ASTER FAMILY

FACTS & FIGURES

Aster systems family key figures

- 3 domestic customer countries
- 6 export customer countries
- 12 customer forces (navies, armies, air forces)
- 78 weapon systems ordered or in plans, 55 delivered
- 21 systems for export
- 1800 missiles ordered or in plans, 1300 delivered
- 11 bn€ global investment (domestic + export) since 1990

Aster Systems Family

ONE single missile concept for many Air & Missile Defence applications:

- Ground Based Air & Missile Defence:
  - SAMP/T in service with French Air Force and Italian Army
  - 1 Export country

- Naval Self-Defence:
  - SAAM/FR on aircraft carrier Charles-de-Gaulle
  - SAAM/IT on aircraft carrier Cavour
  - French FREMM frigates
  - 4 export Navies

- Naval Local Area Defence
  - PAAMS on French and Italian Horizon frigates
  - Sea Viper on UK Type 45 destroyers
  - SAAM ESD on Italian FREMM and PPA frigates
  - 2 export Navies

Aster missiles can operate in conjunction with different radars

- Arabel for SAMP/T and SAAM /FR
- Empar for PAAMS and SAAM /IT
- Sampson for Sea Viper
- Herakles for French FREMMs
- DBR for Italian PPAs
- Grand Kronos for Italian FREMMs

Aster missiles use vertical launchers

- For land applications
- Sylver A43 or A50 for naval application

Aster missile concept is unique and unmatched

Aster is a dual stage missile using 2 kinds of boosters to fit different types of missions

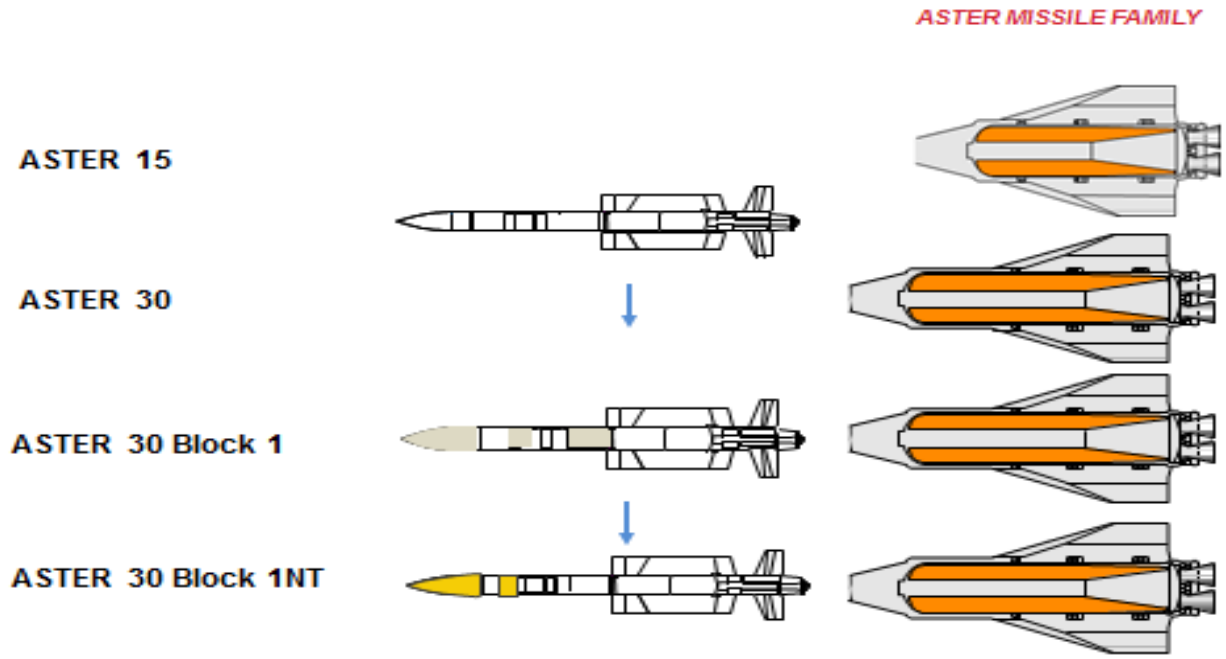
- Short booster for **Aster 15** used in SAAM systems for **self-defence**
- Long booster for **Aster 30** used in SAMP/T, PAAMS and SAAM ESD for **area defence**

Aster terminal stage is common to the entire family to the exception of a limited adaptation (Block 1) for increased efficiency against Tactical Ballistic Missiles, thanks to a dual warhead.

Aster terminal stage features an unmatched agility at any altitude (very low to high altitude) thanks to a combination of two flight control technologies:

- **PAF** (Pilotage Aérodynamique Fort) long chord wings and fins for aerodynamic controls,
- **PIF** (Pilotage In Force) Jet vanes applied at centre of gravity for end game with zero response time, even at very high altitude

Thanks to this unique concept, Aster systems are equally efficient against the full spectrum of Air & Missile threats ranging from supersonic stealth cruise missiles up to ballistic missiles. One key benefit is that Aster systems do not need complementary inner layer air defences to achieve full protection



Aster programmes timeline

1990	First French Italian FSAF Contract : ASTER 15/30 and SAAM (FR & IT) ,PAAMS(FR & IT) and SAMP/T development
1999	UK Navy launches PAAMS system development
2000	ASTER 30 Block 1 development contract
2002	First operational firing from the Charles de Gaulle aircraft carrier
2010	First Horizon frigates in operation with Aster 15 and Aster 30
2010	First TBM firing with Aster 30 Block 1 and SAMP/T*
2011	First SAMP/T in service
2011	Italian Navy "Orrizonte" frigates deployed in response to UN resolution 1973 to enforce No Fly Zone over Libya coast line
2012	First firing against supersonic sea skimmer with Aster 30/PAAMS*
2012	5 years SAMP/T and PAAMS common support contract (pooling all 5 domestic customer forces together)
2015	Italian Army deploys SAMP/T batteries to relieve Patriot as part of NATO package to protect Turkey against missile attacks from Syria
2015	France, Italy, UK MoU for future sustainment of Aster family
2016	France and Italy joint Aster 30 Block 1 NT development and manufacturing contract

*all trials to date against TBM and supersonic sea skimmers resulted in intercepts

Aster fulfils exacting requirements

- Very demanding dual requirements :
  - ✓ Anti-air breathing targets and anti-missile including TBM
  - ✓ Vertical Launcher for naval and land-based, 360° intercept capability
- Naval application for point defence and area defence against manoeuvering supersonic sea-skimmer
- Land and naval based applications for medium and long range area defence with capability against combat aircraft, cruise missiles & Tactical Ballistic Missiles (TBM)
- Capability to be integrated with different radars and with an independent uplink
- Naval TBM capability demonstrated through studies funded by domestic customers and object of development for PPA contract and export

Aster provides freedom of use and sovereign access to capabilities

With a modular concept for both the ammunition and the systems, the Aster family is replacing today several systems in both French and Italian forces which were imported from the USA:

- Hawk MIM-23 in the French Air Force and the Italian Army
- Standard SM-1 RIM-66 in the French and Italian navies

France and Italy had had to support 9 upgrades of the Hawk system unilaterally decided by the US Army between 1974 and 1994, amounting to a total of 3 bn FRF (500 M€), with no visibility for their budget planning, preempting funds for other priorities

When the US Navy transitioned from SM1 to SM2, only compatible with AEGIS Combat Management Systems, production of SM1 has been halted by the manufacturer. French and Italian navies were left with no missile for their class of air defence frigates in development at the time, which lead to cut these classes of ships and launch new developments.

As a consequence of these difficulties, France and Italy had coherent requirements, calendars and will to launch replacement programmes. Which was done in a record time, never matched again by any other cooperation programme : only 30 months lapsed between the Statement of Intent by both nations in November 1987 and the first development contract signature in May 1990

Sovereign capabilities acquired thanks to developing Aster in France and Italy

The ASTER program is a technology driver for the entire missile sector of Europe and helped both France and Italy to acquire an outstanding advance in some technology domains, which in turn benefited to the later development of other missile systems such as: VL MICA, MdCN, Meteor, etc.

- Vertical launch,
- Terminal guidance against maneuvering supersonic and ballistic missiles, thanks to the unique concept of PIF / PAF control
- Interception at very low altitude above sea level,
- Mastery of thermal and mechanical design of a missile flying at great speed (up to 4,5 Mach)
- Design & Development of RF sensors (seeker, proximity fuze, uplink receiver) able to operate in severe environments against complex targets (Electronic Counter Measures, Clutter, Thermal,..)