vehicle. More recently, the ROK Army has integrated the KCB cannon as the basis of the Bi-Ho self-propelled anti-aircraft artillery system, resulting in increased demand for this pattern of ammunition.
- 35mm and 40mm ammunition (produced under license) for use in Oerlikon GDF/353MK and Bofors L/70 cannon, respectively.

U.S. Buys Local Products

The Republic of Korea's principal export customer for its medium-caliber automatic cannon ammunition has been the United States, which issues PMC-produced ammunition to U.S. units based in the Republic of Korea and elsewhere in the region.

Republic of Singapore

Singapore Technologies Kinetics Ltd. Known as Chartered Industries of Singapore until 2000, this firm has managed to make extensive use of the international market.

Extensive Product Line

ST-K currently produces and markets a line of 20mm, 30mm, and 35mm cannon ammunition. Much of the 20mm ammunition, in particular the ADEN aircraft cannon rounds, is for domestic military procurement. ST-K is also one of the few players that still offer 20x120mm ammunition for the world-famous Madsen cannon.

Singapore has exported medium-caliber cannon ammunition to Australia, Malaysia, New Zealand, Thailand, the United Arab Emirates, and the United States (for units based in the Far East).

Unconfirmed reports suggest that Singapore Technologies Kinetics may be involved in the development of case-telescoped ammunition technology.

AUSTRALIA/NEW ZEALAND

Australia

Thales Australia. The Australian Department of Defence coordinates the functions of several major facilities as well as smaller units in the production of all types of ammunition. The formerly government-owned Australian Defence Industries Ltd, which has operated as a component of the Transfield and Thales joint venture team since August 1999, runs a number of these facilities.

In October 2006, the Thales Group (Neuilly-sur-Seine, France) acquired ADI Ltd. The Australian contractor now operates as Thales Australia.

Domestic Demand Dominates

On July 10, 1998, a new 17-year renewable munitions supply agreement between (then) ADI and the Australian Department of Defence increased the contractor's munitions revenue to about AUD100 million a year. The total value of the contract for the initial 17-year period was more than AUD1.7 billion. The contractor had previously (after securing a 1995 agreement with the Australian DoD) invested more than AUD160 million in the development of a modern munitions production facility on a site at Benalla in northern Victoria. This facility replaced three older munitions plants in Sydney and Melbourne.

At present, the only known medium-caliber cannon ammunition products of Thales Australia are the following:

- 20mm M55 Training rounds
- 20mm M56 High Explosive Incendiary rounds
- 25mm M793 Semi-Armor Piercing High Explosive Incendiary-Tracer rounds

As the Australian Light Armored Vehicle inventory continues to grow, demand for 25mm ammunition (for the 25mm M242 Bushmaster automatic cannon) will likewise increase during the next 10 years.

SOUTH AMERICA

Brazil

Companhia Brasileira de Cartuchos (CBC Magtech). This firm is engaged in licensed production of 20mm Vulcan, Oerlikon Contraves, and Hispano-Suiza ammunition, primarily for use in Brazilian military helicopters, armored vehicles, and aircraft. The firm also produces 40mm L/70 proximity-fuzed cannon ammunition. CBC Magtech reportedly secured an unspecified "regional" export sale in mid-2000.

20 to 57mm Cannon Ammunition Archived MAY

United States

The U.S. Department of Defense employs a wide variety of ammunition types for medium-caliber automatic cannon. The major applications for medium-caliber automatic cannon by U.S. forces are as follows:

Vehicle-Mounted Cannon

- 20mm M163 and M167 Vulcan anti-aircraft systems
- 25mm M242 Bushmaster (M2/M3 Bradley Fighting Vehicle and LAV-25)
- 30mm Bushmaster II (multiple platforms)

Aircraft-Mounted Cannon

- 20mm M61 cannon (various Air Force and Navy fighter aircraft)
- 20mm M197 cannon (Army and Marine Corps helicopters)
- 25mm GAU-12/U podded cannon (Marine Corps aircraft)
- 30mm M230 cannon (AH-64 Apache attack helicopters)
- 30mm GAU-8 and GPU-5 cannon (Air Force aircraft)

Unlike the U.S. artillery, mortar, and small arms ammunition markets, the U.S. medium-caliber automatic cannon ammunition market is not primarily dependent upon the depleted U.S. Army ammunition plant system; the DoD buys most of its ammunition from private contractors.

Description. The U.S. Department of Defense currently employs 20mm, 25mm, and 30mm automatic cannon systems. The major programs are as follows:

20mm Ammunition. In the U.S. Army, the importance of this caliber has long been waning and its use is now minimal, limited to the M163 and M167 Vulcan Air Defense System, and (mainly) the M197 cannon on the AH-1J/W/T. Indeed, the U.S. Army now procures 20mm ammunition on an as-needed basis only.

Primarily an Aircraft Round

The U.S. Navy continues to rely on 20mm weapons systems for use on its aircraft. The Navy's program to develop a new multipurpose 20mm round for F-14, F/A-18, A-7, and AH-1 aircraft (PE#0604603N – Project W1341) resulted in a 20mm round providing better ballistics, penetration, and fuze sensitivity. The Navy completed its operational evaluations of this round on the F/A-18 and AH-1 aircraft in 1987; the

service secured U.S. Department of Defense approval for full production in FY88.

The U.S. Navy also is a major user of 20mm ammunition in the Mk 15 Phalanx terminal defense system.

The U.S. Air Force continues to depend on 20mm ammunition for the widely used M61 aircraft cannon and its derivatives. However, the 20mm PGU-28A/B round currently in use by the U.S. Air Force is prone to failure during live fire, leading to in-barrel detonations. Diehl of Germany and Oerlikon Contraves (now Rheinmetall Air Defence) of Switzerland are working together to produce a more reliable 20mm round.

25mm Ammunition. Procurement of 25mm ammunition by the U.S. Department of Defense has been noteworthy for two reasons:

- This market segment exhibits an emphasis on multiyear contracts (usually three years).
- Even before defense budgets began declining in the early 1990s, unit prices for 25mm ammunition experienced a dramatic decrease. Unit prices for 25mm M791, M792, and M793 cartridges had dropped an average of 33 percent between 1983 and 1990.

The decline in unit prices for 25mm M791, M792, and M793 cartridges stemmed from the U.S. Army's fielding of the M2M3 Bradley Fighting Vehicle; the shift to multiyear contracts during this period hastened the price decline. However, with the dramatically reduced rates of procurement that characterized the 1990s, further significant unit-price reductions became a thing of the past; in fact, some unit prices have recently exhibited steep increases.

The Multi-Use M242 Bushmaster

U.S. Army procurement of 25mm ammunition remains consistently heavy, driven by the M242 Bushmaster cannon on the M2/M3 Bradley Fighting Vehicle.

The U.S. Marine Corps also employs the M242 Bushmaster on the Light Armored Vehicle-25 (LAV-25), and the Marine Corps' AV-8B Harrier aircraft mounts a podded version of the M242 Bushmaster.

The U.S. Navy procures 25mm ammunition in relatively modest quantities for the Mk 88 gun mount. This weapon system, used in lieu of the older Oerlikon 20mm cannon, protects smaller ships.

30mm Ammunition. The U.S. Army and U.S. Air Force remain heavy users of 30mm automatic cannon.

20 to 57mm Cannon Ammunition Archived MAY

Rapid Fire for the Apache & Cobra

In the U.S. Army, the 30mm M230 Chain Gun soldiers on as the primary gun system aboard the AH-64 Apache attack helicopter. Also, the AH-1S Cobra fleet is being retrofit with the M230. The continuing employment of the M230 in the attack helicopter role will ensure a healthy level of 30mm ammunition procurement throughout the coming decade.

Feeding the Warthog

In the U.S. Air Force, the 30mm GAU-8 Avenger remains the primary armament of the A-10 attack

aircraft. The Air Force has been developing a new depleted uranium penetrator round for the GAU-8, with emphasis on an APFSDS design that would eliminate the problem of aircraft engines ingesting the discarded sabot. The USAF has also developed a non-ricochet/frangible (encapsulated stacked washer) 30mm target practice round for the GAU-8.

Although the U.S. Air Force procures 30mm ammunition under multiyear contracts, reductions in the active A-10 inventory have precipitated significant reductions in Air Force procurement of 30mm ammunition.

Funding

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

Worldwide Distribution/Inventories

Medium-caliber automatic cannon ammunition produced by various contractors and government organizations is available worldwide.

Forecast Rationale

Europe

European players are continuing to consolidate, establishing a growing number of teaming arrangements with both European and non-European contractors. 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.

We expect that the European players will maintain a combined annual production rate averaging about 40 million rounds.

International

While most non-U.S. and non-European producers of medium-caliber automatic cannon ammunition remain primarily focused on domestic procurement, a number of contractors are challenging the traditional dominance of U.S. and European players in this market.

Combined annual production by non-U.S. and non-European players will average nearly 43 million rounds.

United States

The two remaining U.S. contractors still struggle to meet U.S. Department of Defense demand for medium-caliber automatic cannon ammunition. Prolonged demand at current levels could present new opportunities for domestic and international players to gain a foothold in this market.

Production Settling Down

Nevertheless, based on an analysis of U.S. DoD budget request documentation, the Forecast International Weapons Group concludes that DoD procurement is settling down to an average annual procurement rate of about 10 million rounds.

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