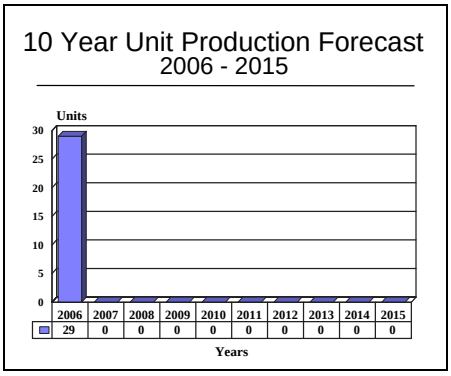
L11 and L30 120mm Tank Gun - Archived 3/2007

Outlook

- BAE Systems no longer offers the L11; potential Challenger 2E export sales may represent the last gasp of the L30 program
- The British Army continues to explore replacing the L30 with the 120mm Rh 120/55 smoothbore tank gun design under the Challenger Lethality Improvement Program
- Production forecast reflects potential L30 production for anticipated export sales of the Challenger 2E tank



Orientation

Description. 120mm rifled tank gun.

Sponsor. The United Kingdom Ministry of Defence, through the British Army, sponsored the development and British Army procurement of the L11 and L30 tank guns.

Licensees. None

Status. Development through serial production. The production lines for both the L11 and L30 are currently dormant.

Total Produced. Through 2005, the contractor produced a total of 3,012 L11 and 483 L30 tank guns.

Application. The primary offensive and defensive armament for main battle tanks. The L11 is the main armament on the Chieftain, Challenger, and Khalid tanks. The L30 is the main armament on the Challenger 2.

Price Range. In 1990 U.S. dollars, the L11 listed for $227,000. The 2006 unit price for a serial-production L30 is $319,800.

Contractors

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NOTE(S): With its 2004 acquisition of RO Defence, BAE Systems now acts as the sole-source contractor for the L30 tank gun.

Technical Data

The following data (except ammunition data) is applicable to both the L11 and the L30.

Crew. Per particular tank.

Muzzle Brake. None

Recoil System. Hydro-pneumatic, two buffers.

Breech Mechanism. Downward sliding semi-automatic block.

Ammunition. The L11 fires the following 120mm ammunition types:

- L31 High Explosive Squash Head (HESH)
- L15 Armor Piercing Discarding Sabot-Tracer (APDS-T)
- L20 Discarding Sabot-Tracer (DS-T)
- L23 Armor Piercing Fin Stabilized Discarding Sabot (APFSDS)
- L34 Smoke
- L32 Squash Head-Practice (SH-P)

The L30 fires all the above types, except the L15 APDS-T round. The L30 can also fire the L26 APDS-T round, developed under the Challenger Armament program.

Dimensions. The following data reflect the FV4034 Challenger-mounted L11A5. The L30 data, where different, are in parentheses.

	SI Units	U.S. Units
Caliber	120 mm	4.72 in
Length overall	6.858 (6.86) m	22.49 (22.51) ft
Barrel length	6.604 m/55 cal	21.66 ft/55 cal
Total weight	1,778 (2,000) kg	3,911.6 (4,400) lb
Recoil Length	37 cm	1.21 ft

Performance. The following data reflect the L11A5 only; the contractor has not yet released L30 performance data.

	SI Units	U.S. Units
Maximum range (APDS)	3,000 m	3,280.83 yd
Maximum range (HESH)	8,000 m	8,478.88 yd
Maximum rate of fire	10 rounds/min	10 rounds/min
Sustained rate of fire	6 rounds/min	6 rounds/min

The British Army rates the L11 barrel life at 120 equivalent full charges; the contractor states that the L30 barrel life is 400 equivalent full charges.

Variants/Upgrades

Variants. Not applicable. Including the L30, the contractor has produced eight different models of the basic L11 through the weapon's evolution. We discuss this evolution in the **Program Review**, below.

Modernization and Retrofit Overview. Generally not applicable. The contractor integrates improvements as production cut-ins. The only modernization and retrofit potential would involve retrofit of the L30 to the tanks originally mounting the L11.

Program Review

Background. The United Kingdom, long a world leader in tank design, was one of the first nations to adopt 120mm tank gun technology, with the rifled L1A1 in 1952. In 1957, the Royal Armament Research and Development Establishment at Fort Halstead designed a new 120mm rifled tank gun, the L11. After firing trials in 1961, the L11 entered service on the Chieftain tank (FV4201) in 1965. Since its introduction, the L11 has evolved into eight different production models, the last being the L30.

Odd Man Out? The United Kingdom has long been virtually the lone producer of the rifled 120mm tank armament in a market dominated by the 120mm smoothbore. In the past, the British defended their position with the following arguments:

1. Rifled tank guns can (in addition to firing conventional spin-stabilized ammunition) fire fin-stabilized ammunition by using a slipping driving band. This allows employment of the widest range of ammunition.
2. Spin-stabilized ammunition, as fired from rifled tank guns, has inherent advantages of stability in flight.
3. A rifled piece is more economical to procure and maintain.

However, the British Ministry of Defence has recently begun to face the growing limitations imposed by the 120mm rifled system. First, continued use of non-NATO standard ammunition severely impacts inter-operability with the U.K.'s allies (especially the United

States) who employ 120mm smoothbore tank guns. Further, the British Army is simply running out of 120mm rifled ammunition. The L31 HESH round has been out of production in the U.K. for years; current supplies are increasingly limited.

The APDS-T rounds presented their own problems, as production of the depleted uranium (DU) penetrators for these rounds became a major environmental and political liability for the Ministry of Defence. The only facility for producing the DU penetrators in the U.K. has already closed.

Challenger Lethality Improvement Program. To deal with this logistical nightmare, the MoD is investigating the potential for rearming the Challenger 2 with a 120mm smoothbore design through the Challenger Lethality Improvement Program (CLIP). Under a $6.2 million MoD contract, BAE Systems (in collaboration with Rheinmetall Defence) is investigating the integration of the Rheinmetall Rh 120/55 smoothbore tank gun with the Challenger 2 main battle tank. Aside from the procurement of the guns, the Challenger ammunition storage and handling equipment would require modification to accept the fixed 120mm smoothbore ammunition. The latest estimate to re-gun the entire inventory of British Army tanks is $386 million.

The Rh 120 design is already virtually the industry standard for 120mm smoothbore tank guns. Further, Rheinmetall offers a full line of non-DU ammunition for its proven Rh 120 design. (For more information on the Rheinmetall Rh 120, see the "Rh 120/M256 120mm Tank Gun" report in this Tab.)

BAE Systems and Rheinmetall have completed initial test firings of an Rh 120/55 on a modified Centurion chassis at the Rheinmetall test range in Germany The contractors are currently integrating the Rh 120/55 with a Challenger 2 in the U.K. for the next round of tests. The U.K. Ministry of Defence expects the initial Smoothbore Option Technical Demonstrator Program (SOTDP) to be complete by mid-2006.

Although the SOTDP failed to secure further development and production funding in the 2005 MoD budget, we expect the MoD will somehow find the funds to continue the Rh 120/55 ordnance integration, to support the stated intention of extending the Challenger 2 service life to 2035

Description. The L11 is of conventional design with a semi-automatic breech mechanism. The design achieves breech obturation by the use of an expanding steel ring on the face of the breech block. A semi-automatic cam mechanism opens the breech after firing, readying the piece for reloading. The L3 vent tube holder at the rear of the breech ring facilitates electric firing of the ammunition. Unlike 120mm smoothbore designs, the L11 design fires ammunition consisting of separate projectile and propellant bag components.

The barrel is of monobloc construction, featuring a fume extractor and a thermal sleeve. The muzzle end of the barrel of the latest production gun features a muzzle reference sight. The L11 was the first tank gun of its type and caliber available with an internally mounted system of this type.

Production Models. The basic L11 design spawned a series of production models; the L11A5 represented the major production version.

L11A1 – The initial production variant; 130 produced.

L11A2 – (then) RO Defence incorporated numerous minor changes to the base model, including a modified vent tube, an obturator sleeve protector, and a 15-hole vent tube magazine. In addition, the contractor used a stronger material in fabricating the breech ring.

L11A3 – This model incorporated additional minor changes to the breech ring.

L11A4 – This was a single piece used to evaluate an automatic loading system.

L11A5 – This was the main production model. It introduced the integral muzzle reference system and a fume extractor of smaller size and less weight. These two modifications necessitated the addition of 7.7 kilograms (16.94 lb) of weight at the breech for balance purposes.

L11A6 – This is a conversion of the A3 to accommodate the muzzle reference system. The L11A6 also featured the modified fume extractor of the A5.

L11A7 – This was a proposed version that never reached production. It featured a semi-automatic plunger for the vent tube loader.

L30 (EXP 32M1) – This is the latest and probably last variant of the basic L11 design, developed under the Challenger Armament program. The British Army considered this model different enough from the basic L11 to apply a new designation.

The L30 has a monobloc barrel of autofrettaged construction. The design features a split sliding-block breech mechanism, with the Crossley pad obturation ring mounted on a split rising block. This system is much more compact and faster in operation than more conventional systems; it is also easily adaptable to automatic operation. The L30 does not have a fume extractor or muzzle brake, although a muzzle reference

system is standard. The exact dimensions, especially those of the chamber, are still sensitive.

The L30 is the standard main armament of all Challenger 2 tanks, including export models. While a few FV4034 Challenger 1 tanks have received the L30 as a retrofit, the original British plans to retrofit all earlier Challengers and some late-model Chieftains with the L30 are now effectively dead.

Funding

The United Kingdom Ministry of Defence, through the British Army, funded the development and procurement of the 120mm L11 and L30 rifled tank guns.

Contracts / Orders & Options

Not available, as the U.K. Ministry of Defence and the prime contractor do not release contractual information regarding this ordnance.

Timetable

Month	Year	Major Development
	1957	Design conception
	1960	Initial prototype fabrication
May	1961	First test firings
June	1964	Serial production begun
	1965	Initial Operational Capability
June	1976	New ammunition development begun
	1984	MoD selected EXP 32M1 for Challenger
	1991	L30-retrofitted FV4034 Challenger 1 tanks see combat during Operation Desert Storm
December	1993	MoD orders additional Challenger 2 tanks
Late	2003	MoD initiated Challenger Lethality Improvement Program (CLIP), with requirement for 120mm smoothbore main gun
	2005	Production of L11 and L30 dormant; L30 available for new orders

Worldwide Distribution / Inventories

Export Potential. The export of the L11 has been limited to users of the Chieftain and FV4034 Challenger 1 tanks. However, given the distinct marketing handicaps of the rifled gun system in a world increasingly dominated by 120mm smoothbore designs, we forecast no additional export sales of the L11.

The Challenger 2, as a fully modern main battle tank competitive with the Krauss-Maffei Wegmann Leopard 2 and the General Dynamics M1 Abrams, enjoys greater appeal on the international market than older designs. This appeal paid off with the first export order from Oman in 1993. However, if the British Army carries through with its intention to adopt the smoothbore Rh 120/55 to replace the L30 on the Challenger 2, we expect the L30's appeal on the export market to quickly evaporate. (For further information on the export of the Challenger 2, see the "FV4034 Challenger and Challenger 2" report in Tab A (Tanks) of the *Military Vehicles* Forecast.)

Countries. The distribution of the L11 and L30 is directly related to the 4200- and 4300-series tanks, as well as the Khalid tank. While we cannot confirm exact numbers, distribution of the L11 and L30 is as follows:

Iran (on FV4201 Chieftain and FV4030/1 Improved Chieftain tanks); **Jordan** (on FV4030/2 Khalid tanks, plus the captured Chieftain Mark 3 tanks that Iraq gave to Jordan in 1989 and the Challenger 1 tanks acquired in 1999); **Kuwait** (on FV4201 Chieftain Mark 5/2K tanks); **Oman** (on Qayis Al Ardh FV4201 Chieftain Mark 15 tanks and Challenger 2 tanks); and the **United Kingdom** (on FV4034 Challenger 1, Challenger 2, and FV4201 Chieftain tanks). Additionally, BAE Systems inherited several L11 guns from Alvis Vickers for various tank development programs.

Forecast Rationale

The serial production lines for the L11 and L30 tank guns remain dormant. BAE Systems does not offer the L11 for further sales; the L30 remains available for new orders. Any future production of the L30 is directly dependent upon export sales of the Challenger 2 tank, as well as a possible Royal Jordanian Army upgrade of its FV4034 Challenger 1 inventory.

With the FV4034 Challenger during Operation Desert Storm and the Challenger 2 during Operation Telic (the British component of Operation Iraqi Freedom), the L30 earned an enviable combat record. Indeed, during Operation Desert Storm, an L30-armed FV4034 Challenger 1 achieved a kill at over 5,100 meters (5,577.4 yards/3.17 miles), the farthest known tank-versus-tank kill in history.

Nevertheless, the British Army is investigating the potential for rearming the Challenger 2 under the Challenger Lethality Improvement Program (CLIP) with the 120mm Rheinmetall Rh 120/55 smoothbore tank gun. The U.K. Ministry of Defence expects the initial Smoothbore Option Technical Demonstrator Program (SOTDP) to be complete by mid-2006.

Although the SOTDP failed to secure further development and production funding in the 2005 MoD budget, we expect the MoD will somehow find the funds to continue the Rh 120/55 ordnance integration in order to support the stated intention of extending the Challenger 2 service life to 2035.

Our 10-year production outlook reflects our assessment that BAE Systems may score some moderate sales of the Challenger 2E (with the L30 ordnance) in the near-term of the forecast period. However, given the drawn-out, on-again/off-again state of many possible procurement programs, we do not forecast procurement by any particular country. Our forecast does not reflect any modernization and retrofit work on existing tanks.

Given the existing inventory of available spare parts, the glut in the international tank market, and the likelihood of the British Army adopting the Rh 120/55 smoothbore design in place of the L30, this forecast production run for potential export sales may represent the end of the L11 and L30 program.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Ordnance	(Engine)	thru 05	06	07	08	09	10	11	12	13	14	15	Total 06-15
BAE SYSTEMS/RO DEFENCE													
L11 SERIES	NO ENGINE	3012	0	0	0	0	0	0	0	0	0	0	0
L30 (a)	NO ENGINE	483	29	0	0	0	0	0	0	0	0	0	29
Total Production		3495	29	0	0	0	0	0	0	0	0	0	29

(a) The through 2005 production includes 50 pre-production L30 cannon (excluding EXP32M1 or XL30E1/E3 prototype guns).

Challenger 2 on Guard in Iraq

Source: U.K. Ministry of Defence