

# ARCHIVED REPORT

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## Artillery Ammunition (International)

### Outlook

- Serial production ongoing; international acceptance of NATO-standard 155mm ammunition continues to grow
- Non-U.S. and non-European players are gradually increasing their collective share of the international market
- We expect production from all non-U.S. and non-European sources to average nearly 1.5 million rounds (75mm-210mm) annually through 2019

### Orientation

**Description.** Unguided artillery ammunition, 75mm to 210mm.

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

**Licensees.** A number of firms and state-owned organizations produce artillery ammunition under some sort of license agreement. In addition, many contractors produce U.S.-pattern ammunition under license.

**Status.** Development through serial production.

**Total Produced.** Through 2009, we estimate the various non-U.S. and non-European contractors

produced over 35.8 million artillery rounds since 1980 inclusive.

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

**Price Range.** In 2010 U.S. dollars, new-production unguided artillery ammunition ranges in unit price from \$19.88 for some of the 85mm high explosive (HE) rounds to \$2,131 for some of the Israeli cargo rounds. Unit price varies according to the type and quantity of ammunition procured.

### Contractors

#### Prime

<b>China North Industries Corp (NORINCO)</b>	<a href="http://www.norinco.com">http://www.norinco.com</a> , 12A Guang An Men Nan Jie, PO Box 2932, Beijing, 100053 China, Tel: + 86 10 6352 9988, Fax: + 86 10 6354 0398, Email: <a href="mailto:norinco@norinco.com.cn">norinco@norinco.com.cn</a> , Prime
<b>Daewoo International Corp, Daewoo Ammunition Corp</b>	<a href="http://www.daewoo.com">http://www.daewoo.com</a> , 541 5-Ga Namdaemunno, Chung-gu, Seoul, Korea, South, Tel: + 82 2 759 2114, Fax: + 82 2 753 9489, Prime
<b>Denel (Pty) Ltd</b>	<a href="http://www.denel.co.za">http://www.denel.co.za</a> , Nellmapius Dr, Irene, 0046 South Africa, Tel: + 27 12 671 2700, Fax: + 27 12 671 2751, Email: <a href="mailto:marketing@denel.co.za">marketing@denel.co.za</a> , Prime
<b>Fabrica Militar de Polvoras y Explosivos Azul, FM "FANAZUL"</b>	<a href="http://www.fanazul.com.ar">http://www.fanazul.com.ar</a> , Route 80 Km 9, Azul, 7300 Buenos Aires, Argentina, Tel: + 54 02281 433330, Fax: + 54 02281 430790, Email: <a href="mailto:ventas@fanazul.com.ar">ventas@fanazul.com.ar</a> , Prime

Artillery Ammunition (International)

<b>Hsing Hua Electric Machinery Corp, Hsing Hua Arsenal</b>	<a href="http://www.thh-electric.com.tw">http://www.thh-electric.com.tw</a> , No 7 Alley 29 Lane 29, Sec 1 Anjhong Rd, Tainan City, 709 Annan District, Taiwan, Tel: + 886 6 245 6156, Fax: + 886 6 255 8586, Email: <a href="mailto:hsinhua.edos@msa.hinet.net">hsinhua.edos@msa.hinet.net</a> , Prime
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## Artillery Ammunition (International)

<b>Israel Military Industries Ltd (IMI)</b>	<a href="http://www.imi-israel.com">http://www.imi-israel.com</a> , PO Box 1044, Bialik St 64, Ramat Hasharon, 47100 Israel, Tel: + 972 3 548 5617, Fax: + 972 3 548 6125, Email: imimrktg@imi-israel.com, Prime
<b>Ordnance Factories Organization of India, Ordnance Factory Board - Export Division</b>	<a href="http://ofbindia.gov.in/index.php">http://ofbindia.gov.in/index.php</a> , 10 A, S K Bose Rd, Kolkata, 700 001 India, Tel: + 91 33 2248 1209, Fax: + 91 33 2248 9744, Email: ofbtrade@vsnl.net, Prime
<b>Pakistan Ordnance Factories</b>	<a href="http://www.pof.gov.pk">http://www.pof.gov.pk</a> , Wah Cannt, 47010 Pakistan, Tel: + 92 51 931 4101, Fax: + 92 596 931 4058, Email: exports@pof.gov.pk, Prime
<b>Singapore Technologies Kinetics Ltd</b>	<a href="http://www.stengg.com">http://www.stengg.com</a> , 249 Jalan Boon Lay, Singapore, 619523 Singapore, Tel: + 65 6473 6311, Fax: + 65 6471 0662, Email: comms.kinetics@stengg.com, Prime
<b>Thales Australia</b>	<a href="http://www.thalesgroup.com/australia">http://www.thalesgroup.com/australia</a> , Locked Bag 3000, Potts Point, 2011 New South Wales, Australia, Tel: + 61 2 9562 3333, Email: communications@thalesgroup.com, Prime

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

## Technical Data

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

<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
<u>Manufacturer – Thales Australia (formerly ADI Ltd)</u>		
105mm	M1	High Explosive
105mm	M314A2	Illumination
105mm	M60	White Phosphorous Smoke
105mm	L31	High Explosive
105mm	L45	Smoke
105mm	L43	Illumination
105mm	L37/38	Marker
105mm	M84	Hexachlorethane Zinc Smoke
155mm	M107	High Explosive
155mm	M485A2	Illumination
155mm	M825	White Phosphorous Smoke
<u>Manufacturer – Fabrica Militar de Polvoras y Explosivos Azul (FM "FANAZUL")</u>		
105mm	EF	High Explosive Fragmentation
105mm	HINC	White Phosphorous Smoke
155mm	unknown	High Explosive Fragmentation
155mm	PALA 37/CH	High Explosive (Extended Range Full Bore)
155mm	PALA 37/BB	High Explosive (Extended Range Full Bore Base Bleed)
155mm	PACU	High Explosive (hollow base)
<u>Manufacturer – China North Industries Corp (NORINCO)</u>		
76mm	unknown	High Explosive Fragmentation
76mm	unknown	Armor Piercing-Tracer
76mm	unknown	High Explosive Anti-Tank Fin Stabilized-Tracer
105mm	unknown	High Explosive
122mm	Type 54	High Explosive
122mm	unknown	High Explosive Fragmentation
122mm	unknown	High Explosive (Extended Range Full Bore)
122mm	unknown	High Explosive (Extended Range Full Bore Base Bleed)
122mm	unknown	High Explosive Anti-Tank Fin Stabilized
122mm	unknown	High Explosive Anti-Tank Fin Stabilized-Tracer
122mm	unknown	High Explosive Anti Tank-Tracer
122mm	unknown	Incendiary

## Artillery Ammunition (International)

<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
122mm	unknown	White Phosphorous Smoke
122mm	unknown	Illumination
122mm	unknown	Cargo (submunition dispensing)
130mm	unknown	Armor Piercing Capped-Tracer
130mm	unknown	High Explosive
130mm	unknown	High Explosive Incendiary
130mm	unknown	High Explosive (Extended Range Full Bore Base Bleed )
130mm	unknown	High Explosive (Extended Range Full Bore)
130mm	unknown	High Explosive (Extended Range Full Bore)
130mm	unknown	Cargo (submunition dispensing)
130mm	unknown	High Explosive Shrapnel
130mm	RAP-130	High Explosive Rocket Assisted Projectile
130mm	unknown	White Phosphorous Smoke
130mm	unknown	Illumination
152mm	Type 66	Cargo (submunition dispensing)
152mm	unknown	High Explosive
152mm	Type 83	High Explosive Fragmentation
152mm	MP-152	High Explosive Rocket Assisted Projectile
152mm	unknown	White Phosphorous Smoke
152mm	unknown	Incendiary (magnesium alloy)
155mm	unknown	High Explosive (Extended Range Full Bore)
155mm	unknown	High Explosive (Extended Range Full Bore Base Bleed)
155mm	unknown (M107)	High Explosive
155mm	unknown	Cargo (Extended Range Full Bore Base Bleed)
155mm	unknown	Smoke (Extended Range Full Bore)
155mm	unknown	Illumination (Extended Range Full Bore)
155mm	unknown	White Phosphorous Smoke (Extended Range Full Bore)
155mm	unknown	Illumination Base Bleed (Extended Range Full Bore)
203mm	unknown	High Explosive (Extended Range Full Bore)
203mm	unknown	High Explosive (Extended Range Full Bore Base Bleed)

Manufacturer – Daewoo Ammunition Corp (Daewoo International Corp)

105mm	M1	High Explosive
105mm	M60	White Phosphorous Smoke
105mm	M314A1	Illumination
105mm	PS390	Cargo
155mm	M107	High Explosive
155mm	M110A2	White Phosphorous Smoke
155mm	M549A1	High Explosive Rocket Assisted Projectile
155mm	PS491	Cargo
203mm	M106	High Explosive

Manufacturer – Denel (Pty) Ltd

76mm	HE-OM	High Explosive
76mm	HE-PFOM	High Explosive Fragmentation
76mm	FNF-MOM	Target Practice
76mm	FNF-OM-1	Target Practice
76mm	FNF-OM-2	Target Practice
87.6mm	Mark 1D	High Explosive
87.6mm	unknown	White Phosphorous Smoke
87.6mm	Mark 1D	Illumination (star shell)
130mm	M1A1	High Explosive (Extended Range Full Bore)
130mm	M1A1	High Explosive (Extended Range Full Bore Base Bleed)
130mm	unknown	Target Practice
139.7mm	Mark 1D	High Explosive
139.7mm	M1A2	High Explosive Base Bleed
139.7mm	213	Smoke
155mm	ERFB-HE	High Explosive (Extended Range Full Bore)
155mm	ERFB-HE/BB	High Explosive (Extended Range Full Bore Base Bleed)
155mm	ERFB-SCR SMK	Smoke (Extended Range Full Bore)
155mm	ERFB-WP	White Phosphorous Smoke (Extended Range Full Bore)

## Artillery Ammunition (International)

<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
155mm	ERFB-IL	Illumination (Extended Range Full Bore)
155mm	ERFB-C	Cargo (Extended Range Full Bore)
155mm	ERFBHE/BBV-LAP	High Explosive (Extended Range Full Bore Rocket Assist)
155mm	Assegai M2000	High Explosive (Extended Range Full Bore Rocket Assist)
155mm	Assegai M2001	Cargo (Extended Range Full Bore Rocket Assist)
155mm	Assegai M2002	Cargo (Extended Range Full Bore Rocket Assist)
155mm	Assegai M2003	Illumination (Extended Range Full Bore Rocket Assist)
155mm	Assegai M2004	Red Phosphorous Smoke (Extended Range Full Bore Rocket Assist)

Manufacturer – Hsing Hua Electric Machinery Corp

75mm	M48	High Explosive
75mm	M66	High Explosive Anti-Tank
75mm	M64	White Phosphorous Smoke
105mm	M1	High Explosive
105mm	M60	White Phosphorous Smoke
105mm	M314A2	Illumination
105mm	M548	High Explosive Rocket Assisted Projectile
155mm	M101	High Explosive
155mm	M104	Smoke
155mm	M107	High Explosive
155mm	M110A2	White Phosphorous Smoke
155mm	M116B	Smoke
155mm	M118A2	Illumination
155mm	ERFB-HE	High Explosive (Extended Range Full Bore)
203mm	M106	High Explosive

Manufacturer – Ordnance Factories Organization of India

75mm	75/24 HE 1C	High Explosive
87.6mm	unknown	High Explosive
87.6mm	unknown	Smoke
87.6mm	unknown	Blank
105mm	L31 series	High Explosive
105mm	L37 series	Smoke
105mm	L38 series	Smoke
105mm	L42A3	High Explosive Squash Head
105mm	L43 series	Illumination
105mm	L45A2	Smoke
140mm	DA117	High Explosive
140mm	213	Smoke
155mm	unknown	High Explosive
155mm	unknown	Cargo (submunition dispensing)
155mm	unknown	Illumination
155mm	unknown	Smoke

Manufacturer – Israel Military Industries Ltd (IMI)

105mm	M1	High Explosive
105mm	M60	White Phosphorous Smoke
105mm	CL 3131	Cargo (submunition dispensing)
120mm	APAM	Cargo (submunition dispensing)
125mm	CL 3254	Armor-Piercing Fin-Stabilized Discarding Sabot
130mm	OF-482M	High Explosive
152mm	DP-IC M350/351	Cargo (submunition dispensing)
152mm	CL 3023	Cargo (Improved Conventional Munition)
155mm	M56	High Explosive
155mm	M107	High Explosive
155mm	M110A2	Illumination
155mm	M116A1	White Phosphorous Smoke
155mm	M395	Cargo (submunition dispensing)
155mm	M485A2	Illumination
155mm	unknown	High Explosive Rocket Assisted Projectile
155mm	CL 3109	Cargo (submunition dispensing)

## Artillery Ammunition (International)

<u>Caliber</u>	<u>Designation</u>	<u>Type</u>
155mm	CL 3013-C	Cargo (submunition dispensing)
155mm	CL 3013-U	Cargo (submunition dispensing)
175mm	CL 3014	Cargo (submunition dispensing)
203mm	CL 3046	Cargo (submunition dispensing)

### Manufacturer – Pakistan Ministry of Defense/Pakistan Ordnance Factories

87.6mm	Mark 1D	High Explosive
87.6mm	unknown	White Phosphorous Smoke
87.6mm	Mark 1D	Illumination (star shell)
87.6mm	unknown	Blank
105mm	M1	High Explosive
105mm	M60	White Phosphorous Smoke
105mm	M314A2	Illumination
122mm	Type 54	High Explosive
122mm	M1938	High Explosive
130mm	OF-482M	High Explosive
130mm	DTs-1	Smoke
155mm	M107	High Explosive
155mm	M110	Smoke
203mm	M106	High Explosive

### Manufacturer – Singapore Technologies Kinetics Ltd

155mm	M107	High Explosive
155mm	M110A2	White Phosphorous Smoke
155mm	ERFB-HE	High Explosive (Extended Range Full Bore)
155mm	unknown	Illumination

## Variants/Upgrades

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

**Modernization and Retrofit Overview.** Not applicable.

## Program Review

**Background.** Since the first cast-iron cannon appeared in Europe in the 14th century, European arms manufacturers have traditionally been at the center of artillery development. However, as the 21st century progresses, the period of domination over the international artillery ammunition market by a select group of U.S. and European players is unquestionably gone.

**Market Trends.** The number of non-U.S. and non-European players producing artillery ammunition 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 advantage of economies of labor and increasingly sophisticated industrial bases to produce highly competitive artillery ammunition. In today's artillery market, ammunition development exhibits three major trends:

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

In general, artillery ammunition design and development by countries beyond the U.S. and Europe exhibits one further trend: Importation of American or European munitions leads to licensed production, which in turn serves to establish the 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 artillery ammunition producers are careful to identify, then follow, the prevalent trends in U.S. and European artillery ammunition development. Witness the growing worldwide standardization around NATO-standard 155mm ammunition.

## Artillery Ammunition (International)

At present, over 20 major non-U.S. and non-European contractors are involved in the artillery 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.

### AFRICA

#### Republic of South Africa

*Denel (Pty) Ltd.* In 1992, the state-owned umbrella arms firm ARMSCOR reorganized, transferring its manufacturing companies to Denel Ltd. This holding company continues to supply all of South Africa's requirements for artillery ammunition, including World War II-vintage and advanced types.

ARMSCOR was one of the first manufacturers to commercially produce a full line of Extended Range Full Bore (ERFB) and Base Bleed ammunition. Denel remains a world leader in the field of 155mm artillery pieces and ammunition.

#### *Export Success*

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 it much easier to export its military products.

Indeed, in the late 1990s, the United Kingdom became a customer for Denel's modular artillery charge system, beating out RO Defence (then Royal Ordnance; now a component of BAE Systems Land Systems). In 1999, South Africa reportedly secured a major sale of 155mm projectiles to an unidentified South American nation; in early 2000, an undisclosed Asian nation reportedly purchased "several thousand" 130mm projectiles.

Denel (including the NASCHEM, SOMCHEM, and Swartklip subsidiaries, as well as the fuze house Fuchs Electronics) offers a full line of 155mm artillery ammunition, including High Explosive, High Explosive Base Bleed, White Phosphorus Smoke, Illuminating, and Base Ejection Smoke.

#### *Denel's ERFB Line*

Denel completed development of a new ERFB 155mm submunition round in 1987. This projectile can deliver 56 dual-purpose (hollow charge/fragmentation) submunitions (mines) out to a maximum range of 35,000 meters (38,276 yd). The fuzes for the submunitions feature a self-destruct mechanism to eliminate the danger presented by unexploded submunitions littering a battlefield.

A more recent ERFB round is the Velocity Enhanced Long Range Projectile (V-LAP), which mounts a rocket

motor to enable a maximum range of slightly over 50,000 meters (54,680 yd). Denel revealed this round in 1996; the first export order (to an undisclosed customer) occurred in 2000.

Denel's Assegai line of 155mm ammunition has generated considerable interest worldwide, including Europe and (most recently) the U.S. Army. The Assegai projectile features the ERFB technology, in which a new-design bourrelet replaces the bore-riding nubs of the original ERFB projectile design. The Assegai line is currently available in the following types:

- M2000 High Explosive
- M2001 Dispenser, Dual-Purpose Improved Conventional Munitions (DPICM)
- M2002 Smoke Dispenser (four smoke canisters)
- M2003 Illumination
- M2004 Smoke (red phosphorous)
- M2005 V-LAP

The Assegai projectiles offer greater range than the earlier ERFB types, as they are optimized for 52-caliber barrels. The Assegai projectiles are also compatible with 39-, 45-, and 47-caliber barrels. Although Denel has not released sales information on the Assegai projectiles, unconfirmed reports suggest the South Africa National Defence Force (SANDF) has purchased the new ammunition.

### ASIA

#### India

*Ordnance Factories Organization of India.* As a component of India's Ministry of Defence, the Indian Ordnance Factories Organization produces various types of Russian-pattern artillery ammunition under license; it also produces some Western-pattern artillery projectiles.

#### *Struggling to Meet Demand*

While India is largely self-sufficient in artillery ammunition production, clashes with Pakistan in the northern Kashmir region have outstripped domestic production capacity. While the Indian ordnance factories have repeatedly increased their production levels and initiated innovative research and development efforts, the supply has yet to catch up with domestic demand. As a stopgap measure, India has resorted to several foreign sources, including South Africa, to address its large demand for 155mm artillery ammunition.

Despite the shortcomings in the field of 155mm ammunition production, India still hopes to become a

## Artillery Ammunition (International)

major player in the international market. Since 1999, the production of artillery ammunition in India has been running at a significantly increased pace in response to the perceived threat from Pakistan in the Kashmir region. Upon some sort of resolution of the Kashmir question, India may indeed be able to focus its considerable production resources on the international market.

### Pakistan

*Pakistan Ordnance Factories.* As a component of the Pakistan Ministry of Defense, the state-owned Pakistan Ordnance Factories employed about 45,000 people in 2000, making it the largest single industrial organization in Pakistan. This organization satisfies nearly all of Pakistan's requirements for munitions up to 155mm, producing a cross-section of NATO- and Chinese-pattern ammunition. With 14 facilities in the Wah complex and the potential to expand, Pakistan Ordnance Factories has the capability to increase its export market share.

### ***Significant Production Capacity***

The Pakistan Ordnance Factories Heavy Artillery Factory in Sanjwal reportedly maintains a maximum annual production capacity of about 800,000 projectiles. In the late 1990s, annual production averaged around 70,000 rounds; since 1999, production has reportedly ramped up substantially in response to the ongoing Kashmir crisis.

The large Pakistan Ordnance Factories propellants factory at Havelian has been in operation since 1983, a product of extensive collaboration with the People's Republic of China. Its two continuous-process production plants manufacture solvent-free, single- and double-base propellants for mortar, tank, and artillery rounds.

Pakistan has provided the benefits of its acquired experience to Malaysia, another Asian nation seeking autonomy in defense production.

### People's Republic of China

*China North Industries Corp (NORINCO).* Prior to the 1980s, the People's Republic of China produced only Soviet-pattern artillery ammunition. This changed as the PRC embraced Western technology in general, and military technology in particular. The PRC was one of the first nations to appreciate the potential of the late Dr. Gerald Bull's revolutionary Extended Range Full Bore technology. By the mid-1990s, the PRC was offering a full line of both standard and Base Bleed ERFB projectiles. The PRC has also adopted the NATO-standard 155mm and 203mm rounds.

### ***Foot in the Door?***

Beginning in 1995-1996, the People's Republic of China began a major effort to sell its artillery systems and ammunition on the international market through the China North Industries Corporation (NORINCO). This effort paid off with the 1998 sale of its PLZ45 self-propelled artillery system to Kuwait; a follow-on sale later ensued. Although the PRC has not reported any associated ammunition sales, available evidence suggests that NORINCO has indeed secured some ammunition sales.

### Republic of China (Taiwan)

*Hsing Hua Electric Machinery Corp.* In addition to producing U.S.-standard pattern ammunition, the Hsing Hua Arsenal also conducts research and development in the field of Extended Range ammunition. Like the PRC, the ROC has also embraced the Extended Range Full Bore technology of Dr. Bull. The Hsing Hua effort in the ERFB field supports the contractor's development of new 155mm towed and self-propelled howitzers. Hsing Hua has exported ammunition to at least two nations in the Far East; it hopes to build on that success with its new long-range products.

### Republic of Korea

*Daewoo Ammunition Corp.* This firm (along with Poongsan Metal Corp and Korea Explosives Corp) produces U.S.-pattern 105mm and 155mm ammunition under license for the Korean armed forces and export. The ROK is also developing new 105mm ammunition (especially a new cargo round) as part of the country's fielding of modern 105mm artillery (the KH 178).

Historically, the ROK has sold its ammunition products to Indonesia, Malaysia, Pakistan, Peru, the Philippines, Thailand, and Venezuela. There are unconfirmed reports of sales to Latin American nations in addition to Peru.

### Republic of Singapore

*Singapore Technologies Kinetics Ltd.* Known as Chartered Industries of Singapore until 2000, this firm has managed to make significant strides in the international market. Recent customers of ST-K include Australia, Brunei, New Zealand, three unidentified Arabian Gulf nations, Zimbabwe, Thailand, and unidentified countries in Central America.

ST-K has been expanding its artillery product lines. The associated Ordnance Development and Engineering firm has developed and placed into production the 155mm FH-88 towed howitzer, as well as its 52-caliber follow-on, the FH-2000. The development and production of several different projectiles incorporating Extended Range Full Bore technology (including Base



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Bleed types) proceed in parallel with the development of the howitzer. A new wheeled self-propelled artillery system and a tracked self-propelled artillery system are in development; ST-K will offer these weapons systems as packages, including ammunition.

### AUSTRALIA/NEW ZEALAND

#### Australia

*Thales Australia.* The Australian Department of Defence Support coordinates the functions of eight major facilities and several smaller units in the production of all types of ammunition. The formerly government-owned Australian Defence Industries (ADI) Ltd, which has operated as a component of the Transfield and Thomson-CSF (now 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.

On July 10, 1998, a new 17-year renewable munitions supply agreement between (then) ADI Ltd 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 is 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.

#### *New Opportunities?*

In the area of artillery ammunition, Thales Australia has long produced NATO-standard 105mm ammunition for the M101 and M56 howitzers. More recently, the firm has concentrated on the production of British-pattern 105mm ammunition for the Hamel Gun (the 105mm Light Gun). Production of 155mm ammunition has been dormant for some years. As Australia is looking to procure a new 155mm artillery piece, production could resume during the forecast period.

Thales Australia hopes to be able to compete in the profitable but very competitive Southeast Asian market. However, other than for some small sales to New Zealand, Thales Australia has yet to score any major export sales.

### MIDDLE EAST

#### Israel

*Israel Military Industries Ltd (IMI).* This firm serves as the prime Israel Defense Forces (IDF) contractor for

artillery ammunition of all types. Further, IMI has emerged as a major player in the international market.

#### *A Major International Player*

Since 1985, Israel has exported artillery ammunition to at least 10 nations, including Germany, South Africa, Iran, and the United Kingdom. Previous customers include Chile, El Salvador, Ethiopia, Guatemala, Haiti, Mexico, and Nicaragua. Since 2001, the U.S. Army has shown an increased interest in Israeli artillery ammunition.

Following extensive trials, the German Bundeswehr selected IMI's 155mm projectile as the DM602 in February 1986. According to the terms of the DEM221 million procurement contract, IMI initially supplied 88,000 projectiles, with options (subsequently taken up) on an additional 12,000 rounds. Due to domestic German political pressures, the Bundeswehr also signed an identical contract with Rheinmetall for its 155mm ammunition. In a subsequent (October 1987) contract, IMI supplied the Bundeswehr with DEM300 million worth of artillery ammunition, including IMI's 155mm cargo (submunition-dispensing) round.

In 1995, IMI beat out Rheinmetall, (then) Giat Industries, and (then) Royal Ordnance to supply 155mm cargo rounds to the British Army. This \$79.2 million sale was the first to the United Kingdom by IMI. Though data on the exact type of round remain unavailable, our research indicates that it was one of the CL 3013 projectiles.

In June 1996, IMI and Rheinmetall entered into an agreement for the cooperative development of new artillery ammunition.

#### *Expanding Customer Base*

India's Ordnance Factory Board has been negotiating a co-production agreement for IMI projectiles. This agreement and its resulting Indian Army procurement could generate tens of millions of dollars for IMI; potential export sales could double that revenue.

Development continues. IMI recently revealed a new 152mm cargo round, the CL 3162 (also known as the DP-ICM M350/351). This projectile is available in standard and Extended Range (Base Bleed) versions. The CL 3162 may be a joint development program between IMI and Arsenalul Armatei of Romania. A 155mm version, the M395, is also available.

### SOUTH AMERICA

#### Argentina

*FM "FANAZUL."* Direccion Generale de Fabricaciones Militares controls the production of artillery ammunition in Argentina for domestic procurement and

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export sales. Among recent export customers are Bolivia, Paraguay, and Uruguay. Under the auspices of the DGMF, Fabrica Militar de Polvoras y Explosivos Azul (FM "FANAZUL") produces NATO-standard 105mm and 155mm ammunition under license.

(CITEFA), the DGMF developed the PALA 37/CH Extended Range Full Bore round and the PALA 37/BB ERFB Base Bleed round. Another newly developed round is the PACU, a ballistically refined HE round with a hollow base to reduce drag.

### *Domestic Development*

In conjunction with the Instituto de Investigaciones Cientificas y Tecnicas de las Fuerzas Armadas

## Related News

**South Africa Cuts Defense Budget** – Economic and budgetary woes have finally caught up with South Africa's defense budget, as spending in the 2010-11 fiscal year is expected to be more than 5 percent less than initially projected (the government's fiscal year runs from April 1 to March 31). The news is set against a backdrop of low federal revenues, and reflects a reversal of what the government hoped would be a period of revitalized defense spending.

Although South Africa's defense budget has shown relatively steady growth in recent years, averaging about 9.6 percent annually since 2006-07, high inflation rates largely nullified much of that investment. Last year's 2009-10 budget aimed to buck that trend, offering a substantial increase that would finally provide significant real growth. At the time, the government had planned to spend ZAR32.02 billion on defense in 2009-10, a 15.4 percent increase over the previous year's spending, despite mounting economic pressure resulting from the global financial crisis. Reality soon caught up with the government's optimistic spending plan, however, and the figure was revised downward to ZAR31.3 billion in the October 2009 Medium Term Budget Policy Statement, and again to ZAR30.3 billion in revised estimates accompanying the new 2010-11 budget released in February.

For the 2010-11 fiscal year, the government now plans to spend ZAR30.7 billion (\$4.0 billion) on defense, down from the expected ZAR32.4 billion. Budget growth over the medium term also slows, to an average of 5.1 percent annually, compared to 7.3 percent annual growth anticipated last year. The new spending plan will barely surpass an inflation rate expected to hover around 5 percent.

The budget outlines ZAR8 billion worth of "efficiency savings" over a five-year period, which includes ZAR23.1 million in 2008-09, ZAR499.6 million in 2009-10, ZAR3.2 billion in 2010-11, ZAR2.2 billion in 2011-12, and ZAR2.1 billion in 2012-13. Over the coming years, the budget reads, the savings "are focused on rephrasing and rescheduling armament acquisition to match a realistic acquisition plan."

The news is actually not as bad as it first appears, however, because the government's new spending plan includes ZAR4.5 billion in "savings" from the recently terminated Airbus A400M program. Whatever program takes its place can be expected to boost topline funding down the road, though a failure to expand the budget to accommodate a new transport would eat away at funding for other programs, many of which are already underfunded. The lack of a replacement program in the budget's three-year estimate also suggests that it may ultimately fall outside of the government's medium-term projections. The budget outlines additional cost-saving measures as well, including limiting overseas travel for military officials, limiting the transfer of personnel between geographical areas, and reducing unnecessary logistics expenses.

Landward Defense dominates the 2010-11 defense budget, receiving ZAR10.0 billion, or nearly 33 percent of the overall budget. This comes as no surprise, given that South Africa's last round of military modernization, carried out through the Strategic Defense Procurement Program (SDPP), favored air and maritime capabilities. Army investment is now expected to see average annual growth of 9.5 percent when measured from 2006-07 to 2012-13, and overall growth of nearly 11 percent from the latest 2010-11 budget to 2012-13. This increase is mainly due to growth in the military skills development program; maintenance requirements for an aging vehicle fleet; the acquisition of new logistics vehicles, APCs, and infantry combat vehicles; and ammunition procurement. The Army also sees a 65 percent increase in its Air Defense Artillery Capability in 2010-11, thanks in part to deliveries of Starstreak surface-to-air missile (SAM) systems. Finalizing the communication systems on the Rooikat armored car

## Artillery Ammunition (International)

and Ratel infantry fighting vehicle bolsters 2010-11 spending as well, though funding in the service's Signal Capability account will decline in the outyears. Three engineering squadrons – one light airborne, one maintenance, and one construction – are also being stood up under the 2010-11 budget. (FI, 3/10)

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### Funding

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

### Timetable

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The non-U.S. and non-European players have made significant technological progress in the past decade. We expect that at least one of these contractors will offer an advanced "smart" projectile on the international market within the forecast period.

### Worldwide Distribution/Inventories

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The Third World remains the primary market for non-U.S. and non-European artillery ammunition. In addition, a number of international players – most notably Israel Military Industries Ltd (IMI) – are emerging as legitimate competitors with the established U.S. and European players for procurement by the United States and European nations.

## Forecast Rationale

Serial production of artillery ammunition by non-U.S. and non-European manufacturers is ongoing for domestic procurement and export. While most non-U.S. and non-European artillery ammunition producers remain primarily focused on domestic procurement, a number of non-U.S. and non-European contractors are emerging as real players in the international market, challenging the traditional dominance of U.S. and European players.

#### *Leveraging Production Experience*

As U.S. and European artillery doctrine increasingly focuses on advanced technology as an alternative to massive conventional munitions stockpiles, a growing number of non-U.S. and non-European players have used the technology and expertise acquired through licensed production of U.S. and European munitions to enter the international market. These players fill the ever-increasing vacuum left by decreased production on the part of the traditional U.S. and European producers.

#### *IMI as a Major Player*

Of the non-U.S. and non-European artillery ammunition producers, Israel Military Industries Ltd (IMI) has emerged as a major player in the international market.

Since 1985, Israel has exported artillery ammunition to at least 10 nations, including Germany, South Africa, Iran, and the United Kingdom. Previous customers include Chile, El Salvador, Ethiopia, Guatemala, Haiti, Mexico, and Nicaragua. Since 2001, the U.S. Army has shown an increased interest in Israeli artillery ammunition.

#### *The NATO Standard*

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

#### *Increasing Market Share*

Through 2019, the Forecast International Weapons Group expects production of artillery ammunition by non-U.S. and non-European contractors to account for over 60 percent of all non-U.S. artillery ammunition production worldwide. Beyond the production of conventional Russian-pattern and NATO-standard ammunition types, many contractors now offer artillery munitions featuring state-of-the-art technology.

## Artillery Ammunition (International)

## Ten-Year Outlook

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Given the scarcity of open-source data regarding non-U.S. and non-European artillery ammunition production, developing a viable 10-year production outlook has become increasingly problematic. Nevertheless, the Forecast International Weapons Group expects the combined output of non-U.S. and non-European manufacturers will average nearly 1.5 million rounds per year through 2019.

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