



HISTORY & PROFILE
OF
LOGISTICS AND ALLIED SERVICES
FOR THE
SPACE INDUSTRY

PROVIDED BY
LASER TRANSPORT INTERNATIONAL LTD



THE HISTORY

STOP PRESS

MARECS A is finally switched off after 14 years Service

On Friday 23 August, after more than 14 years of in-orbit service for ESA, the MARECS A satellite was manoeuvred into a graveyard orbit and deactivated. Launched in December 1981 on the 4th Ariane test flight with a 7 year mission to provide maritime communications services for INMARSAT. The decision to terminate the mission was a consequence of insufficient solar array power being available to support communications services during the eclipse season.



MARECS A is finally switched off For us these words have a wealth of meaning, for it was in 1980 that Laser, against heavy international competition, successfully tendered for the test to launch transportation requirement for that same satellite, MARECS A.

A purchase contract covering the movement of the spacecraft and associated ground support equipment to test locations in Europe, thence to the Ariane launch site in Kourou, French Guiana, was signed in May 1981; and Laser was on the road to establishing its' unique position in the space logistics business, held uninterrupted to this day some 30 years on.

During that time, Laser has developed its role well beyond that of an innovative multi modal operator - the basic requirement for the first MARECS movements - and today provides a complete logistics package, described in some detail later, for the same very demanding customer, now a world leader in the delivery of complete in-orbit satellite and ground tracking systems - providing *SPACE SOLUTIONS TO EARTH PROBLEMS*.

Over the last 21 years we have not only sustained the highest level of service in every movement, but have also adapted and enhanced the range of our services to meet the changing requirements of this rapidly expanding customer.

The following pages describe some of the major projects undertaken worldwide to date. In this Century, Laser has broadened its scope of activities worldwide and will now focus also on the opportunities arising from launch facilities in Kazakhstan, China and Japan.

LASER AEROSPACE

Multimodal Logistics

Over the years, Laser, in *partnership* with their customer, has grown and developed its role and now provides a total *Multimodal Logistics* package, including:

- a. The provision of a specialized team of qualified staff, for account management, packing, palletization, container/trailer stuffing, quay-side supervision, aircraft loading etc - on site in the UK, Europe and overseas.

The provision of specialist logistics staff, in the UK and abroad, for in-plant support.

Pre-shipment surveys at European test and overseas launch locations; the appointment of contractors; direct interface with Government departments, space establishments and security agencies.

The provision of packing, transport and movement plans and communication of information to all interested parties.

- b. The identification and procurement of the most cost effective transport methods and routes, in accordance with the time and security constraints, particular to individual satellite projects.



LASER AEROSPACE

Multimodal Logistics (continued)

Our test and launch campaigns over the years have involved many and diverse multimodal and deep sea operations, including the following (main elements):

- 2 off ship charters - South America to Europe
- 200+ off box & flat rack containers, between Europe and the Americas
- 7 major abnormal interstate movements by road within N America
- 8 off Belfast Aircraft Charters between Europe and the Americas
- 40+ off 747 freighter and Antonov AN124 full/part charters between Europe and the Americas
- 300+ off European abnormal, high security road movements
- Laser's own box trailers by sea UK/Canada and return



- Laser's own containers and trailers by air and sea between Europe and Kourou!

KEY MOVEMENTS

Satellite Test and Launch Campaigns

Until 1999, each satellite project represented, in logistics terms, the spacecraft and 60 to 120 tonnes of ground support equipment, valued up to £170 million.

The ST-1 satellite spacecraft transport container, for example, measured (LWH) M8.90 x 4.40 x 4.32 - a substantially abnormal load.

The smaller Inmarsat satellite, though, shown below loading to Le Shuttle, en route to the US via Paris, had fairly standard dimensions of M4.15 x 2.50 x 3.00.



Compared with the above, the scale of the space hardware and support equipment associated with the **ENVISAT** project was truly enormous; and the following pictures show clearly the size of the Payload Module Container moved during the first European test campaign.



This piece alone - the container and integral tri-axle self steer bogies and goose neck - measures (LWH) M18.5 X M 4.50 X M4.20 and weighs 38 tonnes!



The Envisat project story now follows, describing the exceptional demands on Laser in terms of technical expertise and investment, both in capital equipment and human resources.

KEY MOVEMENTS POLAR PLATFORM

Envisat Project

In January 1987 Laser had its first project meeting with their customer - then the *Space and Communications Division of British Aerospace plc* - now EADS Astrium Limited, in respect of the ESA Polar Platform Project, which we now know as **Envisat**.

There followed years of planning, procurement of specialised road transport equipment, guidance on engineering design, construction and use and many intra-European abnormal movements of hardware, in particular between the UK, Holland and Spain.

... until, 14 years on, finally the go ahead, we were given dates for the long awaited launch campaign in Kourou on Ariane V !

In February 2001, project manager Nick Charlesworth leading the Laser team of five, set up shop at the ESA HQ in Noordwijk Holland for the start of the extremely complex assembly and packing process of 100's of tonnes of ground support equipment and space hardware.

The first target - to meet the departure of the ro-ro charter vessel M/N Toucan sailing from Le Havre on the 14th March 2001 for Pariacabo (the port on the Kourou River) with 23 pieces of freight including 5 road trailers with (very) outsize equipment, 9 x 20-foot containers and 9 x 40-foot hi-cube containers (6 being temperature controlled).

The packing, loading and departure stages were spot on schedule and 12 days later, Laser were in Kourou supervising the final delivery and assisting in unpacking and setting up of this truly remarkable advance shipment of equipment measuring 777 cubic metre with a dead weight exceeding 140 tonnes.

The next target, even more daunting and the culmination of months (and years) of very detailed planning, was to meet our charter aircraft timetable for the movement of the flight hardware and electrical ground support equipment – valued at over £1 billion – which involved 2 exclusive 747-200 Freighters out of Paris and an Antonov AN124 out of Schiphol, all three aircraft scheduled to take off in the space of 8 days!

The coordination of the packing documentation ground transport and security demands, represented a logistics exercise of extraordinary proportions.

KEY MOVEMENTS POLAR PLATFORM

Envisat Project (continued)

The 2 freighters from Paris, with palletization and security supervised by Laser team members, loaded and departed precisely on schedule on the 9th and 16th May carrying 665 cubic metres of equipment including the Asar Antenna Stack, with a combined dead weight of 120 tonnes.

The Antonov was loaded with the payload module (and Laser's tractor unit), the service module, the solar array and other equipment representing in total 4744 cubic metres and a dead weight of 69 tonnes.



This aircraft with Laser project personnel onboard, departed Schiphol on the 15th May and after a tech-stop in Tenerife South, arrived at Cayenne airport 14 hours later at 1936 hours local.

The Laser tractor unit with the Payload Module, an overall length of M 24.5, width M 4.50, height M 4.20 and gross weight of 52 tonnes, under heavy police escort, performed the 77kms move to the new S5 facility at the Space Centre in Kourou on the only highway (closed to all other traffic) in 2 hours 15mins.

Laser driver Cliff Wragg already in Kourou, took the wheel and Nick Charlesworth acted as steersman for this critical final journey.

All the flight hardware and equipment, was delivered to the launch site in perfect condition and the Laser team remained on site for the unloading and unpacking of all the material.

Envisat, with a combined shipment total of over 6000 cubic metres, is the largest project ever delivered to Kourou for launch.

**KEY MOVEMENTS
POLAR PLATFORM**

Envisat Project (continued)

LAUNCH

ENVISAT - the largest satellite project to be handled at Kourou (Spaceport Europe) was launched on Ariane 5 at 0107 hours 59 seconds GMT on Friday 1st March 2002.



Our project team, led by Nick Charlesworth, together with Chris Vinall and Cliff Wragg, began the final phase of the packing in January 2002; an air part charter by 747F with EGSE was arranged mid March and from March through to May 2002, the empty Payload Transport Container with Laser tractor unit N50 LTT and 27 containers and trailers, loaded with return equipment, were shipped back to Europe by Arianespace charter vessels.

KEY MOVEMENTS

Satellite Test and Launch Campaigns

The "window" allowed for transport operations during integration and test programmes, leading up to the final launch of a satellite is very narrow and the demand for precise compliance absolute - there is obviously no margin for error, in view of the enormous penalties at stake, in terms of launch delay and in delay to the in-orbit satellite programmes of the end customers.

To date, Laser has successfully delivered on time, every time, the following satellites to their launch or final integration sites:

ARIANE (KOUROU)	CAPE CANAVERAL	BAIKONUR
(LAUNCHED)		
MARECS A MARECS B MARECS B2 OLYMPUS SKYNET 4B SKYNET 4C INMARSAT 2 FM3 INMARSAT 2 FM4 INMARSAT 3 FM3 INMARSAT 3FM4 ST-1 SKYNET 4E SKYNET 4F ENVISAT	SKYNET 4A INMARSAT2 CM1 INMARSAT 2 FM2 NATO IVA NATO IVB ORION FM1 INMARSAT 3 FM1 SKYNET 4D	INMARSAT 3 FM2 BEAGLE 2

KEY MOVEMENTS

Campaign Support Services

The customer, in addition to complete satellite systems, also wins (sub)contracts to provide ground support services, to other space industry companies. Laser provides the expertise in what are invariably high value, or bulky/abnormal loads, or highly dangerous fuel shipments.

Ground Support Equipment. Miscellaneous Mechanical and Electrical Equipment shipments are sent to various integration installations and launch sites, for example Munich, Toulouse, Florida, New Jersey, California, Noordwijk (Holland), Ottawa, Australia, South Korea, Singapore, Diego Garcia, Bahrain and so on.

In addition, studies are carried out for launches from Baikonur CIS and Longmarch China. Shipments are normally flown out as a part charter operation and after launch are returned by sea, as conventional cargo or containerized (including flat racks).

Spacecraft Fuel Shipments These highly dangerous shipments of monomethylhydrazine (spacecraft fuel) and dinitrogen tetroxide (oxidizer) are sent from the UK to the launch site in Kourou by sea. Laser employ their own specially trained and equipped staff in the UK, apply detailed supervision in very close liaison with the authorities and shipping lines concerned to ensure the absolutely safe transit of this highly explosive cargo - please see photograph.



Up to 10 such shipments each year are normal.

KEY MOVEMENTS

Tracking Stations – Electronic

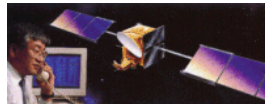
When a satellite system is sold to any country and the satellite is "delivered" in orbit, the customer is best placed to win the contract to provide the Ground Tracking Station.

This ground segment equipment is normally in the order of 20 tons, of high value (£4 million) and is delivered to the country of purchase, where it is set-up by the customer's engineers, having been delivered on site, at prescribed positions inside, by Laser.

Within Europe, the door to door delivery is made with 2 or 3 full trailers including a Laser courier. Delivery of tracking subsystems outside of Europe have included Singapore, Taiwan, Turkey, Diego Garcia, Egypt, Canada, China and South Korea.

A recent overseas tracking station which was shipped to South Korea, required time critical delivery for milestone payments and to avoid late delivery penalties.

KOREASAT



The National Satellite System of the Republic of Korea

Two 747F part charters were arranged and Laser contracted 8 delivery vehicles, local forklifts and labour to effect delivery within the communications centres at two separate, remote and partly constructed sites.



Laser accompanied these shipments and supervised, in detail, every element in the chain of the extremely complex and testing door to door operations.

KEY MOVEMENTS

Tracking Stations – Mechanical

Laser arranges the delivery of a range of mechanical hardware for satellite earth stations and these lower value stations are shipped by sea usually on flat racks.

For a recent station (Radome) to Australia from Ireland, Laser staff loaded and secured the equipment in Ireland, arranged the on-deck shipping to Fremantle, local customs clearance in Australia (avoiding local duties/taxes) and final delivery to the outback, to on-site customer's engineers in Kojerena (NW Australia).



A separate container of installation tooling was despatched under temporary export from the UK; Laser arranged the local temporary import bonds in Australia and later the equipment was sent to Egypt for the next project.

In the Caribbean, 17 off flat racks have been sent to Trinidad and Jamaica. Laser arranged the movement of the tooling container between the Islands, including transit documentation, liaised with the Government offices in each country and finally the return of unwanted equipment to the UK, by sea. Additional time-critical shipments were flown to the islands and delivered directly to the customer's **engineers** at the installation sites.

Comment [JKD1]: 1)

APPENDIX 1



MAN 24.403 Heavy Tractor Unit

Broshius Type 2ABD-38 extendible low loading trailer

Air suspension and steerable rear axles. The bed height is 53cms and the standard lower bed length of 6.5m can be extended to a maximum of 10.5m. The trailer can carry loads up to 40 tonnes in the UK and 30 tonnes plus in mainland Europe.

Aerospace and Defence Sector Customers

Laser is proud to serve the following companies in the Aerospace and Defence sectors:-

- ARC UK Ltd
- Arianespace SA
- EADS Astrium Ltd
- EADS Astrium SAS
- EADS Defence & Security Networks Ltd
- Com Dev Europe Ltd
- Easat Antennas Ltd
- EMS Technologies Canada Ltd
- European Space Agency
- Globecom Systems Inc
- Houchin Aerospace Ltd
- Lockheed Martin Commercial Space Systems
- McAlpine Helicopters Ltd
- Meggitt Defence Systems Ltd
- MOD/DTMA Approved Supplier
- N A S A
- National Grid Ltd
- Paradigm Services Ltd
- Q-Par Angus Ltd
- Rutherford Appleton Laboratories
- Saunders Aviation Ltd
- The Open University
- Vortex Communications Corpn