

# AERMACCHI M-346

One body, two souls | Fighter Attack & Advanced Jet Trainer



AIRCRAFT DIVISION

 **LEONARDO**





Aermacchi  
**M-346**

## A FAMILY OF ADVANCED JET TRAINER & LIGHT COMBAT AIRCRAFT

The same architecture of the twin-engine, tandem-seat airframe, the easy integration of mission system suite, sensors and weapons, allows the M-346 to take on incremental configurations to perform different roles with the same aircraft, from advanced training to combat operations.

The M-346 Advanced Jet Trainer (AJT) is the cost-effective, next generation advanced and lead-in fighter trainer in service with major Air Forces, worldwide. The M-346 is the central element of an Integrated Training System designed to allow student pilots to develop knowledge, skills and practices required for effective exploitation of modern combat aircraft.

The M-346FA Fighter Attack variant is the high performance Light Combat Aircraft, equally suited to air-to-ground with precision-guided munitions, air-to-air and tactical reconnaissance missions.

The M-346 is a family of advanced jet trainers and light combat aircraft that allow pilots to seamlessly pass from training to real missions without having to change the aircraft.





## THE ADVANCED JET TRAINER VARIANT

The M-346 characteristics contribute to maximize teaching effectiveness and to allow flight hours to be downloaded from Operational Conversion Unit to Pilot Training Unit, in the Lead-In Fighter Trainer (LIFT) role.

These characteristics - along with its Integrated Training System solution comprised of simulators and ground based instructional devices, including an operational Live, Virtual, and Constructive environment - make the M-346 the best solution to train the new generation of fighter pilots.

In addition, the aircraft is also ideally suited to satisfy the Companion Trainer role at a sustainable cost and the Adversary Red-Air role, thus preserving airframe-life and training cost of front line fighters.



## INTEGRATED TRAINING SYSTEM (ITS)

In its training role the M-346 has been conceived as the "core" of an advanced ITS which includes:

- › Aircraft with built-in Embedded Tactical Training System (ETTS)
- › Academic training (Computer Aided Instruction and Computer Based Training)
- › Synthetic Ground Based training (Full Mission Simulator and Part Task Trainer)
- › Mission Planning (Mission Support Station to support Briefing and De-briefing phases)
- › Training Need Analysis (TNA) and Training Management Information System (TMIS)
- › Live, Virtual, Constructive training environment
- › Logistic service (from standard Integrated Logistic Support to full Performance Based Logistics)



## MAIN FEATURES

### Airframe

- › Damage tolerant designed structure
- › Large use of composite materials

### Engines & Fuel System

- › Two interchangeable modular Honeywell F124-GA-200 dry turbofan engines with FADEC
- › An APU to provide autonomous engine starting
- › 2,500 l internal fuel and three external fuel tanks (630 l each)
- › Single point pressure refueling system

### Cockpit & Avionics

Latest generation Human-Machine Interface (HMI) with:

- Six liquid crystal Multi-Function Displays (MFD)
- Two Head-Up Displays (HUD)
- Up-Front Control Panel (UFCP)
- Digital moving map
- Hands On Throttle And Stick (HOTAS) controls
- Integrated Helmet Mounted Display (HMD) system
- Night Vision Goggles (NVG) fully compatible
- Get Home Display (GHD), for backup flight data

- › Autonomous navigation based on Embedded GPS/INS Radar-altimeter (EGIR)
- › Radio-aided navigation based on TACAN and VOR/ILS/MB
- › Two independent V/UHF transceivers

### Cabin

- › Two Martin Baker Mk.II16D “zero-zero” ejection seats
- › On-Board Oxygen Generator System (OBOGS)
- › Environmental Control System (ECS)





## EMBEDDED TACTICAL TRAINING SYSTEM (ETTS)

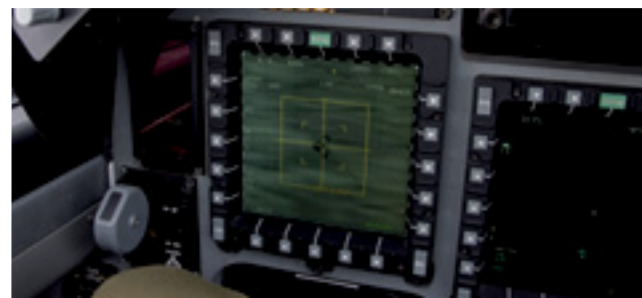
A comprehensive in-flight ETTS suite is a key feature of the M-346 and core element of the Integrated Training System (ITS).

ETTS enables the M-346 to offer the whole spectrum of simulated training functions in flight and provides both students and instructors with the following on-board simulations:

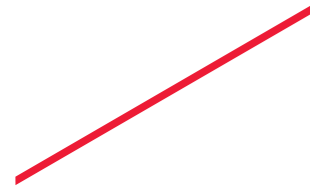
- › A tactical scenario (digital map with threats and targets)
- › Presence of realistic Computer Generated Forces (friend and foe)
- › On-board sensors (such as multimode Fire Control Radar, targeting pod and active/passive electronic countermeasures)
- › Weapons, including specific symbology and delivery parameters
- › Live, Virtual, Constructive (LVC) environment

ETTS functions can support Stand Alone (flying a single-ship mission) or Multi-Ship networked operations, with aircraft and simulators being networked via a dedicated Training Data Link to exchange Tactical Scenario data with other participants.

The cost-effective M-346 with its high performance and flying qualities, the on-board ETTS and the Ground Based Training System (GBTS) are part of a LVC environment, thus enabling a remarkable transfer – called “download” – of flight hours from the OCU to the training school during advanced and LIFT phases, improving teaching effectiveness with a low Life-Cycle Cost.







Aermacchi  
**M-346 FA**  
 FIGHTER ATTACK



MC.205V



MB.326K



G-91R



MB.339



AMX

## A TRADITION OF EFFECTIVE AND EFFICIENT COMBAT AIRCRAFT

The Aermacchi M-346FA is the latest Leonardo's Aircraft Division product based on its long-term experience in the development of combat aircraft, dating back to the early 20th century.

Aeronautica Macchi produced effective combat aircraft, among which the Macchi C.202 and C.205 used during World War II. At the end of the Sixties the company developed the high praised Aermacchi MB.326K, a dedicated single seat attack variant derived from the widely used MB.326 jet trainer. A further evolution of MB-326, led to the MB-339 jet trainer and its highly effective, combat proven, attack variant. FIAT's Aviation Division, absorbed by Aeritalia in 1969, then Leonardo, also produced combat proven aircraft such as the G-91R.

The AMX, currently in service with Fuerza Aérea Brasileira and with Italian Air Force for air-to-ground and reconnaissance tasks, originally produced by Aeronautica Macchi, Aeritalia and Embraer, is another example of Leonardo's combat aircraft legacy.

## THE FIGHTER ATTACK

In the current operational scenarios, especially those with a low-medium threat level, the trend of modern Air Forces is to reduce the number and types of aircraft in their inventories for logistic and economic reasons. As a consequence, modern and expensive 20/30 tons class fighter-bombers are employed in the CAS/COIN role, taking-off with just 2 tons of weapons, thus rapidly eroding their fatigue life.

The new M-346FA version is the answer: it is the evolution of the M-346 Advanced Jet Trainer (AJT) to meet, with a high performance platform, an increased wide range of customer operational needs.

The M-346FA is a radar equipped multirole light fighter and represents a highly cost-effective, tactical solution for the modern battlefield.

At the same time it keeps all the attributes of the M-346AJT, including the Embedded Tactical Training System (ETTS) suite. This enables the M-346FA to still be used as an Advanced Jet Trainer, Lead-In Fighter Trainer (LIFT), to offer the whole spectrum of simulated training functions in flight and to be integrated in the fully validated M-346 Integrated Training System (ITS) with Live, Virtual, Constructive (LVC) capabilities.





## KEY FEATURES

- › **Multi-mode radar** Grifo-M346 by Leonardo Electronics, specifically optimized for the M-346FA with IFF interrogator, supporting Air-to-Air and Air-to-Ground missions:
  - Long range detection and tracking in all scenarios (look-up and look-down, any altitude, any aspect)
  - High resolution imaging (sub-metric SAR and ISAR)
  - Wide scan sector and multiple target tracking
  - HOTAS and HMD designation
- › **Tandem-seat configuration** well suited for complex air-to-ground missions (back-seater acting as Weapons System Operator or Forward Air Controller – Airborne, FAC-A), with excellent visibility from both seats
- › **High-end, net-centric communication suite:**
  - Secure Comms
  - Tactical Data Link (TDL) both NATO and non-NATO
- › **Seven external hard-points** for an extensive variety of weapons and external stores including:
  - General-Purpose, laser and GPS guided weapons
  - Air-to-surface and air-to-air missiles
  - Gun Pod, Recce and Target Designator Pod
  - ECM Pod
- › **Air-to-Air refueling capability** for long range/ endurance and Time on Station
- › **Embedded Tactical Training System (ETTS)** activated as a training alternative to real sensors and weapons.



## SURVIVABILITY & SELF-PROTECTION

- › **Twin engine configuration**, hydraulic and electric redundancy and robust digital four channel Fly-By-Wire Flight Control System with carefree handling ensuring that pilots can focus on mission success
- › **High Angle of Attack (AoA)** and energy for unmatched maneuverability, high rate of climb and penetration speed even at low altitude with external stores
- › **Good performance also with One Engine Inoperative (OEI)** for effective Threats Escape/ Return to Base
- › **Defensive Aids Sub-System (DASS)** including:
  - Radar Warning Receiver (RWR)
  - Missile Approach Warning System (MAWS)
  - Chaff & Flare Dispenser (CFD)
- › **Radar Cross Section reduction kit** available for low detectability



## SAFETY

- › **Redundancy by design:**
  - Twin Engine, Two Independent Accessory Gearboxes
  - Quadruple Redundant FBW Flight Control System and Air Data
  - Two Separated/Independent Hydraulic and Electrical Systems
  - Two Batteries for 30 min of operations
  - Independent Fire Extinguisher in Engine & APU Bays

- › **Carefree handling functionality to:**
  - Prevent aircraft departure/loss of control
  - Limit the possibility of overstressing the airframe
- › **In-Flight safety features:**
  - Ground Proximity Warning System (GPWS)
  - Mid-Air Collision Avoidance System (MIDCAS)
  - Pilot Activated Attitude Recovery System (PARS)





## EXTERNAL STORES

The M-346FA can be employed in medium-low intensity scenarios and is designed to have different operational capabilities, with a wide range of guided and unguided munitions and other external stores, thanks to:

- › Five underwing pylons and two rail launchers at the wingtip for air-to-air missiles
- › External stores interface in accordance with MIL-STD-1760
- › MIL-STD-1553B armament Bus Control
- › Store management system enabling to carry a full range of weaponry, including the latest smart weapons

## OPERATIONAL CAPABILITIES

Air-to-Air:

- › Air policing/homeland defence
- › Slow mover intercept

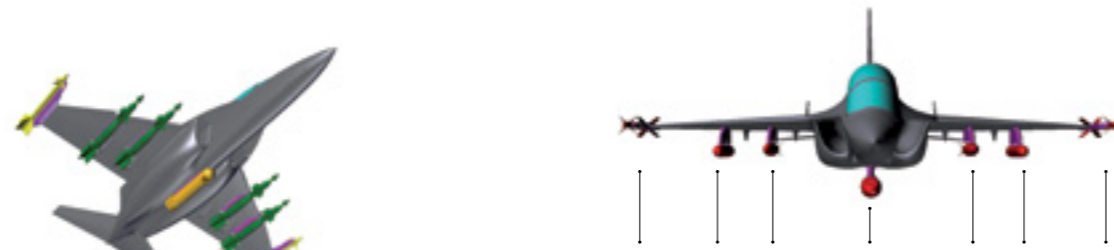
Air-to-Ground:

- › Close Air Support (CAS)
- › Counter Insurgency (COIN)
- › Forward Air Controller - Airborne (FAC-A)
- › Combat Search And Rescue (CSAR)
- › Interdiction
- › Battlefield Air Interdiction (BAI)
- › Tactical Air Support for Maritime Operations (TASMO)

Reconnaissance (RECCE)

With three external fuel tanks and one In-Flight Refueling, the endurance can reach seven hours for maximum mission persistence and extended loiter time.

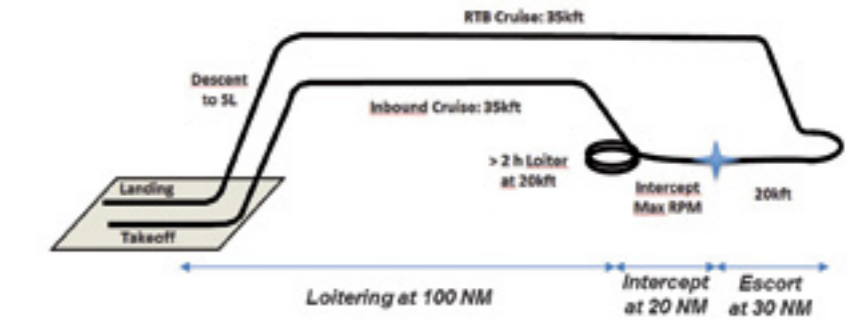
Medium Range Air-to-Air Missiles for Beyond Visual Range (BVR) intercepts can be integrated.



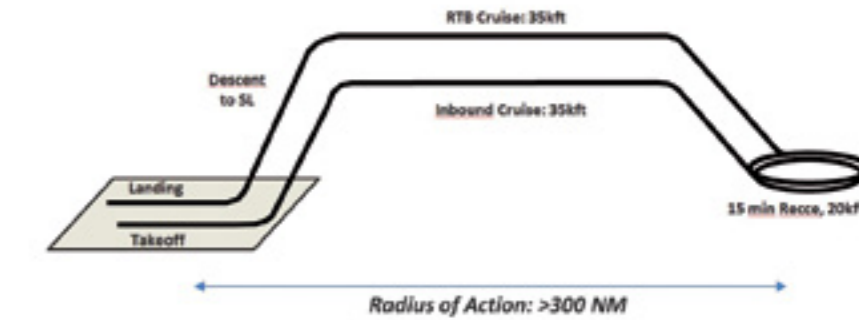
	RIGHT WING			FUSELAGE	LEFT WING		
	Tip	Central	Inboard	Ventral	Inboard	Central	Tip
Baseline stores			●	●	●		
External Fuel tanks (630 l each)			●	●	●		
Lizard 2 (500 lb) LGB		●	●		●	●	
MK. 82FF (500 lb) general-purpose bomb		●	●		●	●	
BRD-4-250 Bombs Rockets Dispenser		●	●		●	●	
SUU-20 Bombs Rockets Dispenser			●		●		
AIM-9L/ATM-9L Short Range Air-to-Air Missiles	●	●				●	●
FPR-14 AACMI pod	●	●				●	●
Gun pod				●			
Recce pod				●			
Target Designator Pod				●			
Luggage Pod				●			
Options		●	●		●	●	
GBU-12 (500 lb) Paveway II LGB		●	●		●	●	
GBU-16 (1000 lb) Paveway II LGB		●	●		●	●	
GBU-38 (500 lb) JDAM		●	●		●	●	
GBU-32 (1000 lb) JDAM		●	●		●	●	
GBU-49 (500 lb) Enhanced Paveway II GPS/LGB		●	●		●	●	
Lizard 4 (500 lb) GPS/LGB		●	●		●	●	
Small Diameter Bomb (SDB)		●	●		●	●	
TEBER (250 lb) LGB		●	●		●	●	
SPICE (250 lb) EO/GPS		●	●		●	●	
MK.82HD Snakeye (500 lb) general-purpose bomb		●	●		●	●	
MK.83 (1000 lb) general-purpose bomb		●	●		●	●	
Rocket Launchers		●				●	
Brimstone Air-to-Surface Missiles		●	●		●	●	
IRIS-T Short Range Air-to-Air Missiles	●	●				●	●
MRAAM	●	●				●	●
ECM Pod				●			



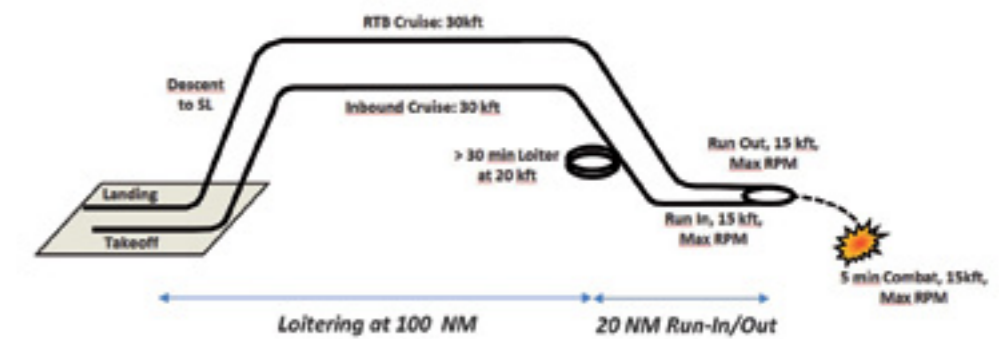
### Air Policing: 2 SRAAM + U/F Gun Pod



### Reconnaissance: 2 SRAAM + U/F RECCE Pod



### Air-to-Ground: 2 SRAAM + Targeting Pod+ 4 LGB (500lb class)





## THE BEST SOLUTION FOR THE MOST DEMANDING AIR FORCES

Since the acquisition by Italian Air Force in 2009, the M-346 won the most important international tenders and was selected by some of the most demanding Air Forces in the World, beating the most advanced training aircraft available on the market, delivering first class training and operational capabilities, while keeping low operating costs.

### Italy

*"It's the most modern advanced/lead-in fighter trainer in production, and it's the only new generation trainer equipped for this role. Its performance and flight qualities are excellent, similar to modern fourth- and fifth-generation fighters. Its design solutions are advanced and provide high levels of safety and limited purchase and operating costs. It is suitable for every phase of advanced training, LIFT and 'companion trainer' for combat types, thanks to its ability to simulate a wide range of sensors and armament."*

*"The recent introduction of LVC – live, virtual and constructive – training allows missions to be data-linked between simulators and aircraft. The T-346A [as ItAF calls the M-346] 'downloads' training tasks from the more expensive firstline fighters. Its low maintenance costs and high efficiency make it an economically sound option for advanced training."*

Col. Luigi Casali, Head of Training and Standardisation Office, Air Education and Training Command, Italian Air Force  
January 2019 – Air Forces Monthly



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### Poland

*"[The Polish M-346 programme] was an important operation that has completely changed the face of our flying schools in terms of both infrastructure and training. It will result in a transformation of the Polish Air Force. The Bielik [as the PLAF calls the M-346] delivers a revolution in the training of pilots for the Polish combat aircraft"*

Prezydent Rzeczypospolitej Polskiej Andrzej Duda  
August 2019 – Lotnictwo magazine



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### Israel

*"The 'Lavi' [as Israeli Air Force calls the M-346] enabled one of the IAF's most advanced virtual training simulations. The aircraft has no missiles or electronic warfare systems – in turn, they are simulated by virtual systems connected to the various aircraft which transfer the data to the cockpit, which then presents them as actual systems", elaborated Lt. Col. A'. We can simulate 'Mig-29' aircraft which lock onto the real aircraft and fire virtual missiles at them. This allows us to perform complex scenarios in safe conditions"*

Lt. Col. A', Heyl Ha'Avir, Israeli Air Force  
June 2018 – IAF website



© Israeli Air Force



## MAINTENANCE CONCEPT

- › On-Condition and Condition Monitoring maintenance for equipment and systems
- › Two level maintenance concept (Organizational and Intermediate) for aircraft, equipment and systems
- › Structural depot level maintenance is not required
- › Health & Usage Monitoring System (HUMS) and Structural-Health (S-HUMS) enable monitoring and data collection of on-board equipment and airframe structure
- › The Ground Support System (GSS) allows a rapid assessment of the aircraft systems status, reducing troubleshooting, scheduled and unscheduled maintenance activities



## INTEGRATED LOGISTIC SUPPORT

- › Structural Integrated Logistics Support (ILS) techniques and analyses have been extensively used to guarantee a support system that optimizes materials and equipment, making the operational support easier
- › ILS has built the lowest life cycle cost for this category of aircraft decreasing the logistics footprint
- › Support solutions tailored on different customer's requirement and different missions profiles



## CHARACTERISTICS

### DIMENSIONS

Wing Span, Trainer	31.9 ft	9,72 m
Fighter Attack	33.2 ft	10.14 m
Length, overall	37.7 ft	11.49 m
Height	15.6 ft	4.76 m
Wing Area (reference)	253.2 sqft	23.52 mq

### Aermacchi M-346



### WEIGHTS

Take-off (Clean)	16,775 lb	7,600 kg
Ramp (Maximum)	21,165 lb	9,600 kg

### PERFORMANCE

Max Level Speed, Low Altitude	590 KTAS	1,090 km/h
Limit Speed	572 KEAS/ 1.1MN	1,060 km/h
Service Ceiling	45,000 ft	13,715 m
Rate of Climb, SL	22,000 ft/ min	6,705m/ min
Sustained Load Factor, SL	8 g	
Sustained Turn Rate, 15,000 ft	12.5 deg/s	
Ferry Range, 10% reserve, Int. Fuel	1,040 nm	1,925 km
Ferry Range, 10% reserve, 3 Ext. Tanks	1,375 nm	2,550 km



### POWERPLANT

Engines, Turbofan:	2 Honeywell F124-GA-200	
Thrust, Max, SLS, ISA	2 x 6,280 lb	2 x 2,850 kg
Internal Fuel	4,420 lb	2,005 kg

### Aermacchi M-346 FA FIGHTER ATTACK



### WEIGHTS

Take-off (Two SRAAM)	17,860 lb	8,100 kg
Ramp (Maximum)	23,148 lb	10,500 kg

### PERFORMANCE

Max Level Speed, Low Altitude	575 KTAS	1,065 km/h
Limit Speed	572 KEAS/ 1.1 MN	1,060 km/h
Service Ceiling	45,000 ft	13,715 m
Time to 30,000 ft	2.5 min	
Sustained Load Factor, SL	7.3 g	
Sustained Turn Rate, 15,000 ft	11.5 deg/s	
Ferry Range, 10% reserve, Int. Fuel	900 nm	1,665 km
Ferry Range, 10% reserve, 3 Ext. Tanks	1,200 nm	2,220 km





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