The Era of the Cold War

The days of giant conglomerates were ending. Ling-Temco-Vought and the others had become too large and too diverse to be manageable. As its parent company began to disperse, Vought found itself in a series of reorganizations. But it kept on manufacturing airplanes right through the changes. It also kept designing them, though it now found itself having greater success with missiles and space exploration than with new military airplanes.

The reorganization of Ling-Temco-Vought as LTV in 1972 worked its way down over the next year into a re-structuring of LTV Aerospace. Vought Aeronautics and Vought Missiles and Space were combined into Vought Systems. The new unit took its place alongside the Michigan Division, Ground Transportation, and Agri-Chemical Products.

Vought Systems itself was busy on a wide range of manufacturing contracts. It was still building A-7Ds and A-7Es for the Air Force and Navy, as well as the Scout launch vehicle for NASA. It was manufacturing much of the S-3A Viking anti-submarine plane in partnership with Lockheed. There were also major contracts for civilian aircraft. The employees of Vought Systems were building Boeing 747 tail assemblies, McDonnell Douglas DC-10 tailplanes and elevators, Lockheed C-130 and P-3 control surfaces. The Michigan Division was still producing Lance battlefield missiles for the Army. Ground Transportation was engineering the Airtrans network for DFW airport as it continued development of experimental models of ground transportation systems.

On January 1, 1976, LTV Aerospace became simply Vought Corporation. Its divisions and sub-divisions were simplified as peripheral units were sold off or closed down. The re-emergence of the historic Vought name signaled a new attention to the firm's old strengths.

Vought Systems was well established as a premier airframe manufacturer. Its association with Boeing, for example, kept growing. On February 23, 1979, Vought announced a contract for up to 300 complete tailplane assemblies for the Boeing 767. The following October, the company also began work on tail units for the Boeing 757, including the aft fuselage. There was related, but much more secret work as Vought Systems was responsible for building the intermediate and rear fuselage sections of the Rockwell B1-B bomber. It was also a principal airframe builder for the Northrop-Grumman B-2.

Vought had less success in military aircraft competitions. It was involved in an unfortunate disagreement with the Air Force over the selection of the Fairchild A-10 close support aircraft in 1972. There was a longer and even more public debate when the Navy bypassed Vought and General Dynamics to choose as its new fighter the F-18 offered by Northrop Grumman and McDonnell Douglas. Vought protested the choice to the GAO and there was much political controversy, but Congress settled matters when it voted funds for the F-18. In 1976, the string of bad luck was extended when Vought lost the fly-off for the Tomahawk cruise missile.

Of course, there were significant victories as well. For example, in April of 1980, Vought was chosen as prime contractor for the Multiple Launch Rocket System to be used by the Army and its NATO allies. It also continued development of missiles as part of Navy's supersonic Tactical Missile program. Vought was now emerging as a premier aircraft and missile manufacturer.

Model Number : ALVRJ
Model Name :
Model Type: Air Launched Low-Volume Ramjet

The ramjet engine was exploited by many countries including the United States. The first flight test of a ramjet in the United States took place in 1945. Work leading to the ALVRJ began by the Navy in the 1950's with the idea of reducing the size of ramjet systems. Early versions of ramjets used separate boosters to obtain ramjet speeds. The low volume ramjet used the concept of an "integral rocket" to reduce volume. After rocket burnout the empty rocket chamber became the ramjet engine chamber thus reducing the total volume.

Work on the integral rocket ramjet concept was performed by the Marquardt Corp. for the US Air Force in the early 1960's. This effort was not entirely successful in that successful transition from boost propulsion to ramjet propulsion was never achieved.

The initial integral ramjet work performed by the Navy was performed by Chance Vought Aircraft and Texaco Inc. The ALVRJ Program was started in 1968 under contract to the Navy (N0019-68-0605) with the objective of demonstrating the flight performance and mission capabilities of an integral booster air-launched low-volume ramjet tactical missile system. Both air-launched and ship-launched tactical systems were envisioned by the Navy.

Six dynamic test vehicles (DTV) plus ground test hardware were fabricated to provide data for analysis and future engineering development of the integral rocket ramjet engine system. The first flight test was conducted in 1974. The program was completed in 1976 with complete success. The ALVRJ demonstrated successful transition from rocket to ramjet operation with cruise at a speed in excess of Mach 2.5 and flights at sea level and 35,000 feet.

The vehicle placed no significant restrictions on its launch aircraft. In each of five flight tests, the ALVRJ demonstrated stable controlled separation from the launch aircraft, smooth transition to ramjet operation, and stable cruise performance. In addition, lateral turns, pullups and pushovers demonstrated the controllability of the vehicle and satisfactory operation of the ramjet engine at the angles of attack expected for tactical operations.

Characteristics	
Diameter	15 in
Lenght	180 in
Weight	1200 lb
Range N - Nautical	104 N/miles
Speed	2.5 mach

Warheads	
	Ballast for Flight Test
	High Energy Unitary Proposed For Tactical
Propulsion	
	Solid Rocket Booster
	.Liquid (JP-5) Sustainer
Guidance System	
	Inertial/Active Radar Proposed for Tactical
	Inertial for Flight Test
Quanitity Produced	
	6 Missiles

Model Number : ZBGM-110
Model Name :
Model Type: Sub Launched Cruise Missile

The cruise missile program began in 1971 with six companies (including LTV) in competition on a Navy study contract to investigate the feasibility of a submarine launched cruise missile. After several rounds of competitive proposals, two companies (LTV and General Dynamics San Diego) were selected to compete in a fly-off. Each company was to build and test five to six missiles to demonstrate their capabilities.

There were two engine companies that had products of the correct small size to fit the cruise missiles (Teledyne Engines in Toledo, Ohio, and Williams Engine in Michigan). The Williams company was very small but its engine was in a more mature state of development due to work on very small turbine engines used for the Army's man maneuver unit. LTV and General Dynamics (GD) both selected the Williams engine but the Navy wanted both engine companies involved in the fly-off competition. The Navy therefore assigned the Teledyne engine to the LTV Cruise Missile, despite unofficial protests by the company.

Another difference between the LTV and GD cruise missiles was the design approaches used to survive the harsh underwater submarine launch. LTV elected to design the missile structure to be rugged enough to withstand the pressures and shocks with no protective covers. GD elected to design a conventional light missile structure and to use a protective dispensable shell for the underwater launch. The GD design approach turned out to be a real advantage during the latter days of the program when air-launched cruise missile versions became popular. For air launch, the protective shell could be eliminated, making a lighter payload than the LTV version.

In the fly-off competition, the LTV flight tests were not completely successful due to an error in programming the timer mechanism used to sense that the missile was ready to transition from underwater flight to normal air flight.

This competition included the first known incident of fullscale powered wind tunnel tests measuring both thrust and drag. LTV performed better in this part of the competition even though the Teledyne engine had difficulty in sustaining long run times in the wind tunnel.

GD won the competition and work by LTV was ended in 1975.

Characteristics	
Diameter	21 in
Lenght	12.1 ft
Weight	
Range	
Wing Span	10.5 ft
Speed	0.7 mach
.	
Warheads	
High Energy Unitary	
Propulsion	
Solid Rocket Booster	
.Turbo Engine 500 lb thrust	
Guidance System	
Inertial/Active Radar Proposed for Tactical	
Quanitity Produced	
6 Missiles for flight test	

Model Number : MLRS/GSRS
Model Name :
Model Type: Rocket Launch System

The Multiple Launch Rocket System (MLRS) was designed and is being produced by Lockheed Martin Vought Systems for the U.S. Army, as well as the armies of several allied nations.

MLRS is a highly mobile, automatic system that fires surface-to-surface rockets from the M270 weapons platform. The M270 weapons platform also launches Army Tactical Missile System (ATACMS) missiles.

From inside the cab, the crew of three can fire up to 12 MLRS rockets in less than a minute

M270A1 Launcher

- Improved Fire Control System (IFCS)
- Improved Launcher Mechanical System (ILMS)

IFCS has added capacities for the launcher fire control system to accommodate complex munitions and modern computer electronics: e.g., video display, onboard navigation package with satellite-based GPS, architecture for ultra-fast processing, and all mission software onboard. ILMS aims the launcher in 16 seconds (vs. the current 93 seconds) and cuts reload times by 38%. Together, IFCS/ILMS permits 60% less time at the launch site, increases reliability by 45%, reduces O&S costs, and provides the growth to accommodate future weapons. This translates to faster response times, more fire missions per launcher, and greatly improved system survivability. Fielding is projected for FY 2000.

High Mobility Artillery Rocket System (HIMARS)

To extend heavyweight fire support to early entry forces, HIMARS adapts MLRS launcher capabilities to the 5-ton, 6x6 all-wheel drive FMTV (family of medium tactical vehicles) truck. HIMARS features:

- high equipment and crew commonality/interoperability with M270 units
- compatibility with existing and future MFOM rockets and missiles
- C-130 transportability
- an improved position determining system

- basic MLRS tactics, shoot and scoot, fire from the cab, crew self-loading/unloading
- three-man crew with one-man operation if necessary
- full MANPRINT compliance

MFOM munitions give HIMARS the range to support maneuver elements and win the counterfire battle. IFCS modifications can be installed in HIMARS prototypes in mid-FY 1999. Currently in ACTD, following maturation, HIMARS will be M270A1 compatible in operation and maintenance. To extend heavyweight fire support to early entry forces, HIMARS adapts MLRS launcher capabilities to the 5-ton, 6x6 all-wheel drive FMTV (Family of Medium Tactical Vehicles) truck.

Family of Munitions

The exceptional load capacity of the basic M26 Rocket made it a potential vehicle for many payloads. With the addition of the Army Tactical Missile System (ATACMS), payloads in the 1,000-pound range are now delivered to extreme ranges. The MLRS family of munitions, comprising both rockets and missiles, was born. With the broader munitions suite, the next step is a more responsive flexible launcher to accommodate munitions yet to be designed. These improvements to the M270 launcher resulted in initial modifications in 1998. The MLRS rockets and launchers are manufactured at the Vought facilities in Camden Arkansas.

M26 Rocket

Each M26 Rocket delivers 644 dual-purpose improved conventional munitions to achieve a maximum range of 32 km (19.8) miles). Called “Steel Rain” by soldiers in the Gulf War, the M77 grenades are dispensed in mid-air above the target, drag-ribbon stabilized, and armed during free fall. Each warhead will saturate a target 200 meters in diameter, combining shaped-charge penetration and blast fragmentation. The average ground pattern of a 12-round ripple, with some overlapping of warhead patterns, varies from about 120,000 to 200,000 square meters, depending upon the range. The initial operational capability (IOC) of this combat-proven rocket was March 1983.

M26A1 Extended-Range Rocket

The Extended-Range MLRS Rocket improves the basic M26 range to more than 45 km and the area of influence by 107%. The rocket motor is extended 274mm and the warhead shortened equivalently. This reduces the payload to 518 M85 (modified M77) grenades, but dispersion is enhanced for better effectiveness with fewer grenades due to improved accuracy from unique aerodynamic characteristics. In addition, no-load detents pyrotechnically release the rocket to reduce tipoff during launch. Deliveries of these rockets started in January 1998.

M28A1 Reduced-Range Practice Rocket

With flight ranges reduced to 7.5 to 14.3 km by aerodynamic drag from the warhead's blunt nose, the M28A1 practice rocket allows safe, realistic MLRS live-fire training on existing tube artillery ranges at significant savings. Using steel ballast rods to replace the cargo, but with the same rocket motor as the M26 rocket, it improved the overhead safety with no airburst debris and it eliminated dud ammunition on the ground, as well as reducing the range danger area. It also allowed tactical handling, storage, transport and fire missions with the dynamics of a full-service, full-caliber launch. The initial operational capability was in September of 1993.

M28 practice Rocket

The M28 practice rocket is just like the tactical MK26 rocket but without dual purpose M77 grenades. It simulates the inflight warhead event by dispersing inert steel ballast rods over the target. It is still in user inventories but no longer in production.

Guided MLRS Rocket

By adding low-cost GPS-aided inertial guidance to the ER-MLRS and future MLRS rounds, 2- to 3-mil accuracy or better is attainable. This accuracy allows MLRS to attack more targets with fewer rockets while limiting collateral damage. Implementation has minimal design impact on existing rockets and adds flexibility for future warheads. Flight performance was optimized by the following improvements:

- a modular guidance unit in the forward nose section
- a low-cost inertial unit in the forward nose section
- low-cost inertial measurement unit for navigation
- non-folding canards for control
- non-spinning launch

Trajectory Corrected System (TCS)

The TCS program for inflight, ground-control of MLRS flight increases the number of targets engagable, yet decreases the number of rockets to defeat a given target. This is in development and has:

- Maximum commonality with MLRS
- A ground control unit in the battery command post which simultaneously controls a full command post 12 round ripple, selectively targeting single rockets to different aim points within the target area.

Testing was scheduled for 1989 with production projected by 1999 and delivery in 2000.

AT2 Rocket

Each AT2 warhead dispenses 28 anti-tank mines from seven dispenser units at the midair warhead event. A drag parachute stabilizes and orients each mine during descent. Upon ground impact, this parachute is detached, the erecting elements position the mine, and the detonator is armed. The AT2 shaped charge penetrates all tank hulls with high secondary effects. A multi-functional sensor defends against mine sweeping attempts, and an anti-lift device defeats manual disarming. Thirty-six AT2 rockets lay a minefield 2,000 by 115 meters. The launcher fire control system is used to program AT2 mines for any of six selectable self-destruct times. The AT2 rocket was implemented in 1993.

Army Tactical Missile System (ATACMS)

Packaged in an MLRS-lookalike launch pod and fired by MLRS crews from dual-capable M270 launchers, ATACMS is a family of long-range guided missiles having the massive firepower to win the deep battle. The combat-proven Block I missile delivers 950 antipersonnel/antimateriel (AP/AM) bomblets to a maximum range of 165 km. The Block IA missile doubles that range by reducing the payload to 300 bomblets, and is augmented by a global positioning system (GPS) which improves already impressive accuracies.

The Block II missile, with an initial operational capability (IOC) of October 2000, also has an improved missile guidance section with GPS, and delivers 13 BAT (Brilliant Anti-Tank) submissiles to Block I ranges to defeat moving armored targets. The Block IIA missile, projected for an IOC in FY 2003, will deliver six improved BAT submissiles to the same ranges as the Block IA missile.

The missile is assembled in the Vought facilites in Horizon City, Texas.