LAUNCHERS @ ESA

The European Launchers' Family

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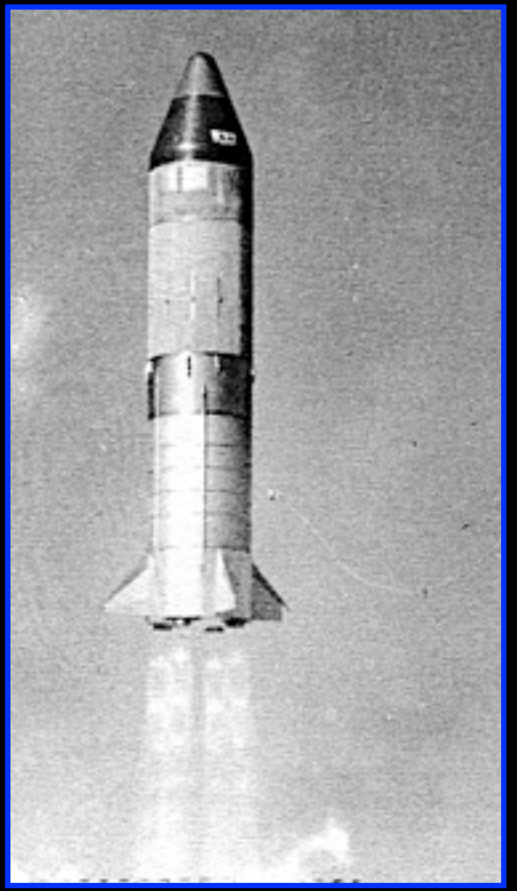
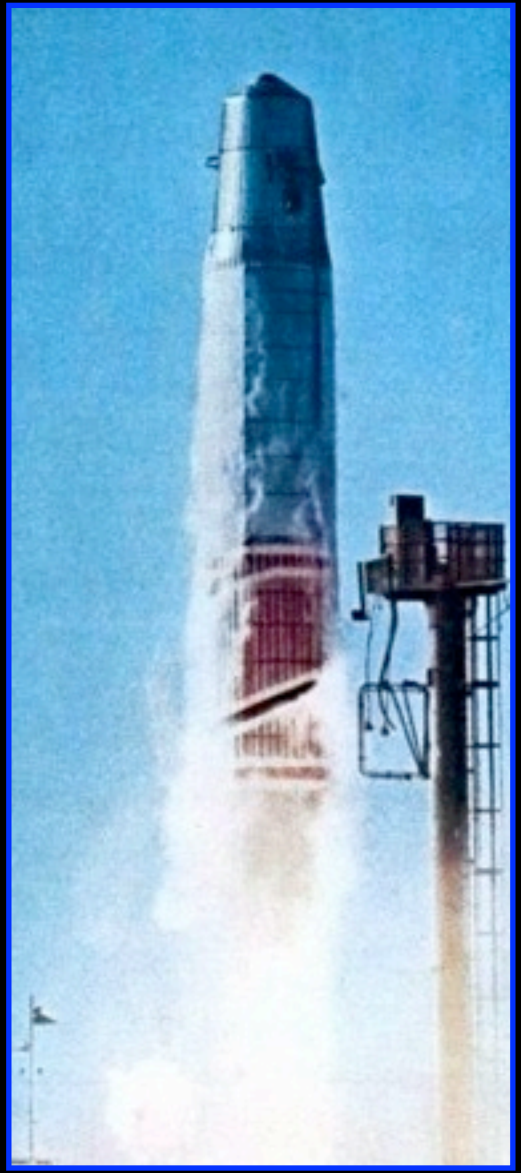
Ariane 5 Post-ECA
Programme Mngt. Support
Launchers' Directorate
ESA HQ - Daumesnil

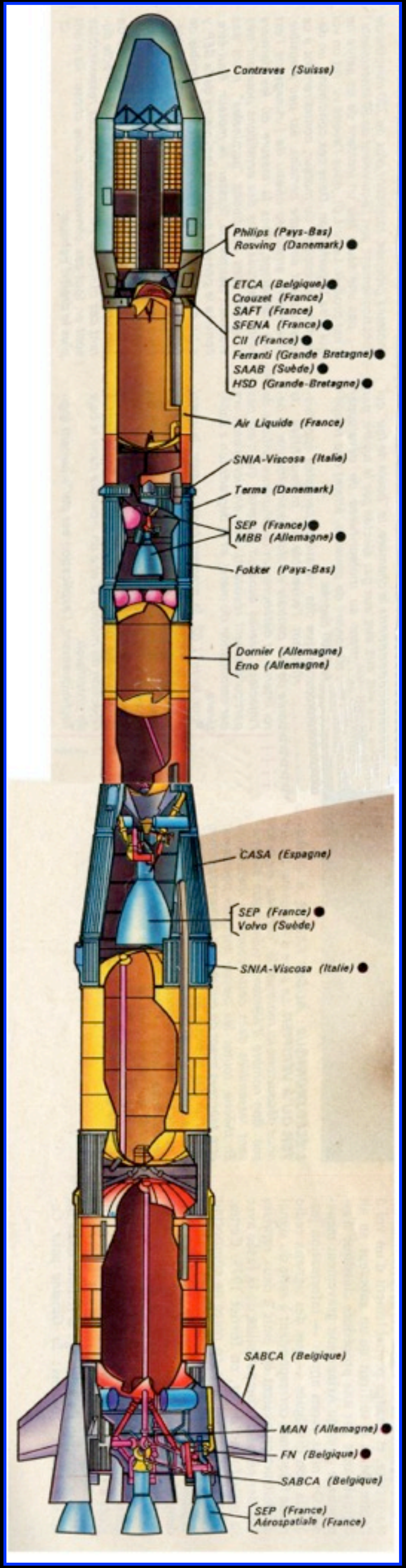
2 October 2012

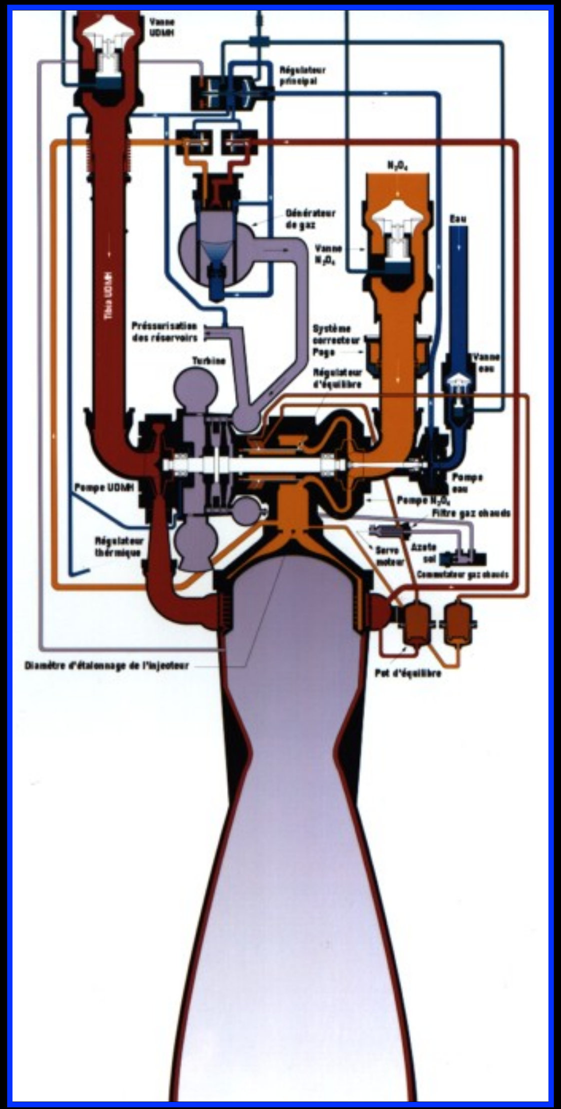
Presentation to 19th SpaceWire Working Group

ARIANE 1



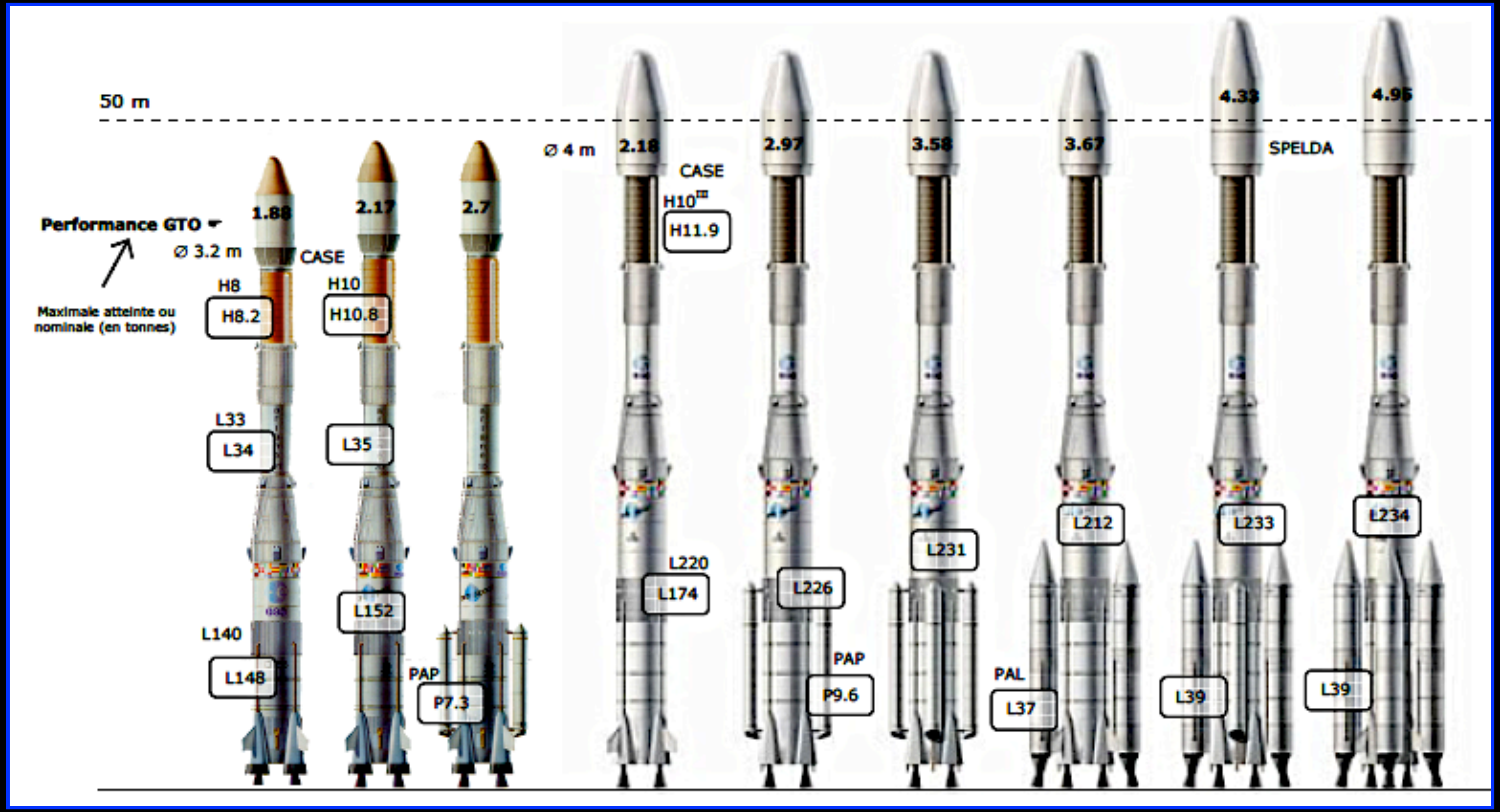




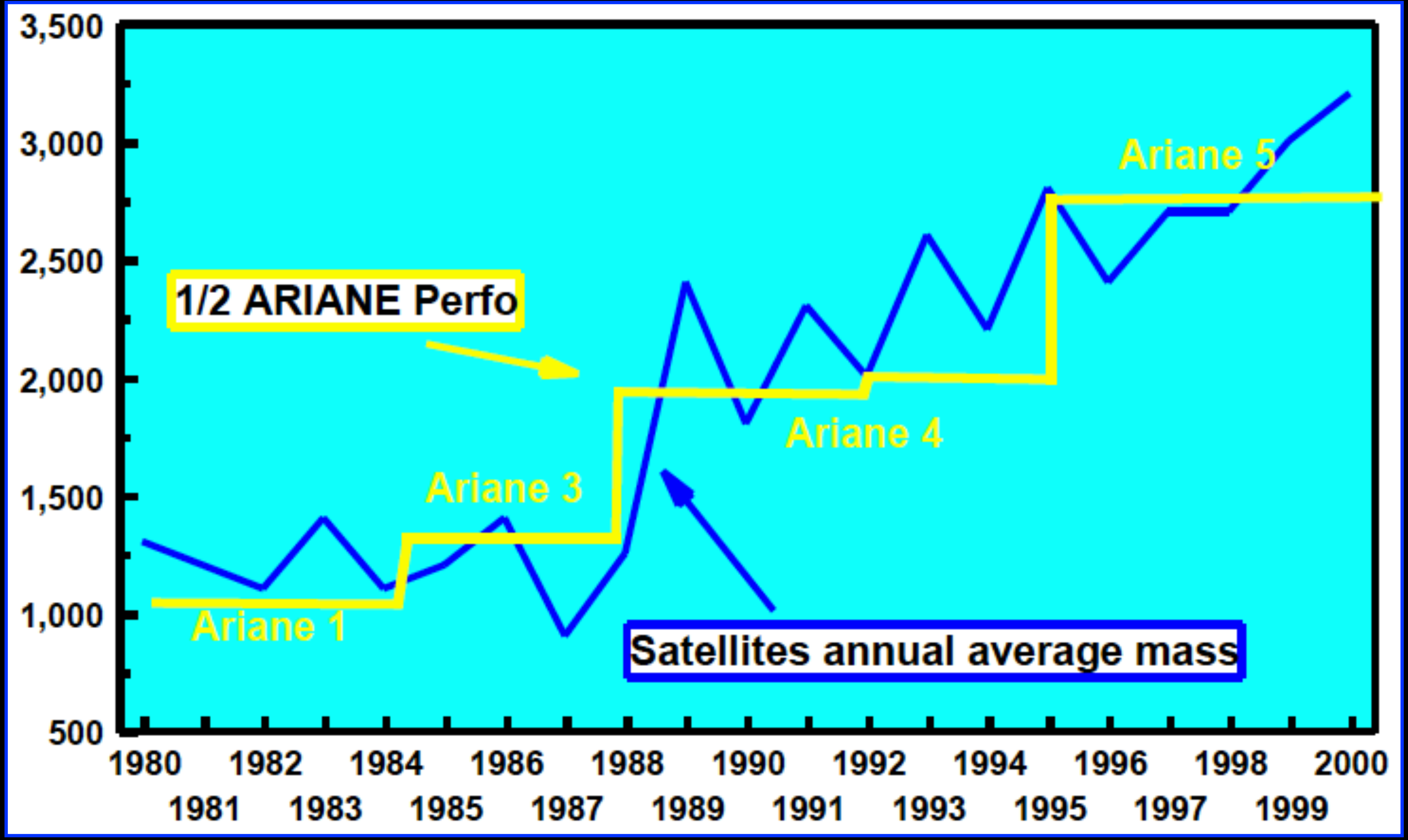


Bruxelles 31-07-1973
1st Flight: 24-12-1979

ARIANE 2-3 & 4

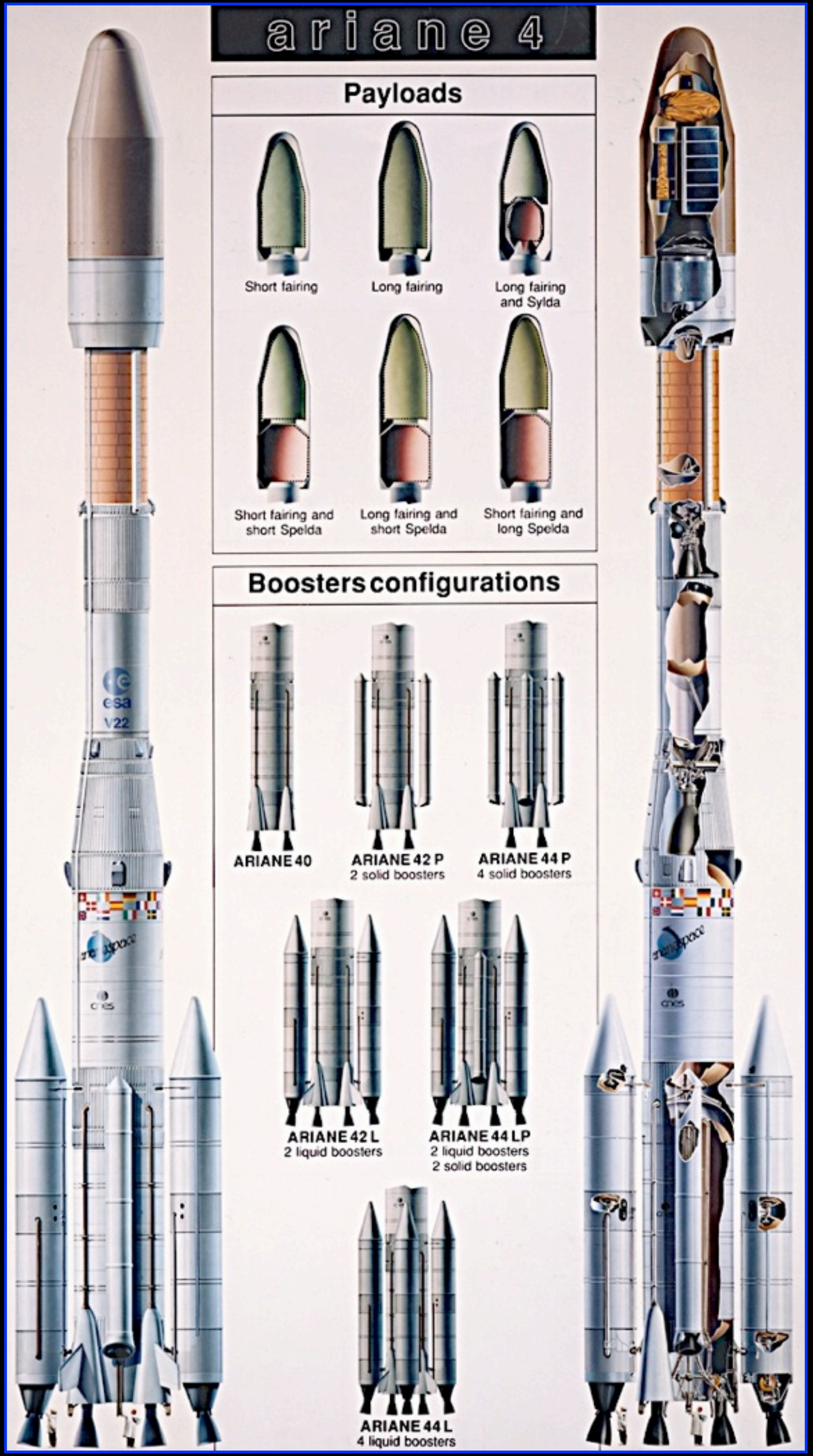


50 m
Performance GTO
Maximale atteinte ou nominale (en tonnes)
Ø 3.2 m
CASE
H8
H8.2
H10
H10.8
L33
L34
L35
L140
L148
L152
PAP
P7.3
1.88
2.17
2.7
Ø 4 m
2.18
CASE
H10
H11.9
L220
L174
2.97
L226
PAP
P9.6
3.58
L231
3.67
L212
PAL
L37
4.33
SPELDA
L233
L39
4.95
L234
L39



3,500
3,000
2,500
2,000
1,500
1,000
500
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
1/2 ARIANE Perfo
Ariane 1
Ariane 3
Ariane 4
Ariane 5
Satellites annual average mass

15/06/1988
esa
ariane

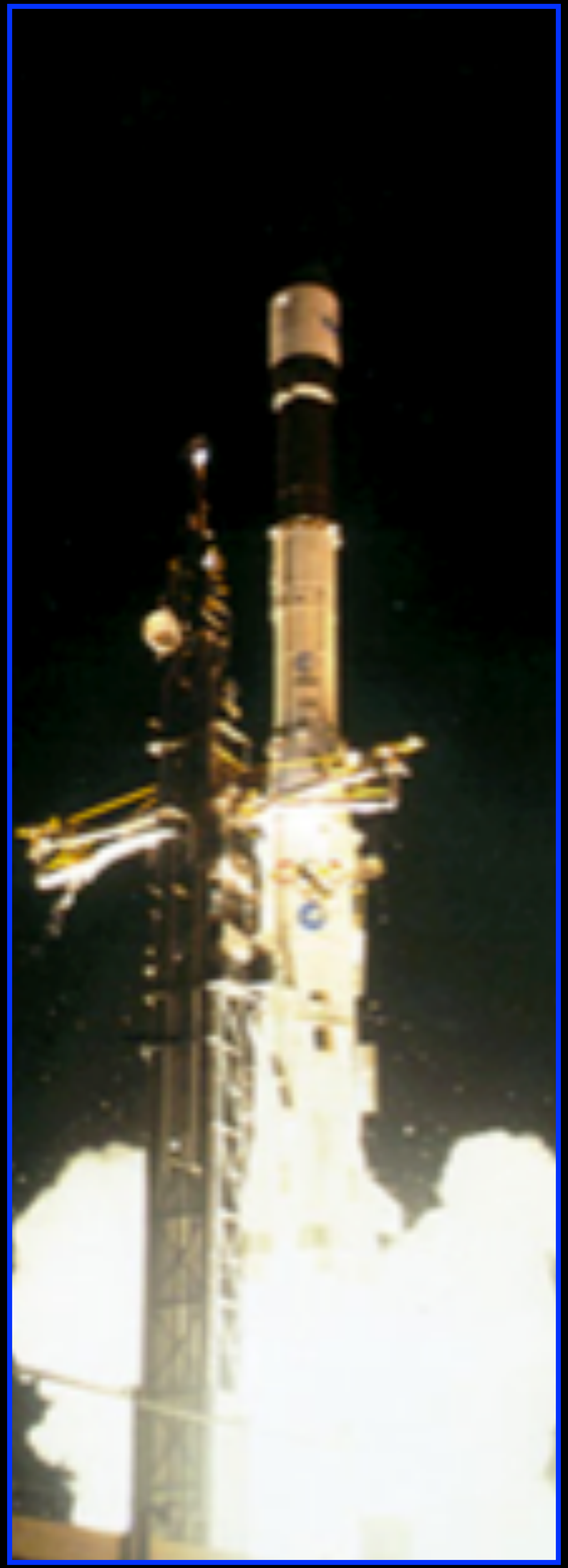


ariane 4
Payloads
Short fairing
Long fairing
Long fairing and Sylda
Short fairing and short Spelda
Long fairing and short Spelda
Short fairing and long Spelda
Boosters configurations
ARIANE 40
ARIANE 42 P
2 solid boosters
ARIANE 44 P
4 solid boosters
ARIANE 42 L
2 liquid boosters
ARIANE 44 LP
2 liquid boosters
2 solid boosters
ARIANE 44 L
4 liquid boosters
esa
V22

ARIANE 1-2-3 & 4 : 144 Launches

1st AR1 . LO1
1979
11 Launches
2 Failures

1st AR3 . V10
1984
11 Launches
1 Failure



1st AR2 . V20
1986
6 Launches
1 Failure

1st AR4 . V22
1988

100th AR4 . V134
2000

Last AR4 . V159
2003

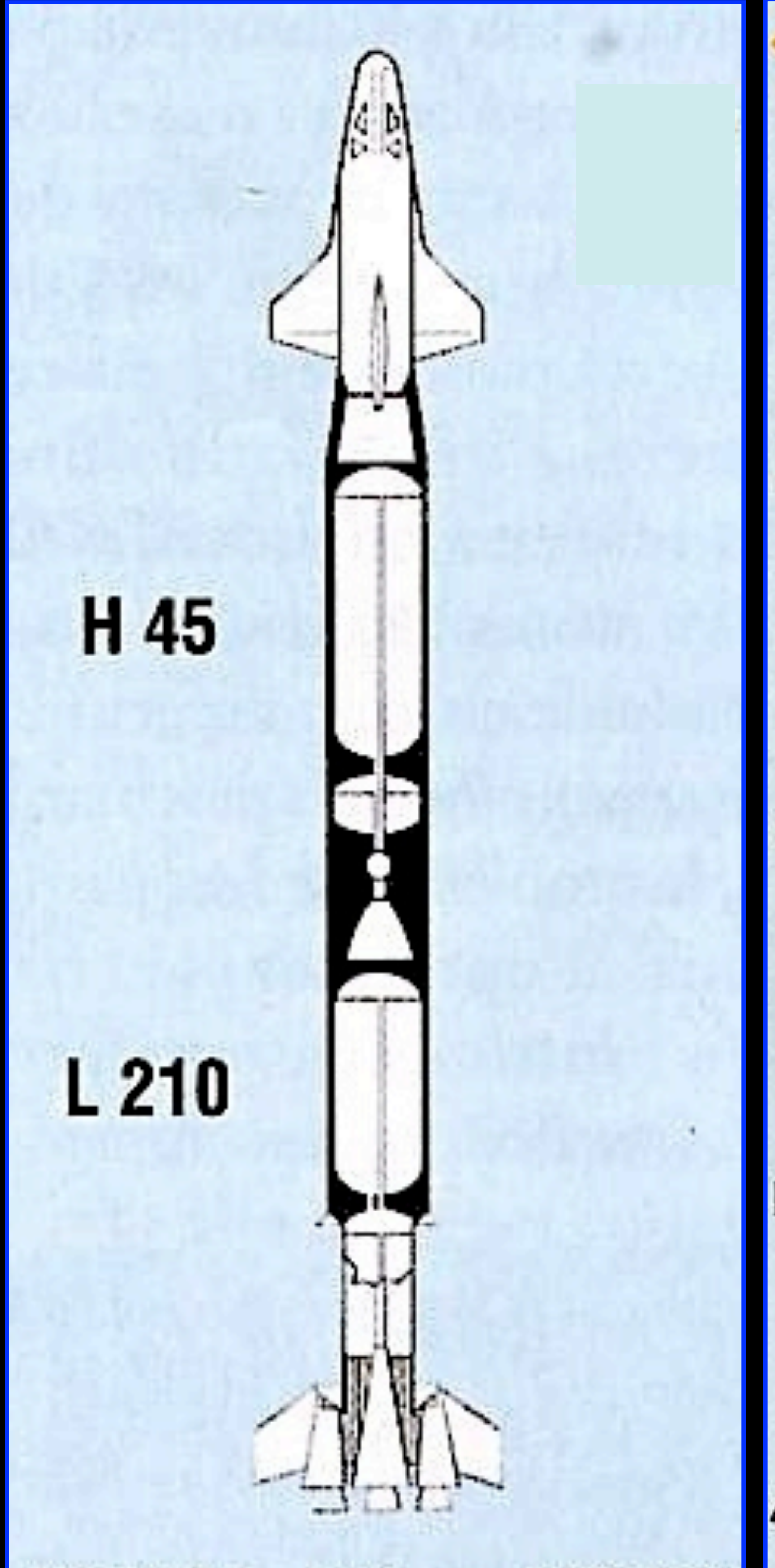
< 116 Launches, 3 Failures, 74 Consecutive Successes >

958 Viking engines &
144 HM7x engines

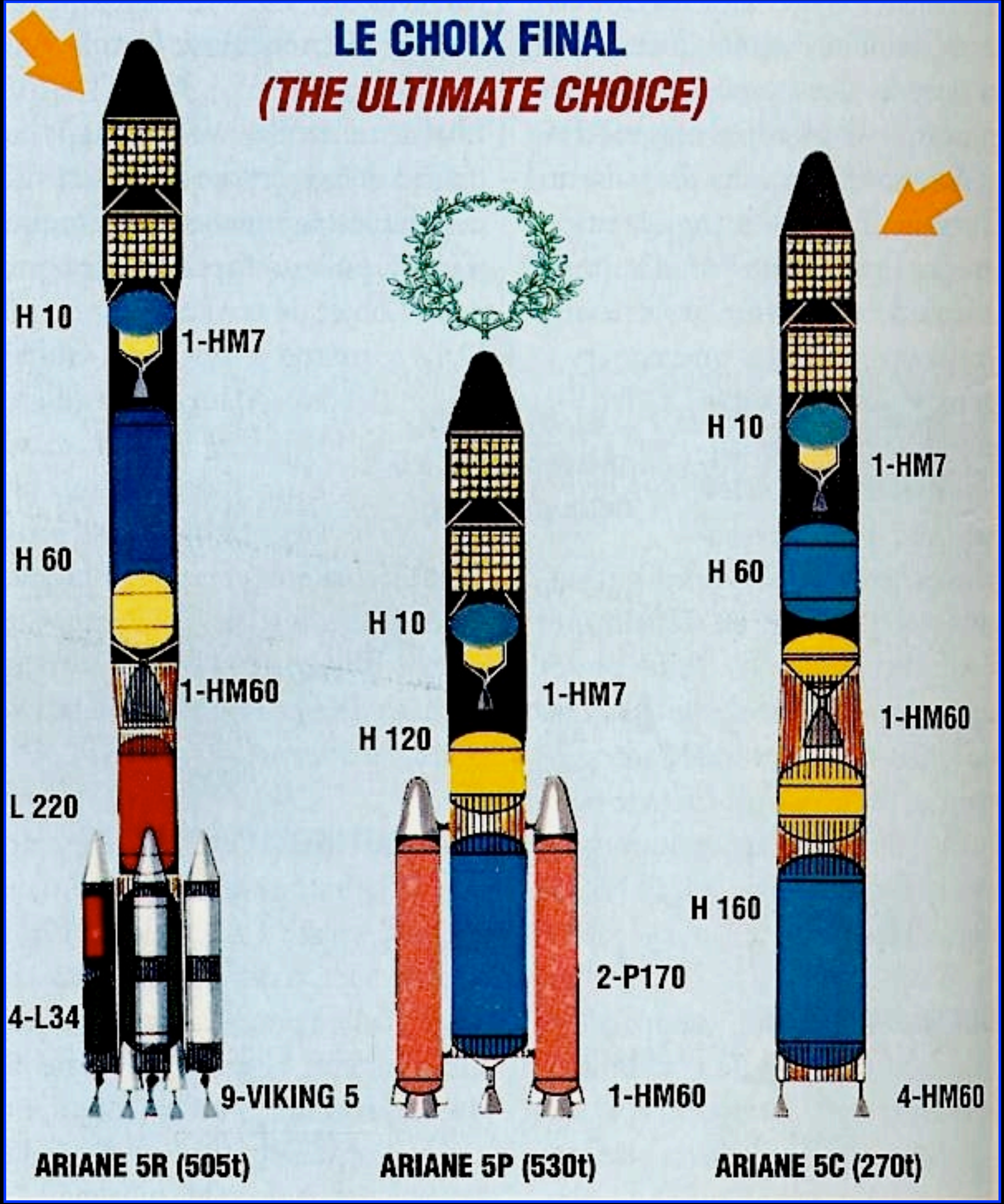
L 02	23/05/80	AR1	1 Viking engine 1st St.
L 05	10/09/82	AR1	HM7 engine 3rd St. failure
V 15	12/09/85	AR3	HM7 engine non ignition
V18	31/05/86	AR2	HM7 engine non ignition

V36	22/02/90	AR4	Viking Obstruction by Cloth
V63	24/01/94	AR4	HM7 engine 3rd St. failure
V70	01/12/94	AR4	HM7 engine 3rd St. failure

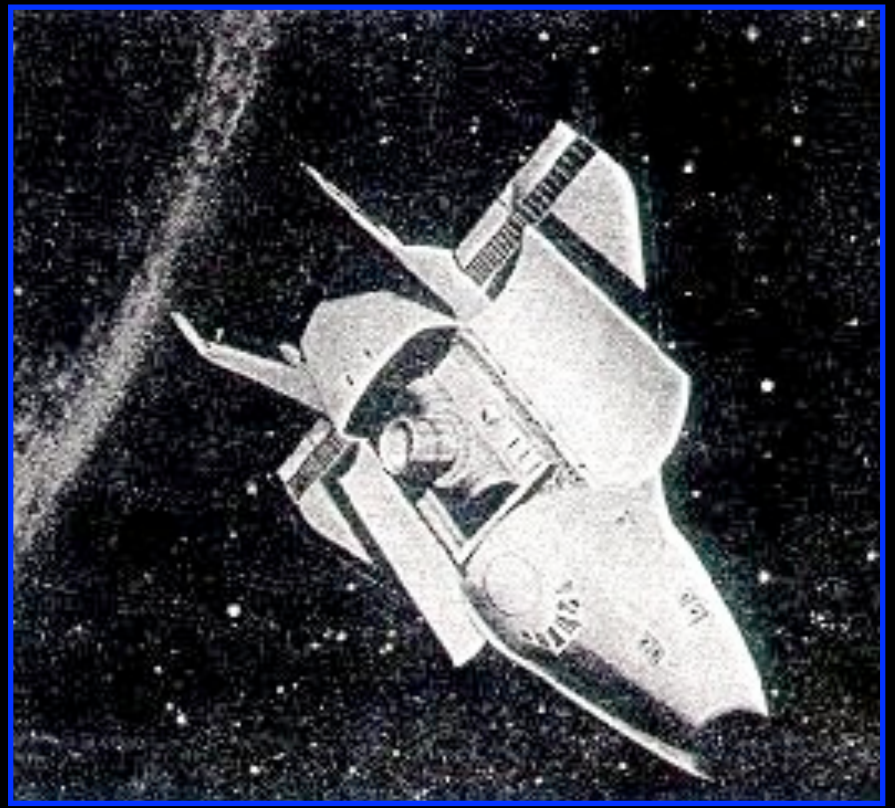
ARIANE 5

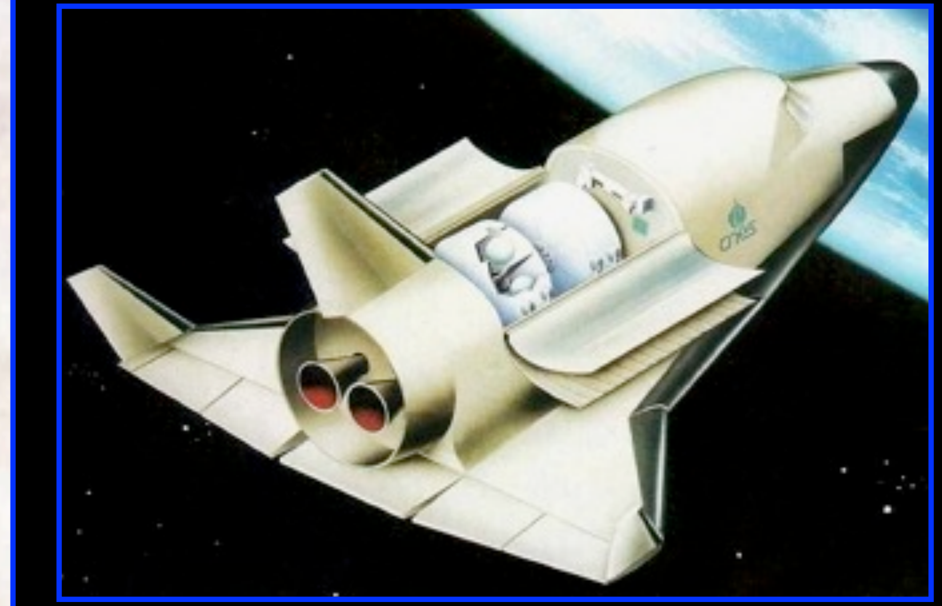


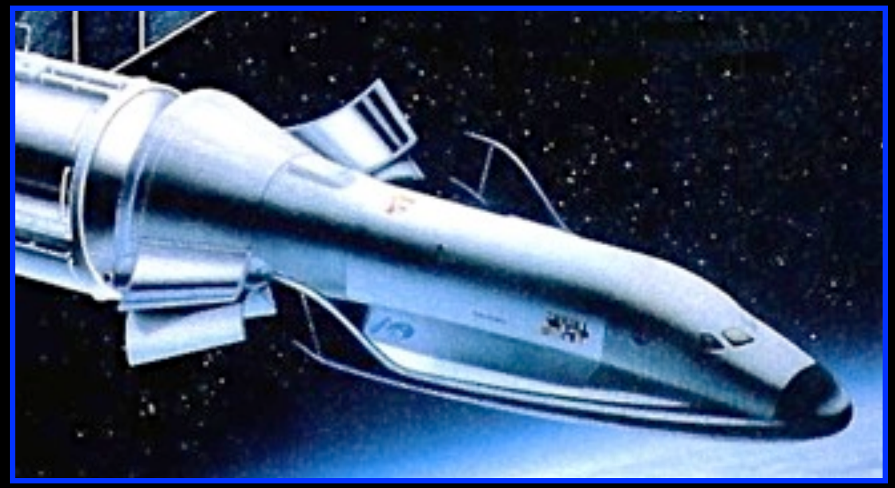
ARIANE 5 : biétage, HERMES vol habité. *(2-stage, Hermes manned flight)*



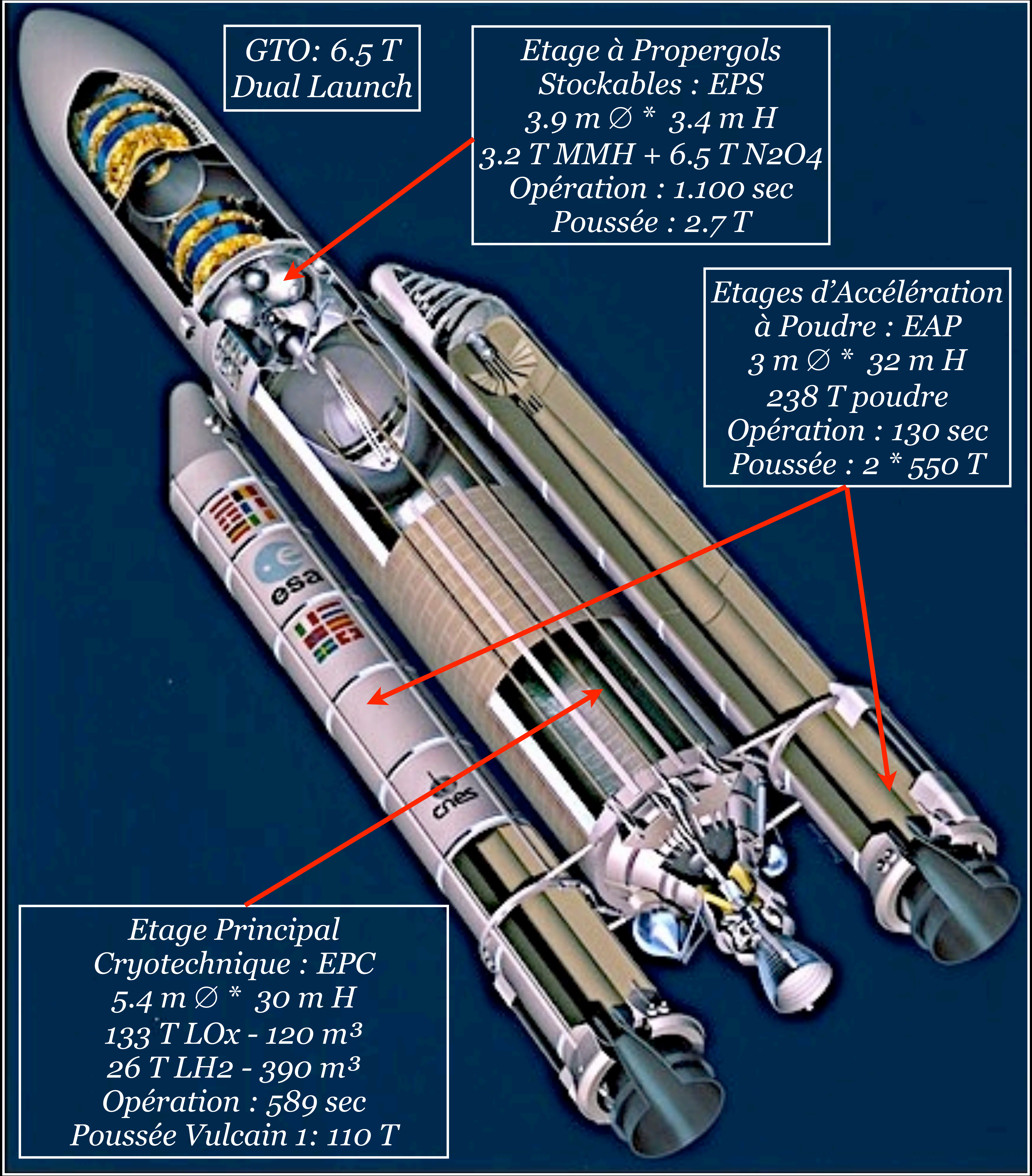
Hermes



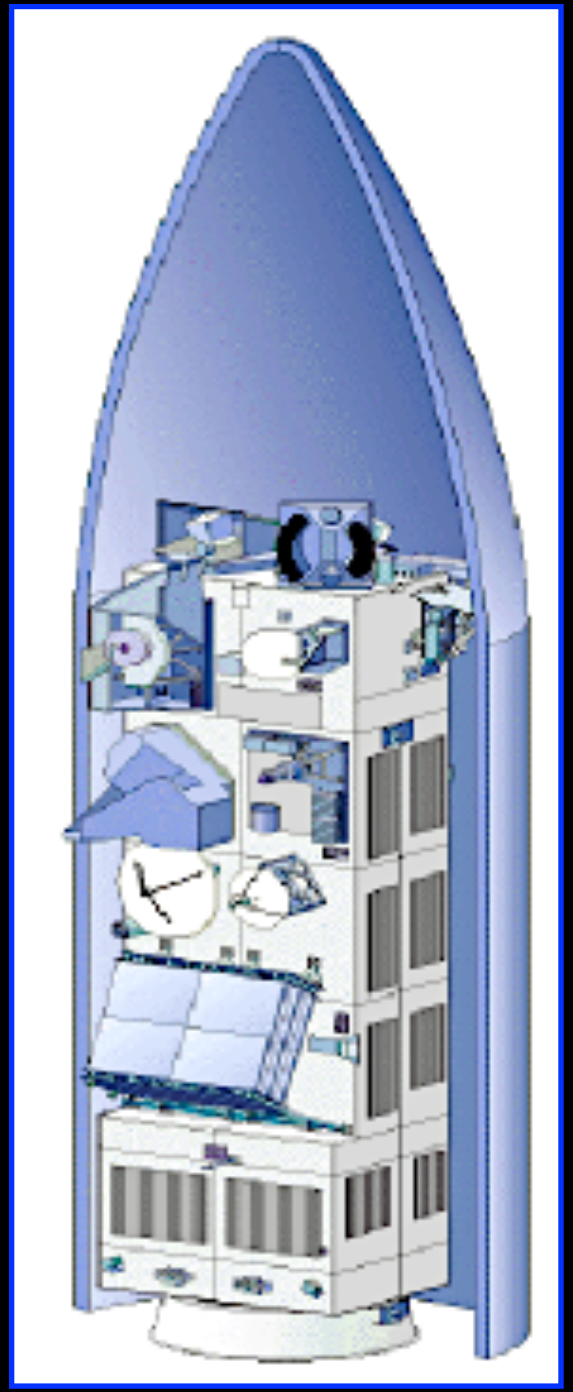


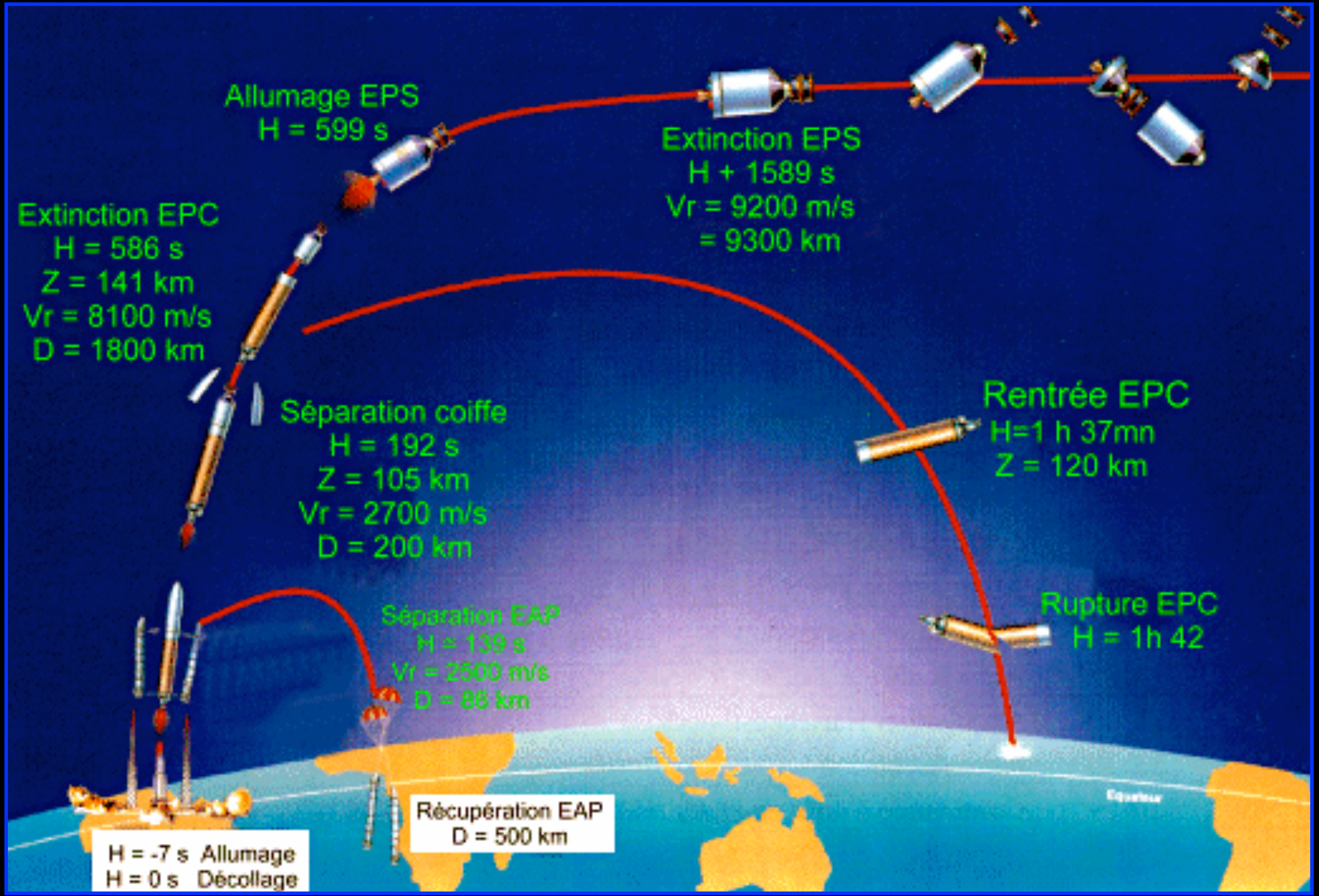


ARIANE 5G

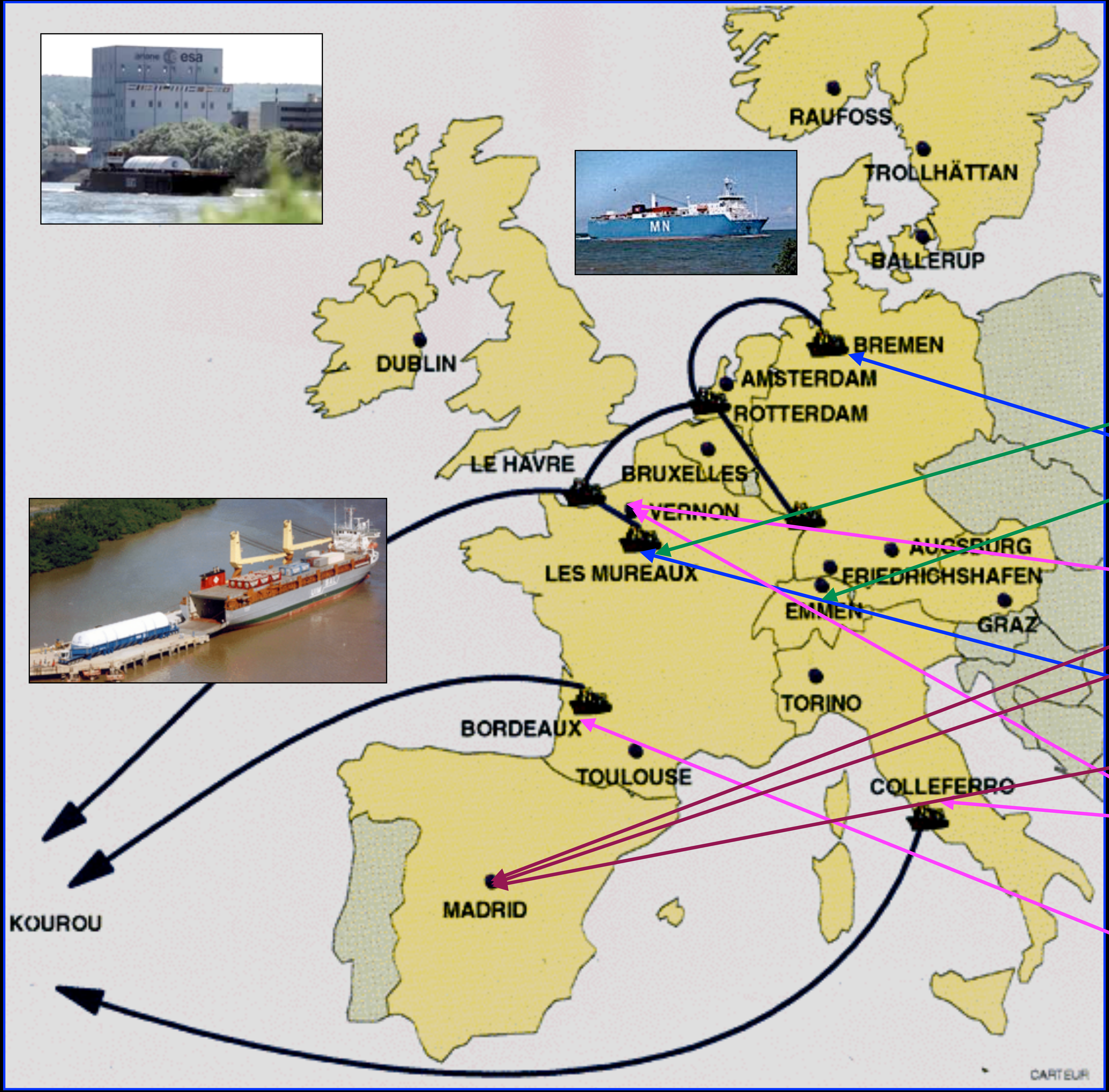


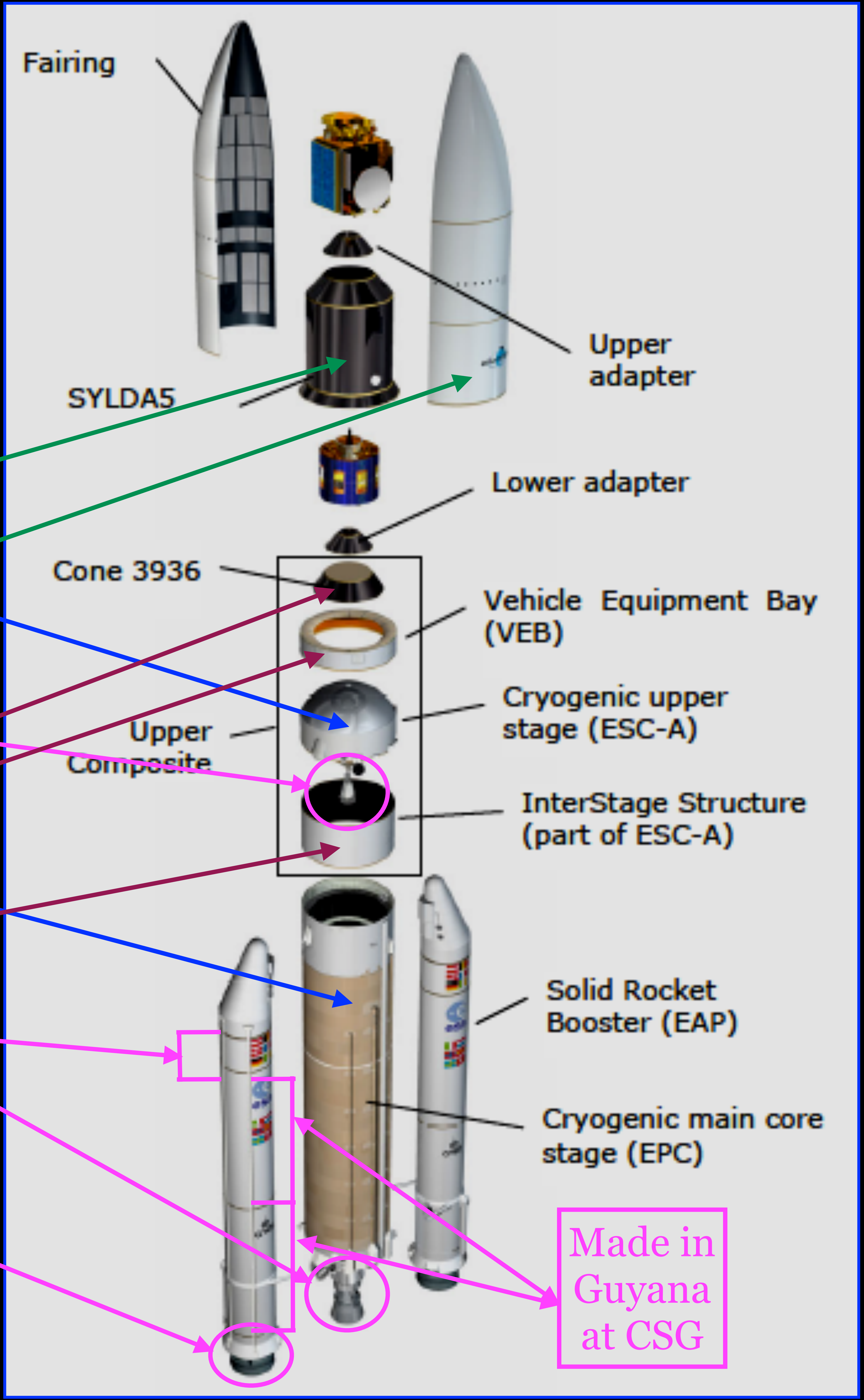
Double Launch / Fairing : SYLDA





ARIANE 5 Major Elements Production & Transport





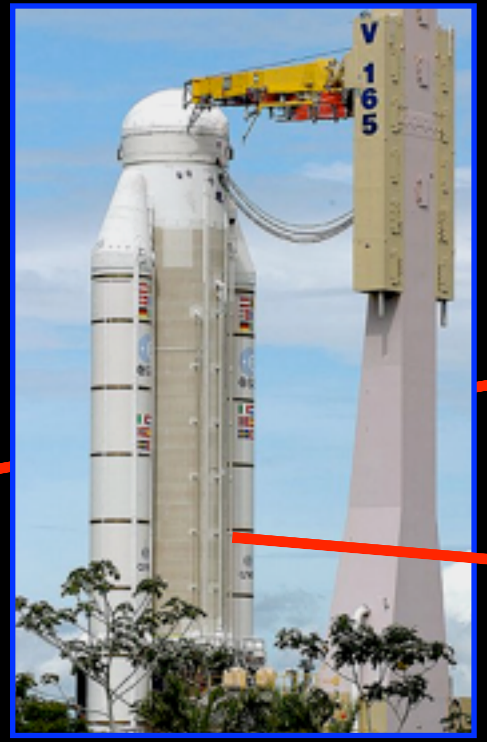
ARIANE 5G

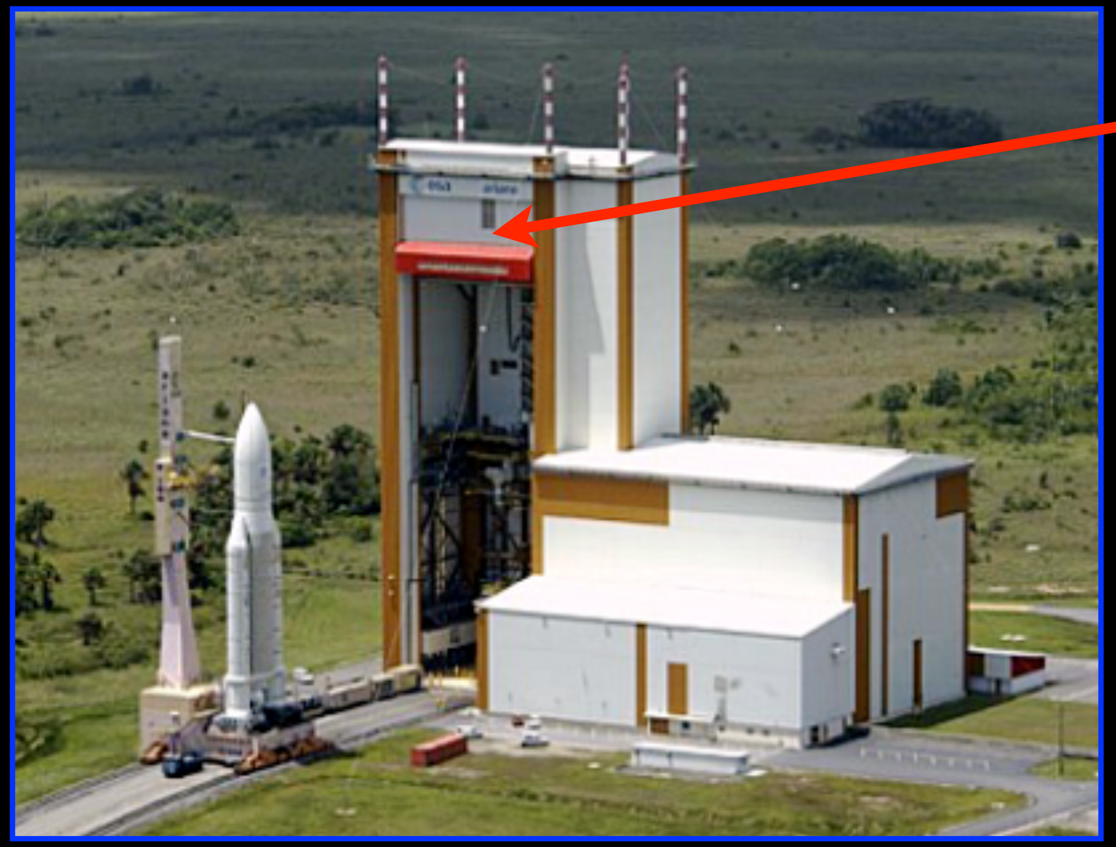
BIL : Bâtiment d'Intégration Lanceur

S5 : Satellites Preparation Rooms

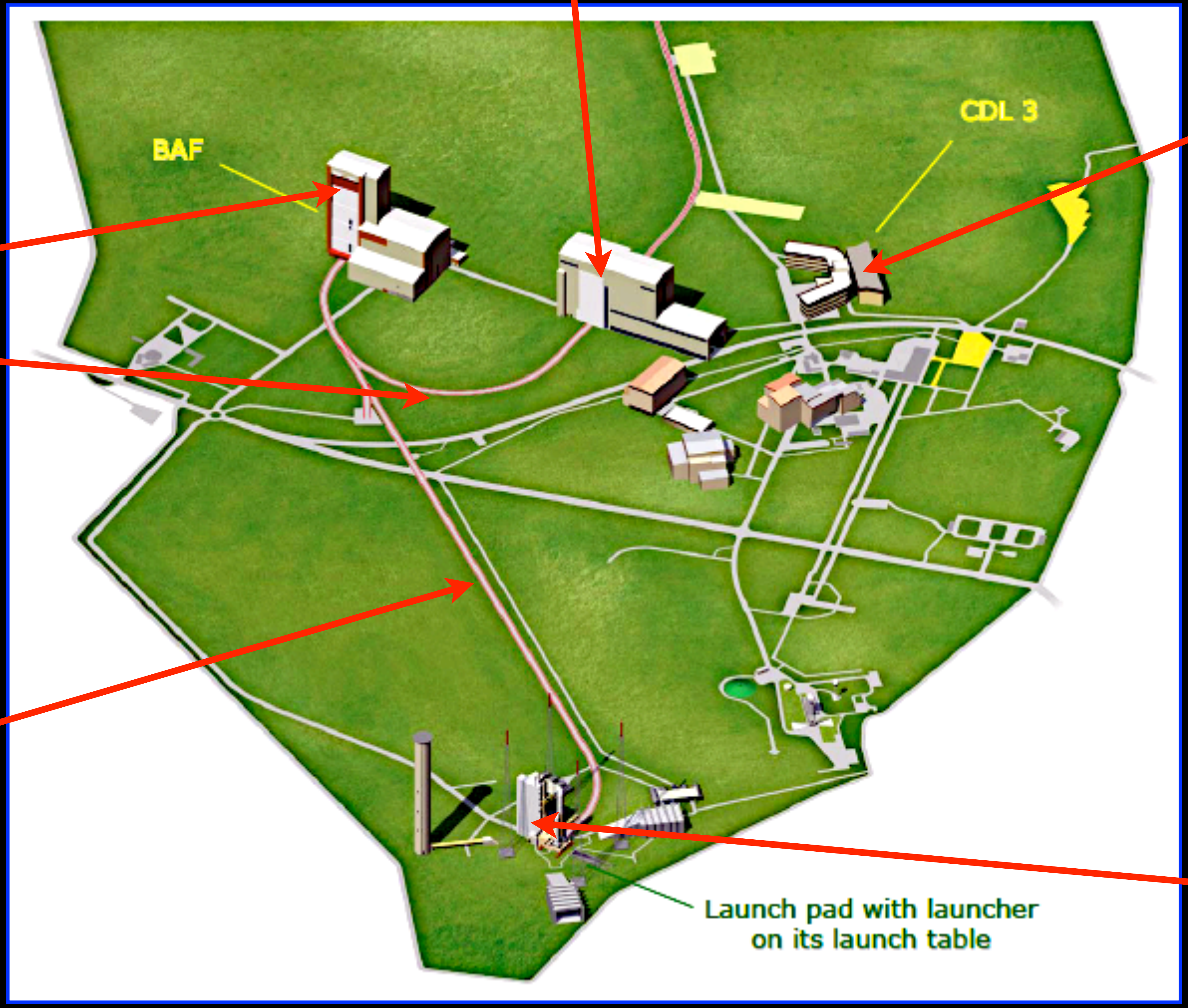
CDL3: Centre de Lancement 3

BIL to BAF Transfer





BAF : Bâtiment d'Assemblage Final (Upper Part)



BAF to ZL Transfer

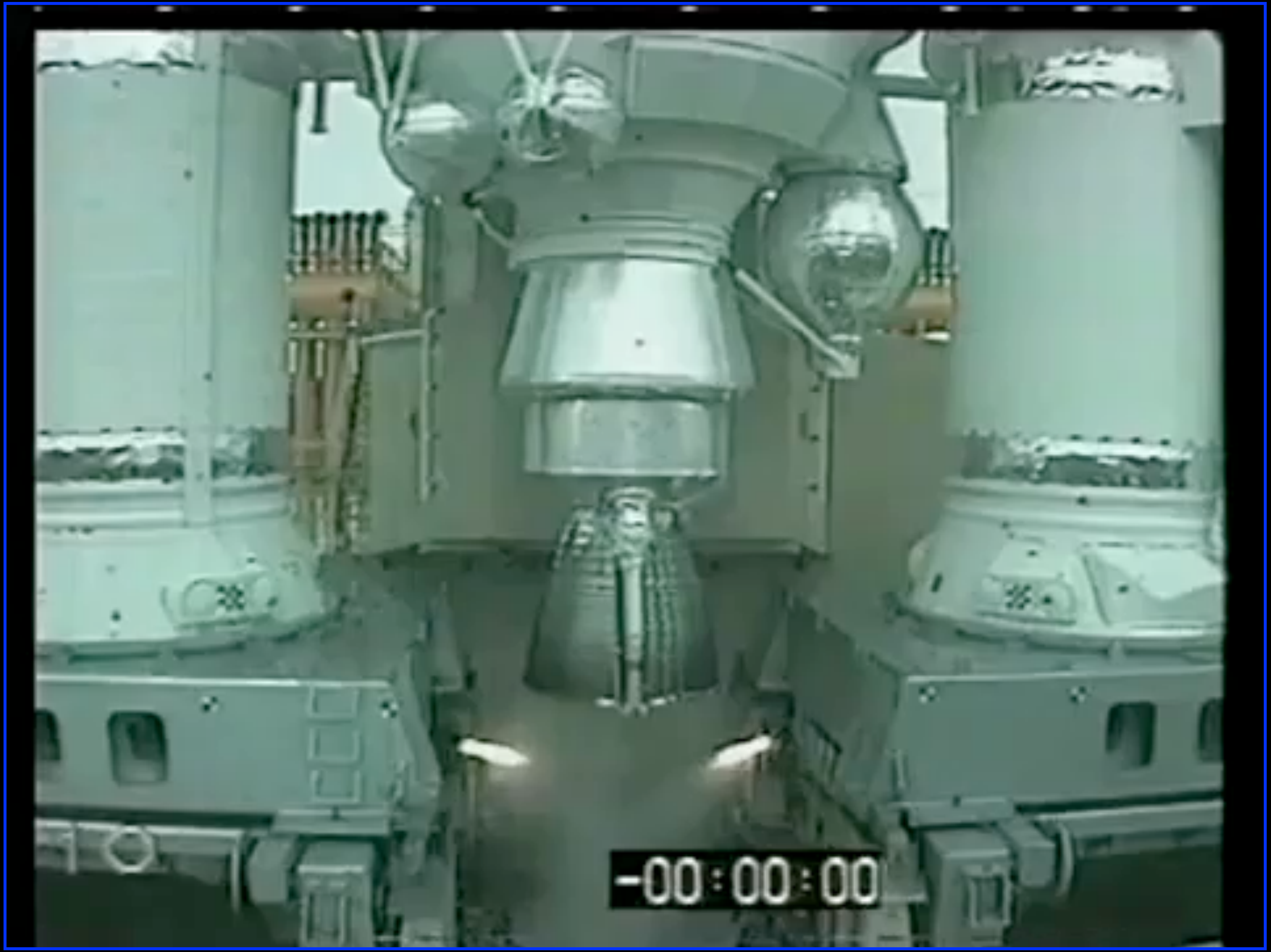
Ariane 5 in ZL

ARIANE 5G

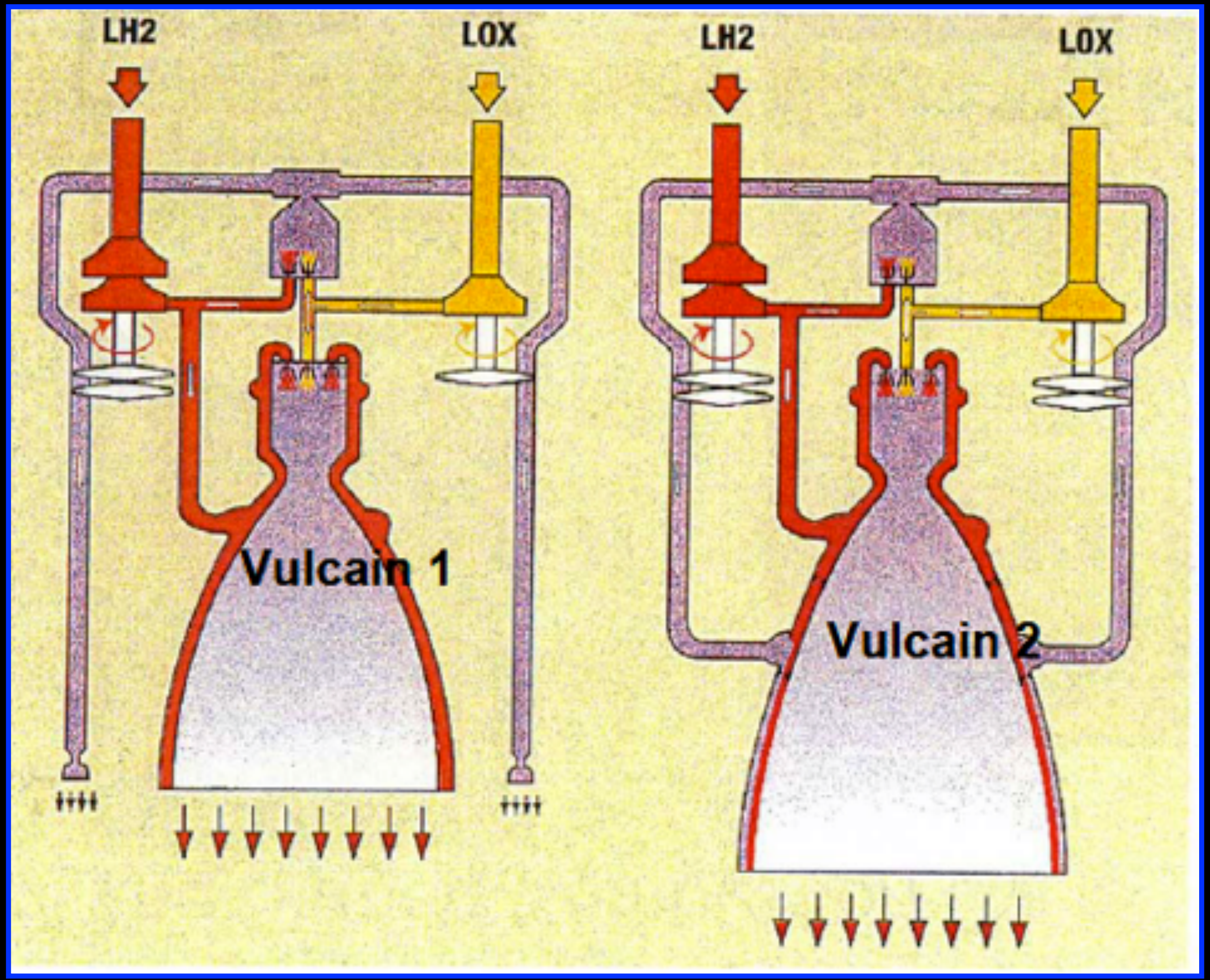
1st Launch on 04/06/1996

Operational since October 1998

GTO Missions
6.5 T Payload
Double Launch

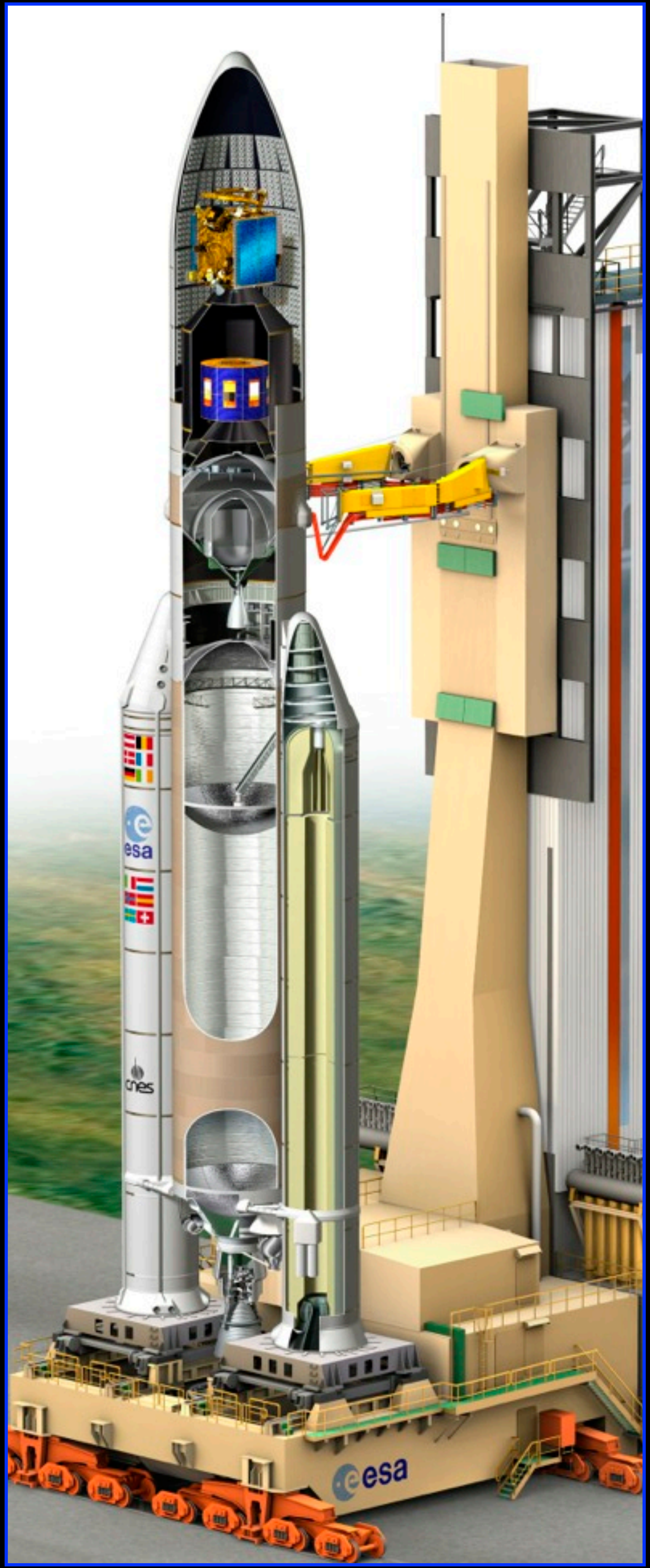


ARIANE 5ECA

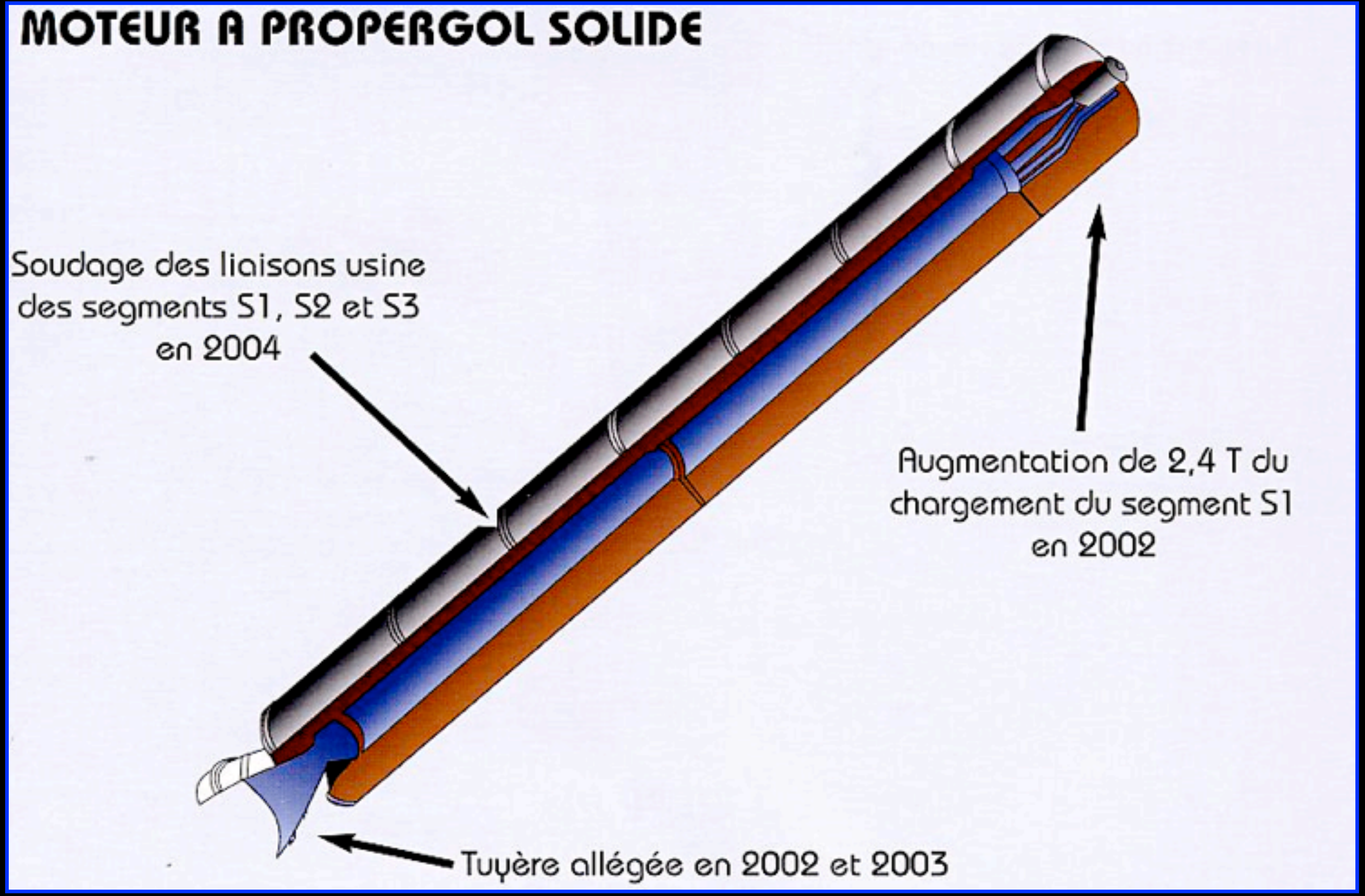


LH2
LOX
LH2
LOX
Vulcain 1
Vulcain 2

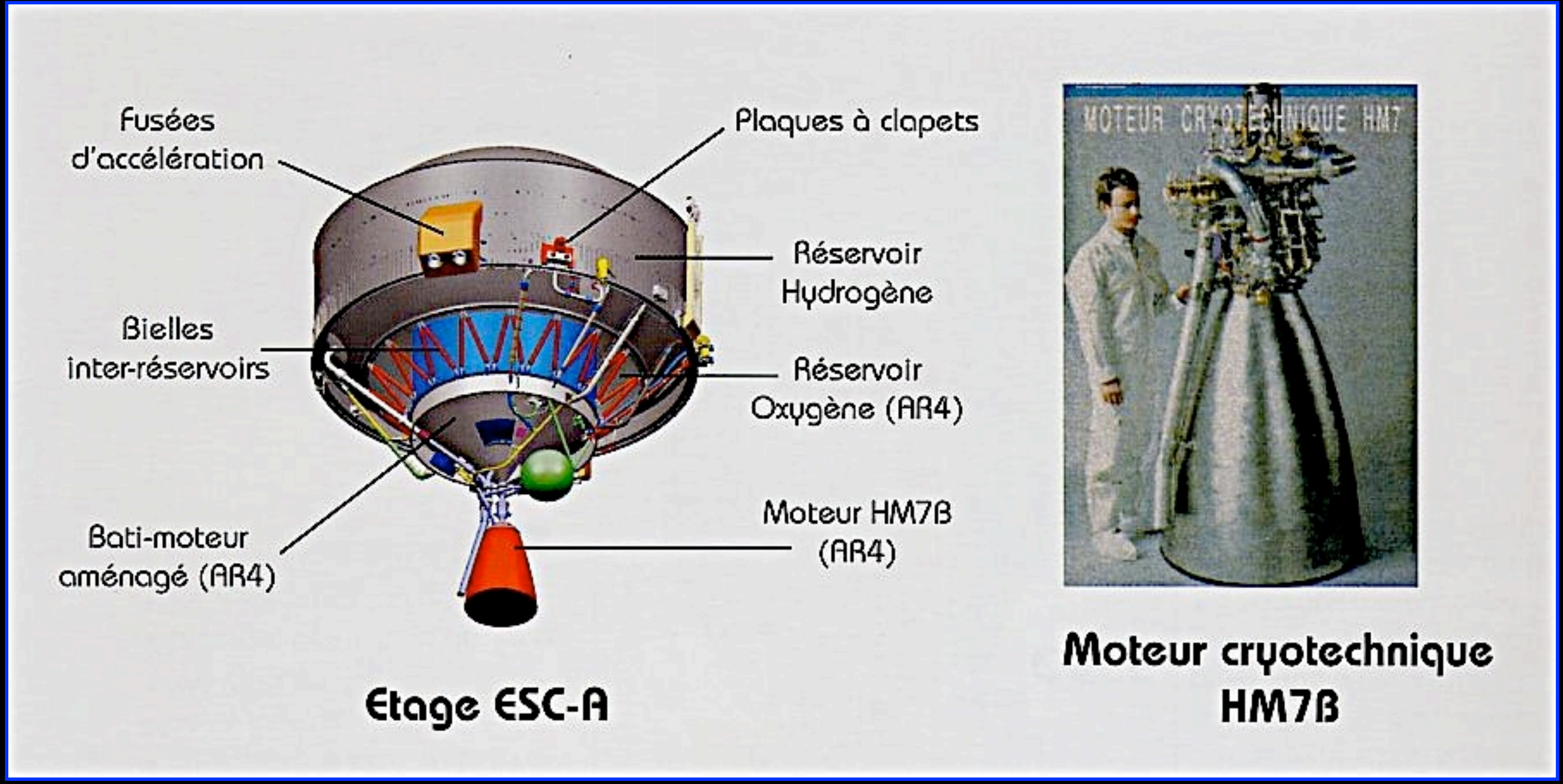
MOTEUR VULCAIN
(jusqu'en 2001)
Poussée : 1 140 kN
Impulsion spécifique : 431 s
MOTEUR VULCAIN 2
(en 2002)
Poussée : 1 355 kN (+20 %)
Impulsion spécifique : 433,7 s
– Turbopompe LOX, 46 % plus puissante
– Nouvelle chambre simplifiée
– Nouveau concept de divergent
plus performant
– Aménagement moteur simplifié



esa
cnes
esa



MOTEUR A PROPERGOL SOLIDE
Soudage des liaisons usine
des segments S1, S2 et S3
en 2004
Augmentation de 2,4 T du
chargement du segment S1
en 2002
Tuyère allégée en 2002 et 2003



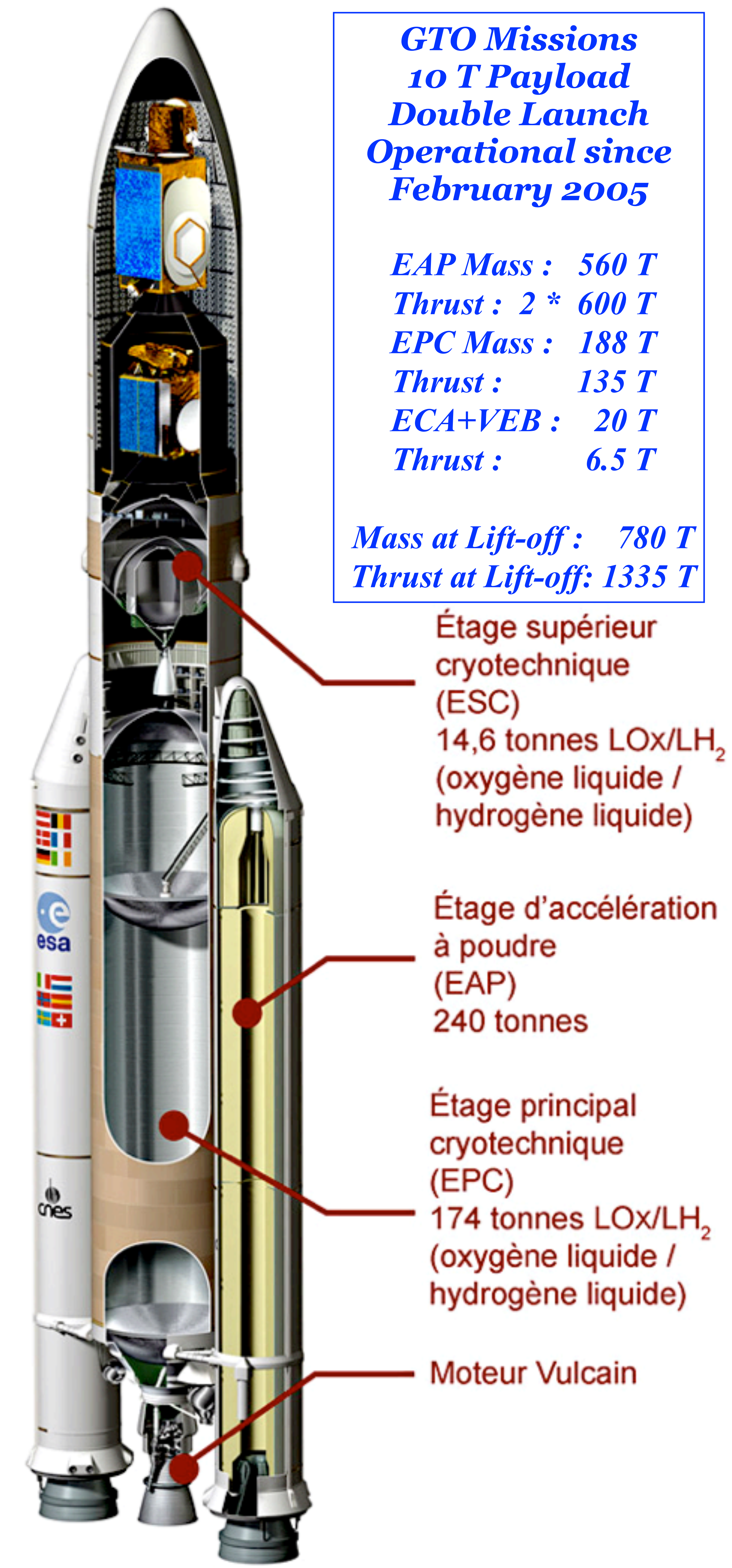
Fusées
d'accélération
Plaques à clapets
Réservoir
Hydrogène
Bielles
inter-réservoirs
Réservoir
Oxygène (AR4)
Moteur HM7B
(AR4)
Bati-moteur
aménagé (AR4)
Etage ESC-A
MOTEUR CRYOTECHNIQUE HM7
Moteur cryotechnique
HM7B

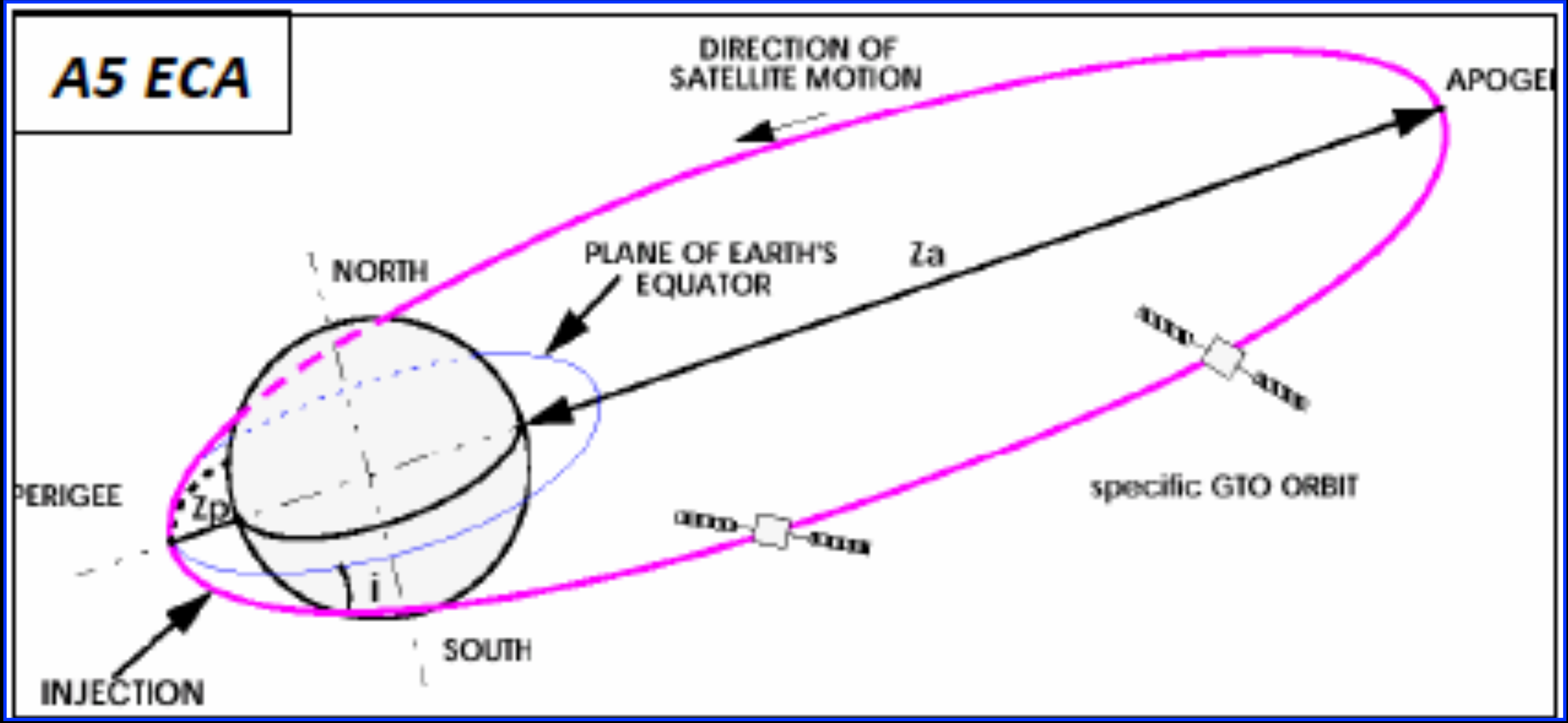
ARIANE 5ECA

GTO Missions
10 T Payload
Double Launch
Operational since
February 2005

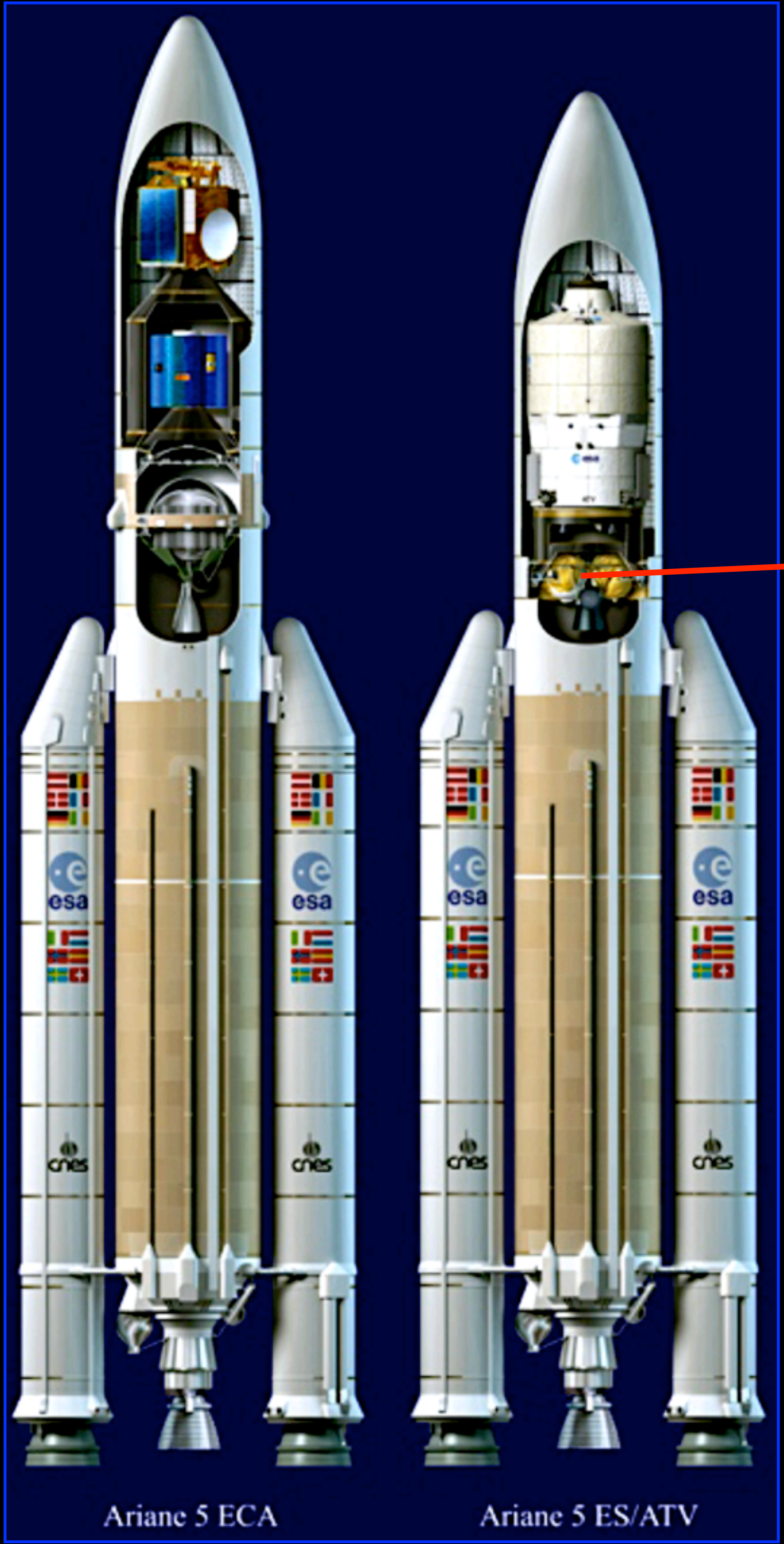
EAP Mass : 560 T
*Thrust : 2 * 600 T*
EPC Mass : 188 T
Thrust : 135 T
ECA+VEB : 20 T
Thrust : 6.5 T

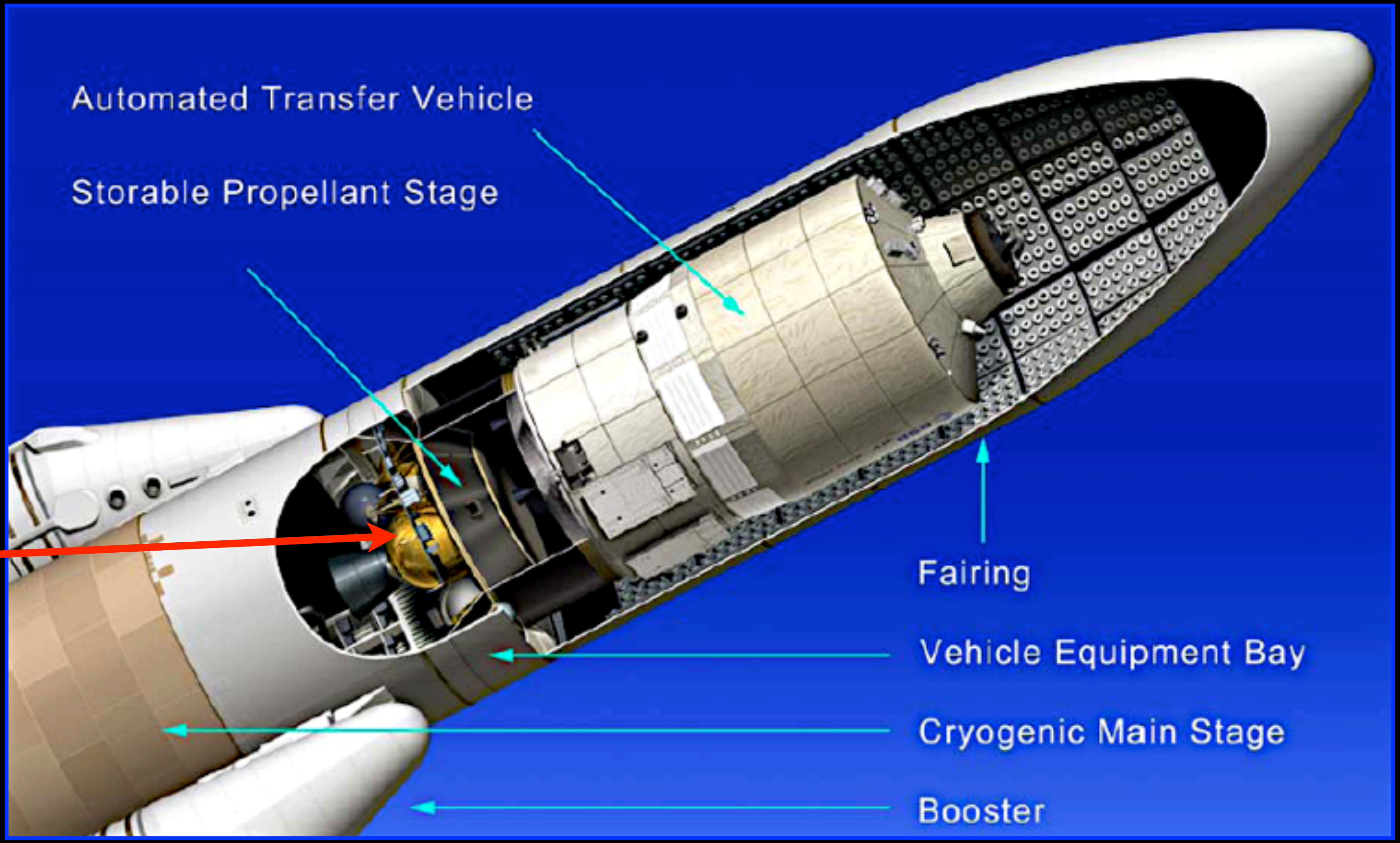
Mass at Lift-off : 780 T
Thrust at Lift-off: 1335 T

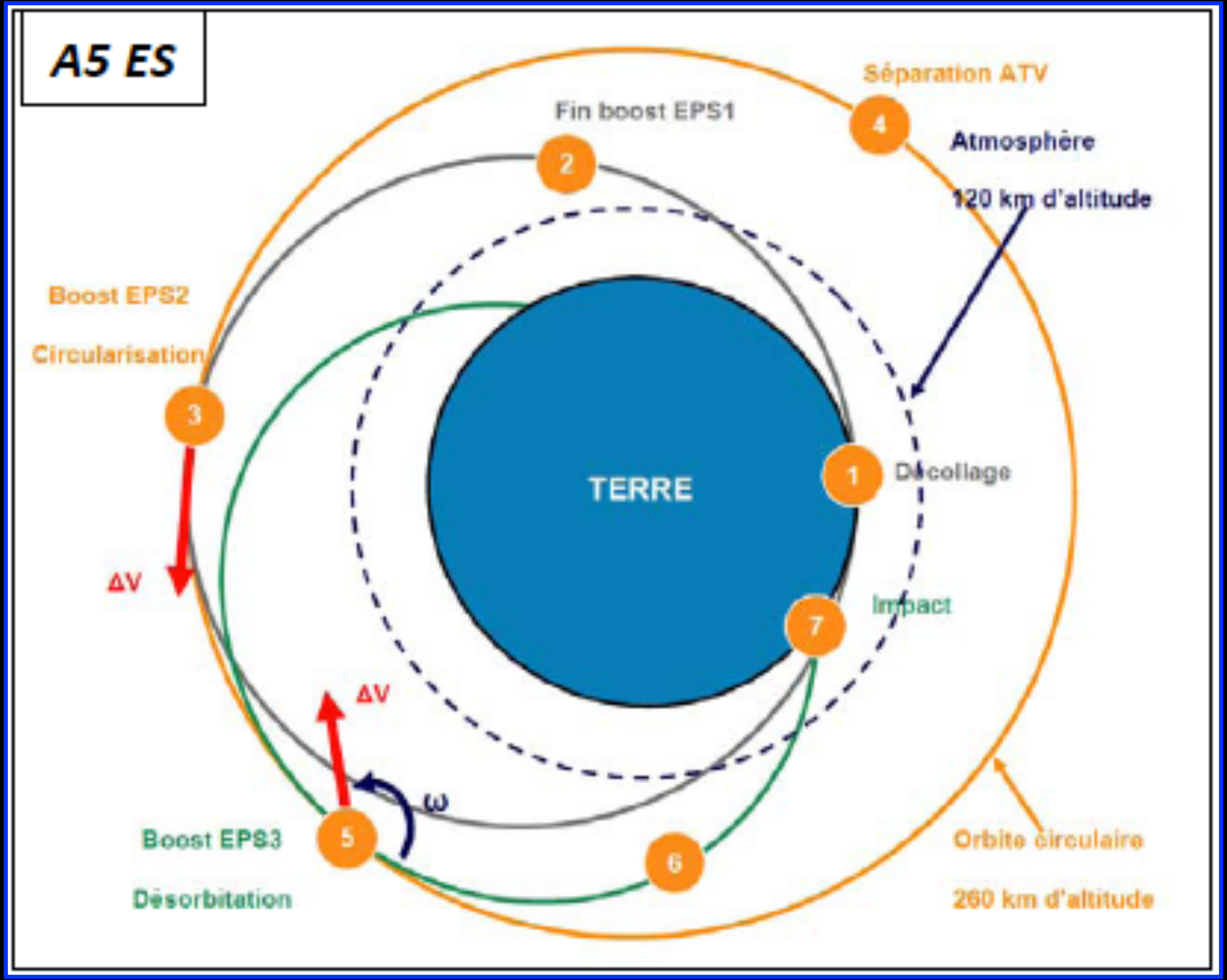




ARIANE 5ES-ATV

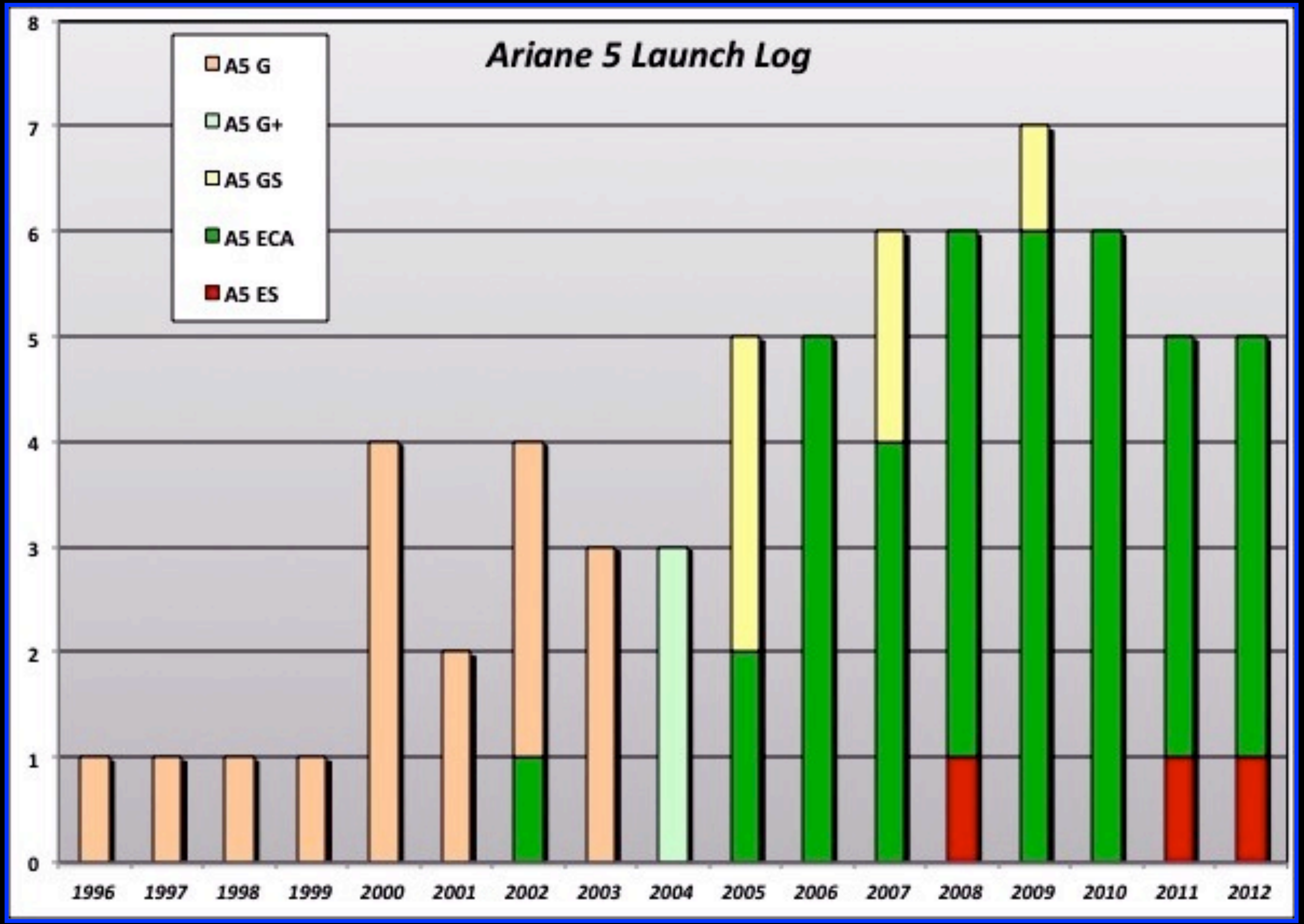


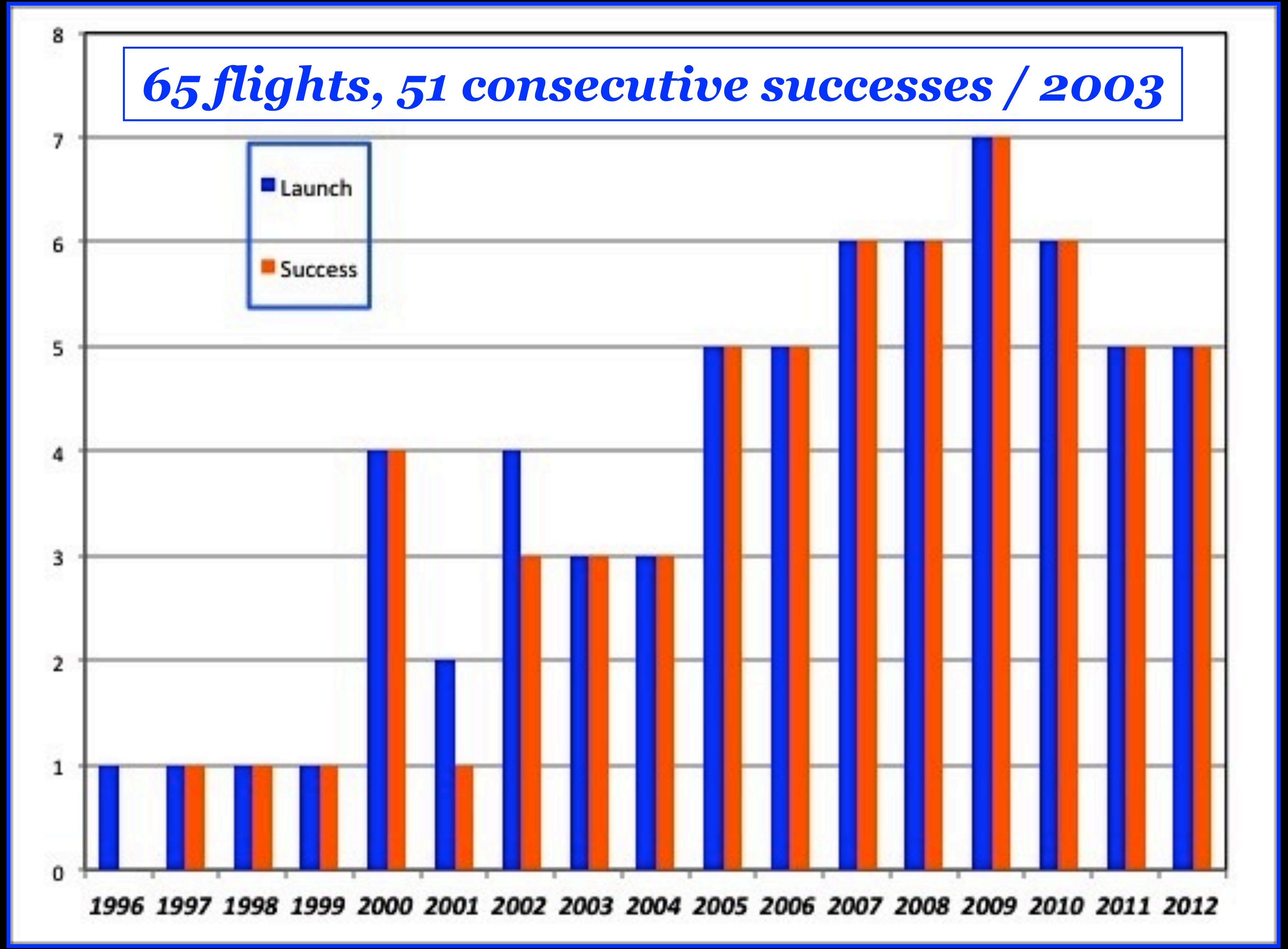


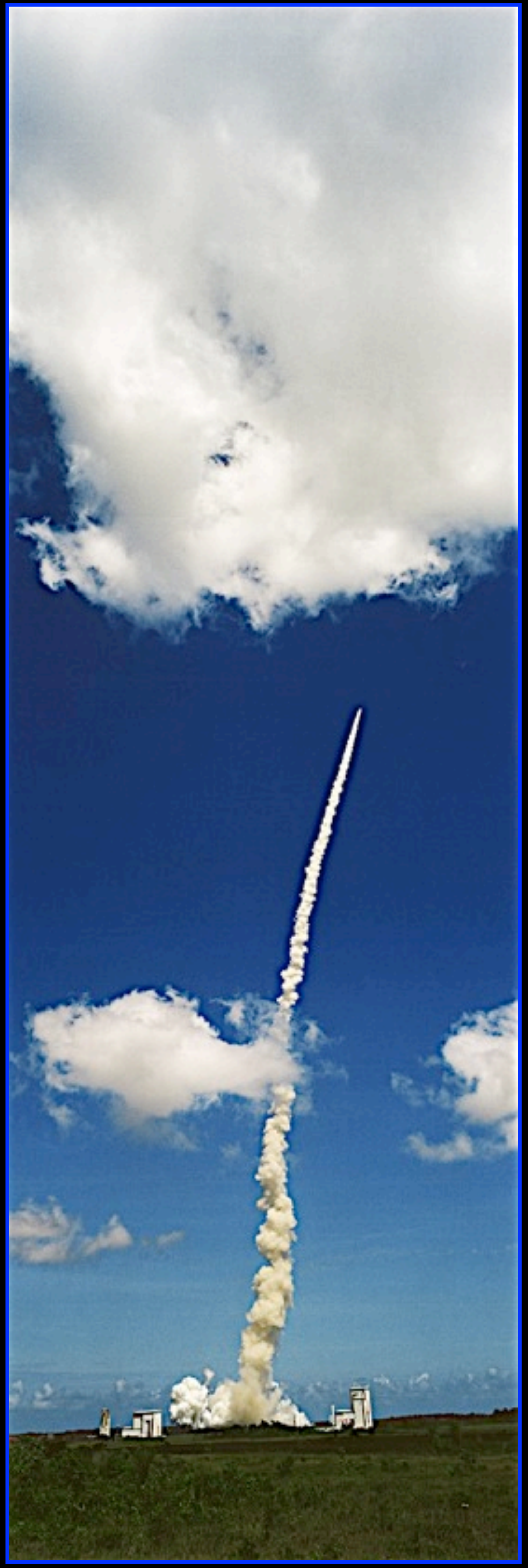


LEO Missions - RDV orbit with ISS @ 51.6°
20.5 T Payload : ATV vehicle
9/03/2008 - 16/02/2011 - 23/03/2012

ARIANE 5G, G+, GS, ES & ECA





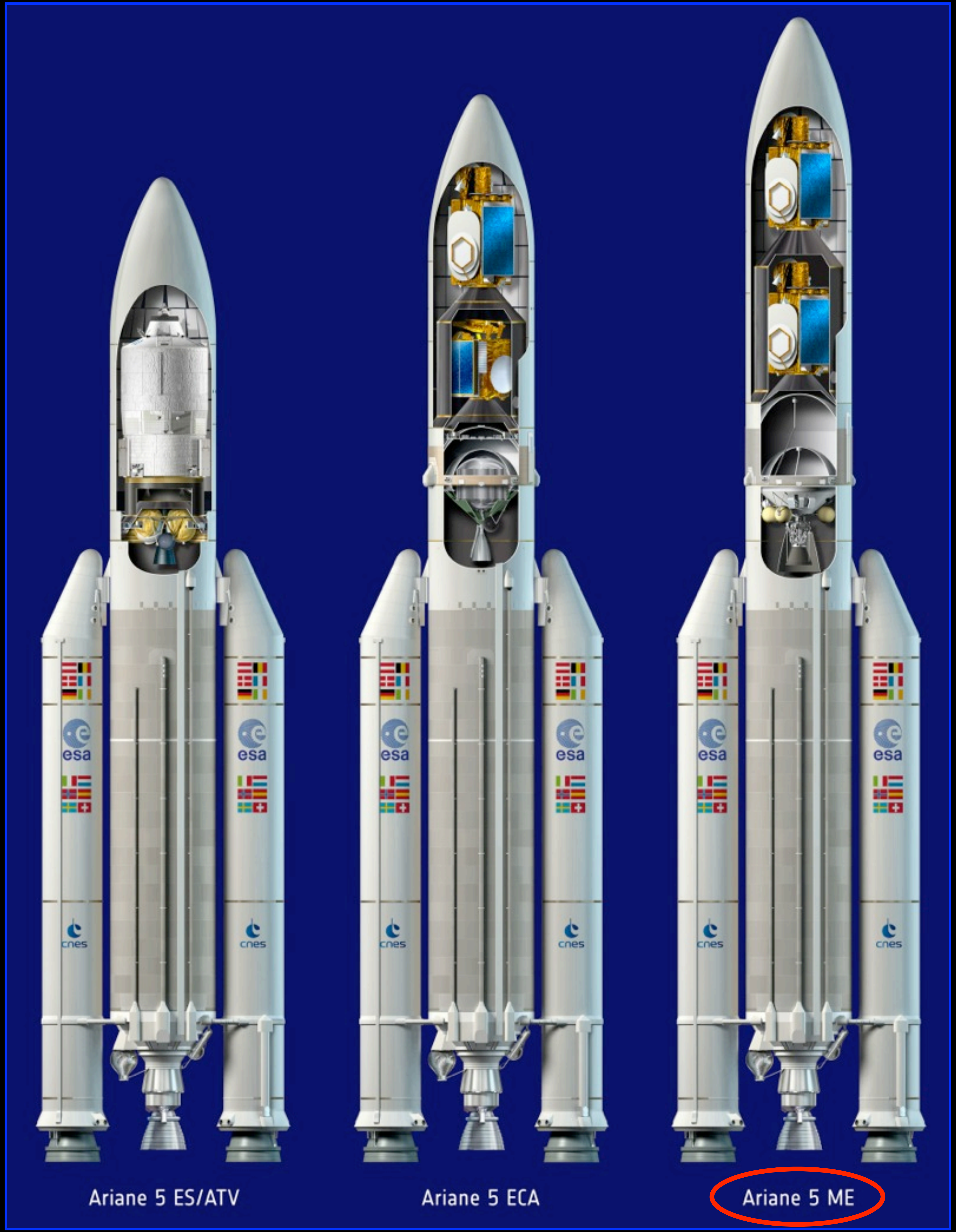


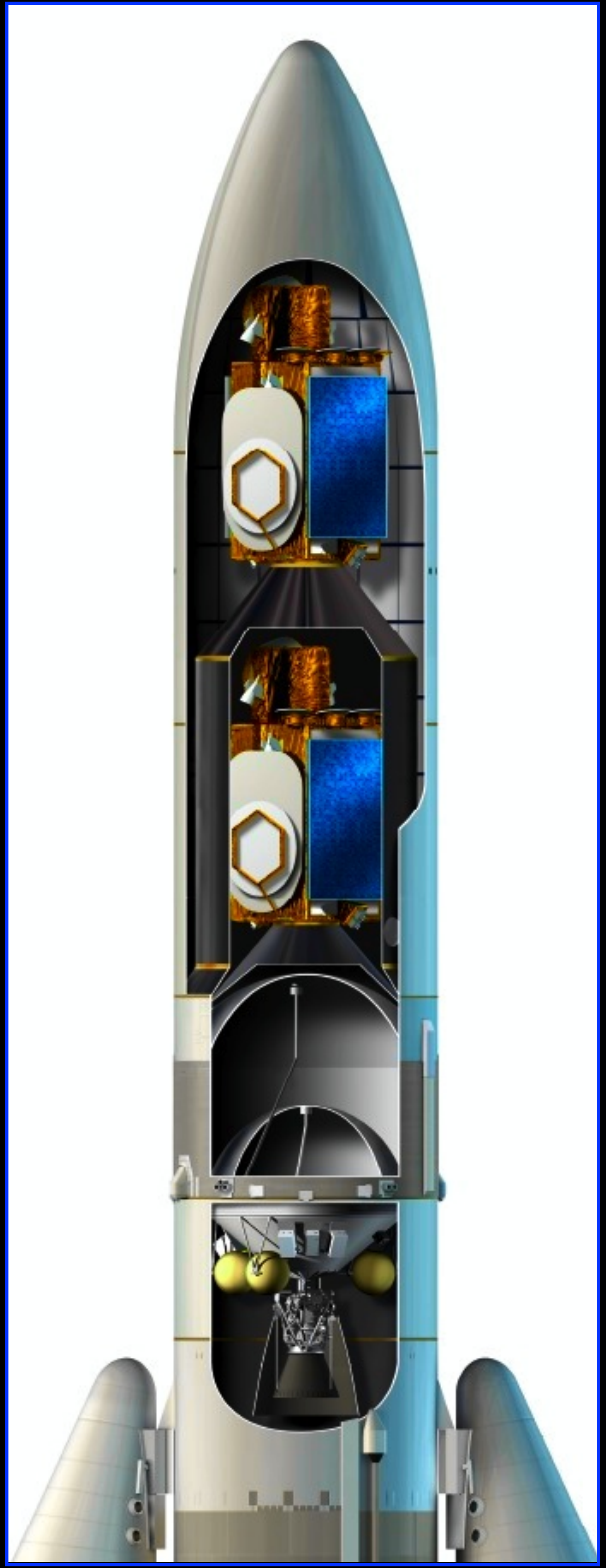
V88	*04/06/96*	*AR5G*	*System (Software) design error*
V142	*12/07/01*	*AR5G*	*3rd stage engine Instability*
V157	*11/12/02*	*AR5ECA*	*EPC Vulcain 2 failure*

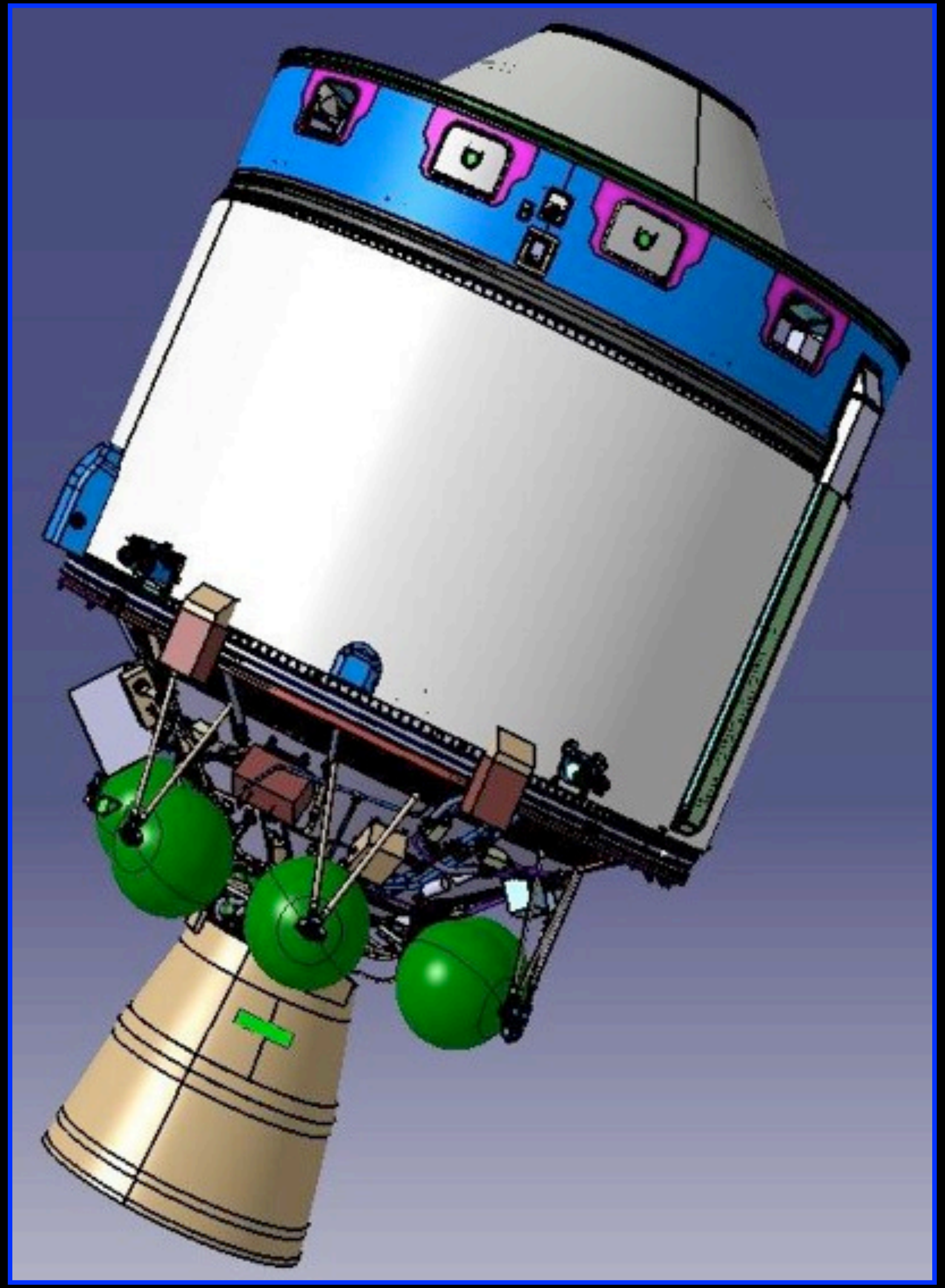

esa
ariane


arianespace
02.15
TOUCAN

ARIANE 5ME



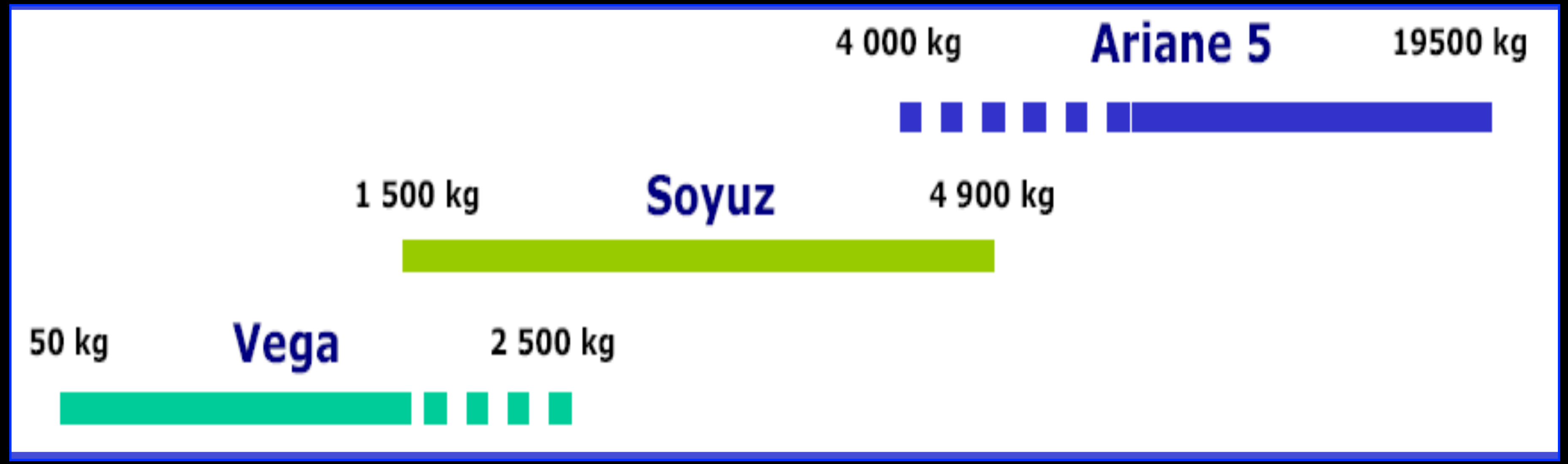




New Cryogenic Upper Stage
Vinci engine (180 kN)
With Deployable Nozzle
Propellants: 28 t (LH2 & Lox)
Common Bulkhead Design

Higher Performance,
Combined Missions:
GTO / GTO+, GTO / Escape,
LEO, MEO, HEO, …
Stage Desorbitation

European Launchers' Family

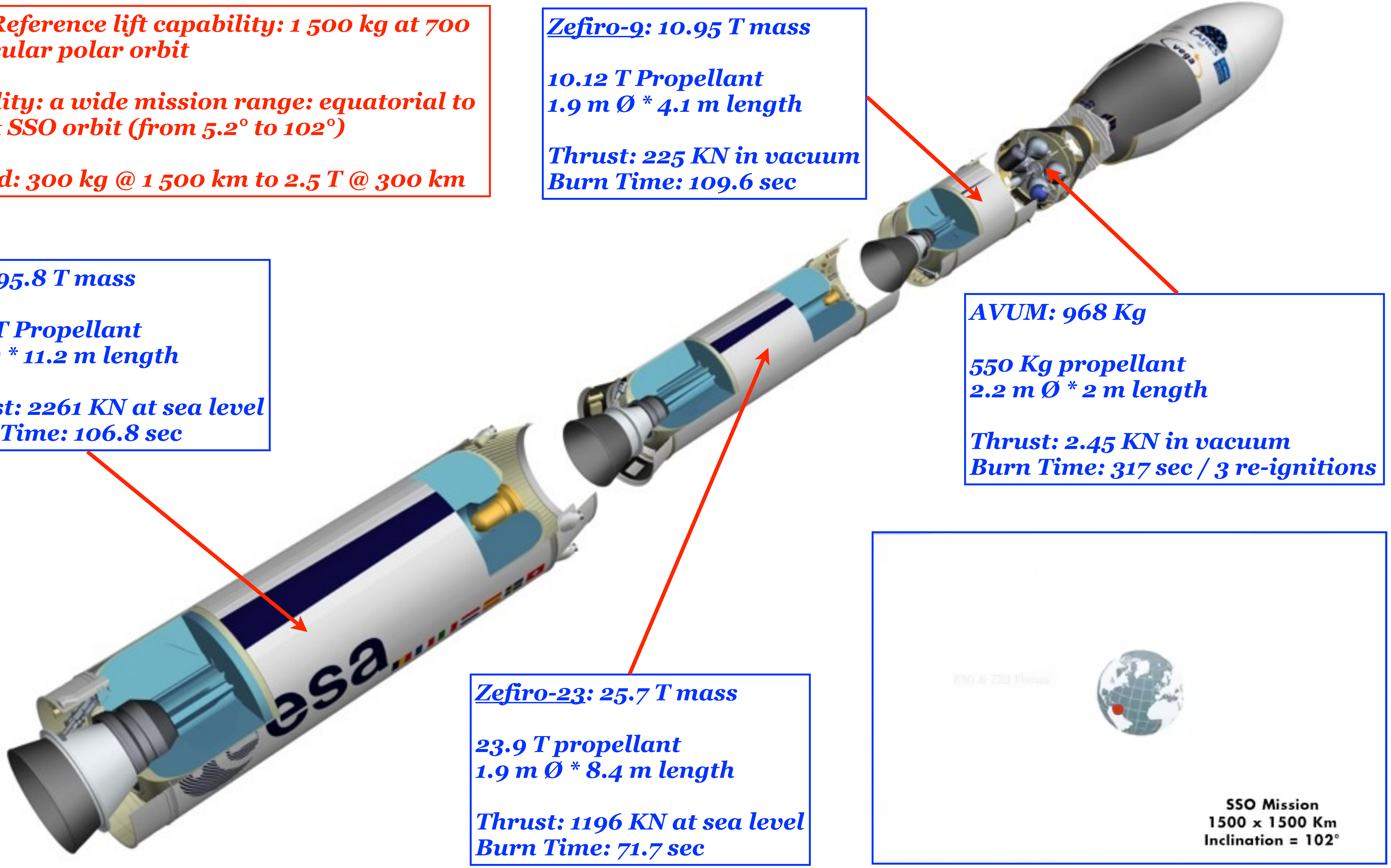


VEGA

VEGA Reference lift capability: 1 500 kg at 700 km circular polar orbit

Flexibility: a wide mission range: equatorial to polar & SSO orbit (from 5.2° to 102°)

Payload: 300 kg @ 1 500 km to 2.5 T @ 300 km



Zefiro-9: 10.95 T mass

10.12 T Propellant
1.9 m Ø * 4.1 m length

Thrust: 225 KN in vacuum
Burn Time: 109.6 sec

P80: 95.8 T mass

88.4 T Propellant
3 m Ø * 11.2 m length

Thrust: 2261 KN at sea level
Burn Time: 106.8 sec

AVUM: 968 Kg

550 Kg propellant
2.2 m Ø * 2 m length

Thrust: 2.45 KN in vacuum
Burn Time: 317 sec / 3 re-ignitions

Zefiro-23: 25.7 T mass

23.9 T propellant
1.9 m Ø * 8.4 m length

Thrust: 1196 KN at sea level
Burn Time: 71.7 sec

VEGA


2006: P-80 test 1


2006: Zefiro 23 test 1


2008: Zefiro 23 test 2


2005: Zefiro 9 test 1

2000

Programme Approval

2002

2003: Development Contract Signature

Launch System Preliminary Design Review

2004

Start Ground Segment work at Kourou

Ground Segment Design Review

2006

Launch System Critical Definition Review

2008

2010

Launch System Qualification Review

2011: Vega Mock-up at Kourou

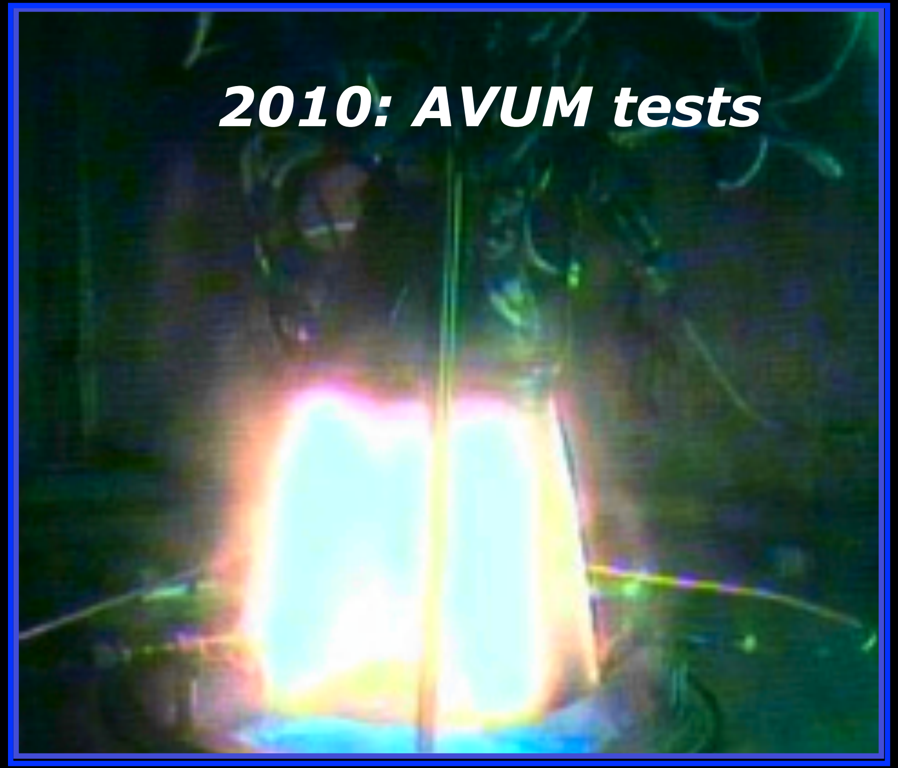
Flight RR

2012


2007: Zefiro 9 test 2
2008: Zefiro 9A test 1
2009: Zefiro 9A test 2
2010: Zefiro 9A test 3

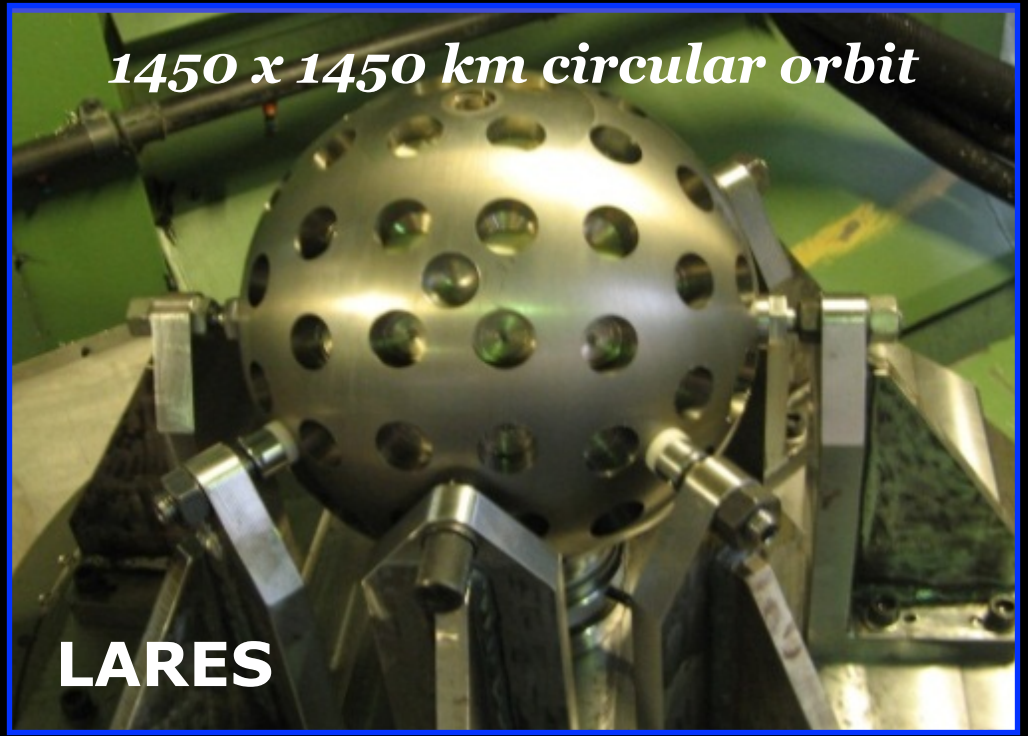

2006: Fairing tests

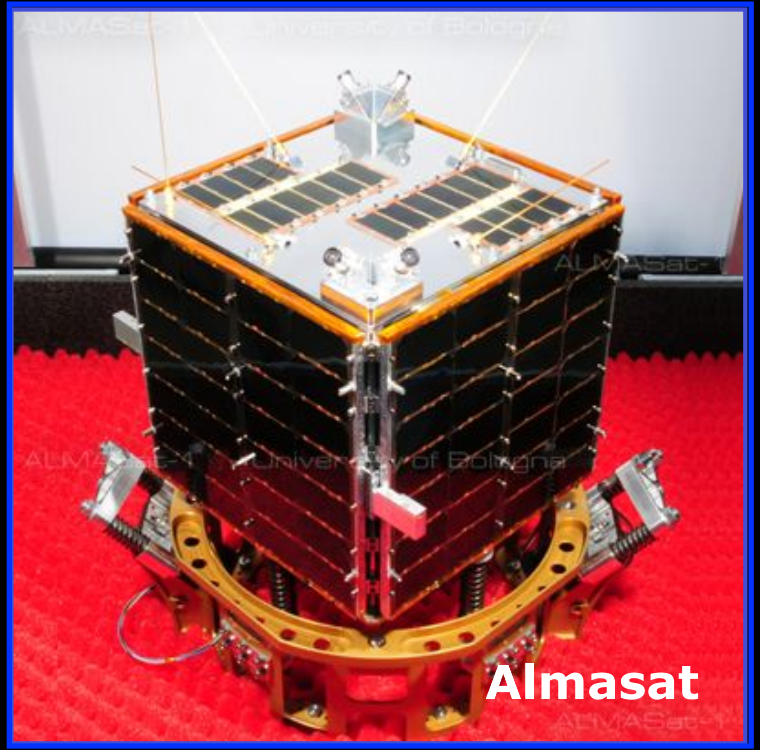

2007: P-80 test 2

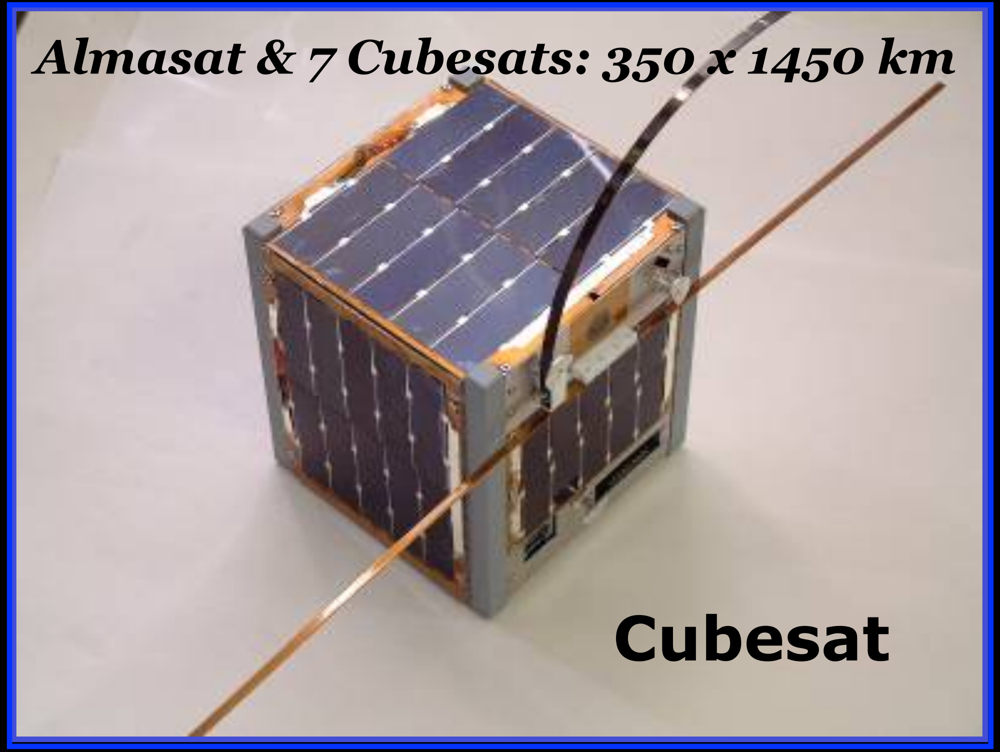

2010: AVUM tests


esa
vega
VV01 VEGA qualification flight, launcher assembly
Europe's Spaceport : 7 november 2011 - 22 january 2012

VEGA

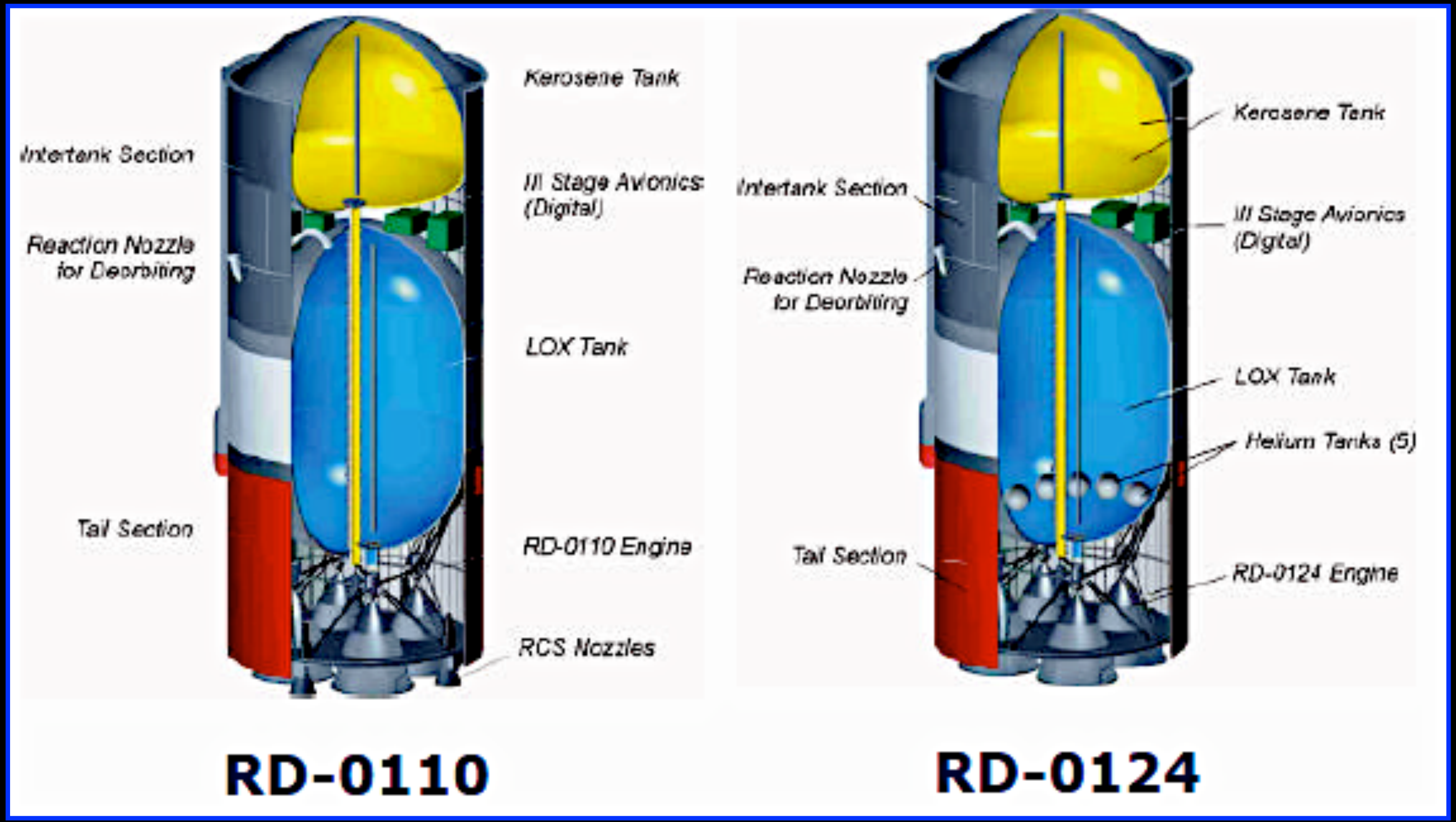


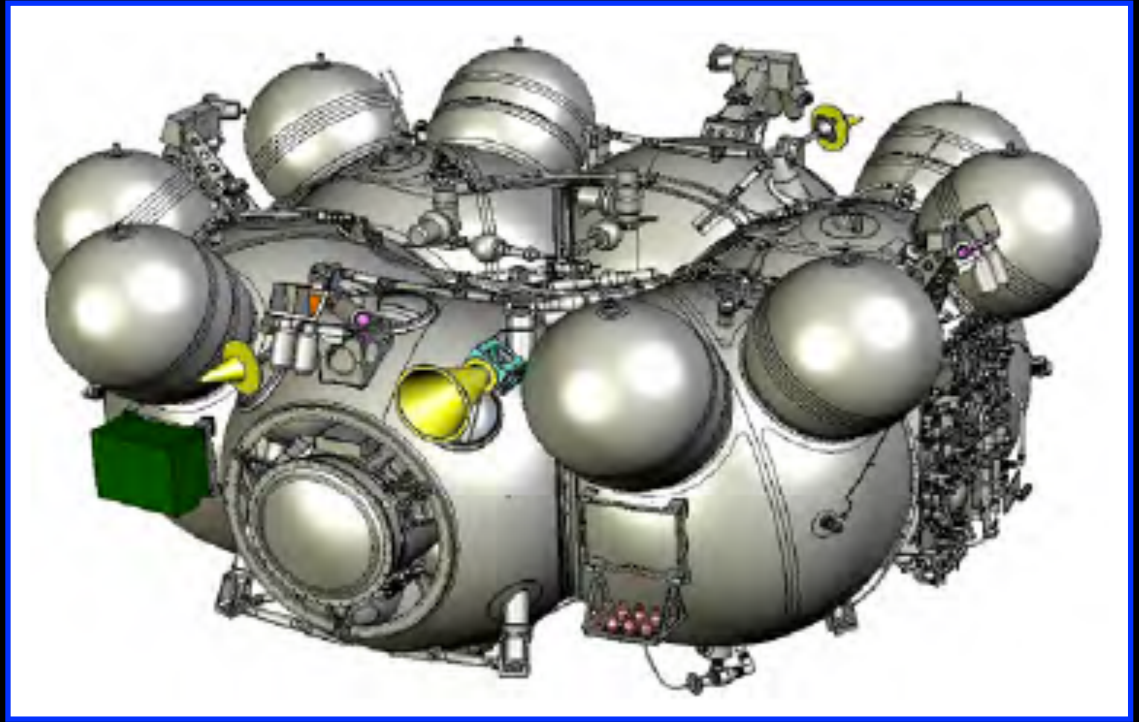




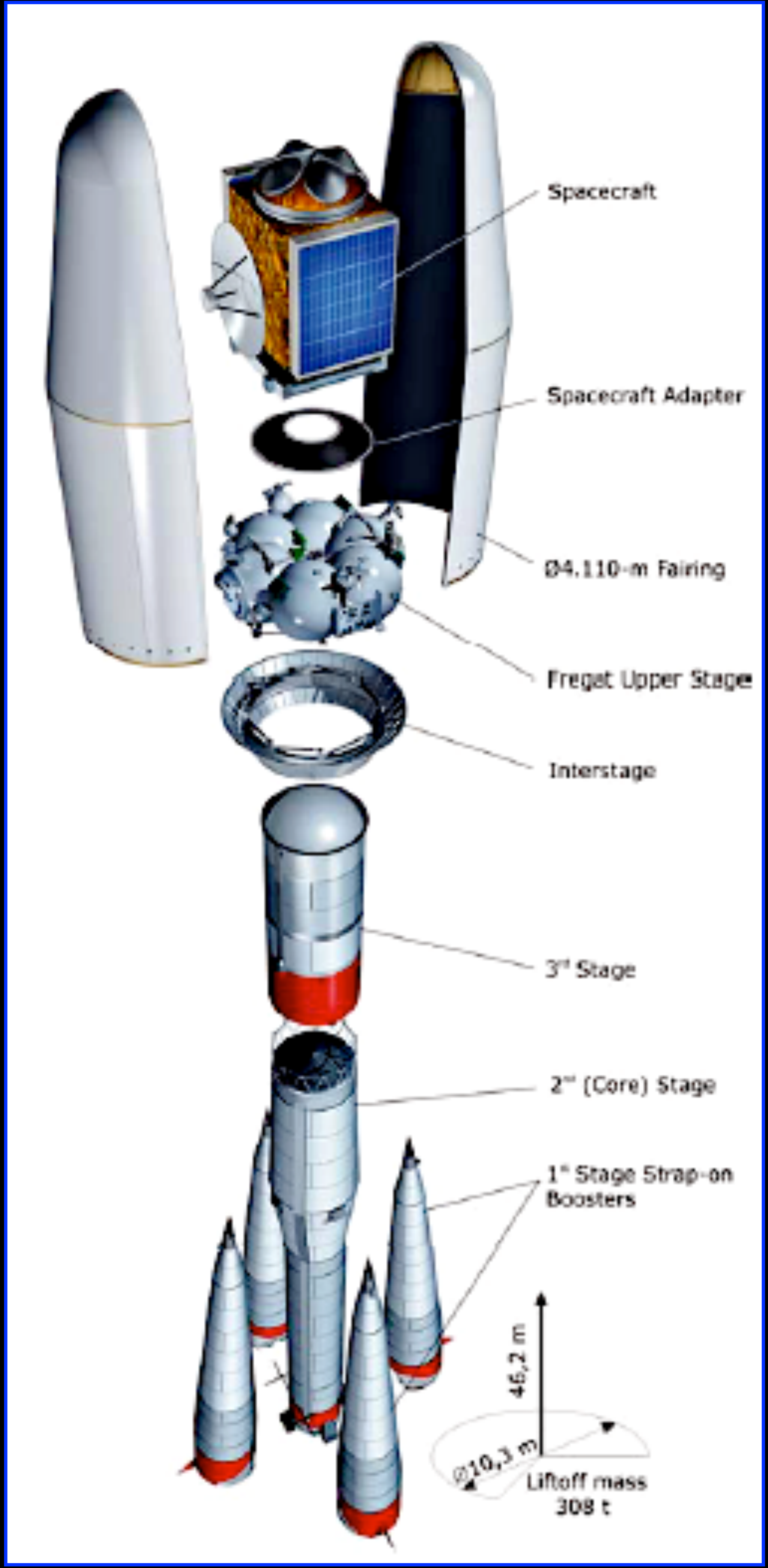
Inclination of 69.5°; 700 Kg Payload

SOYUZ @ KOUROU



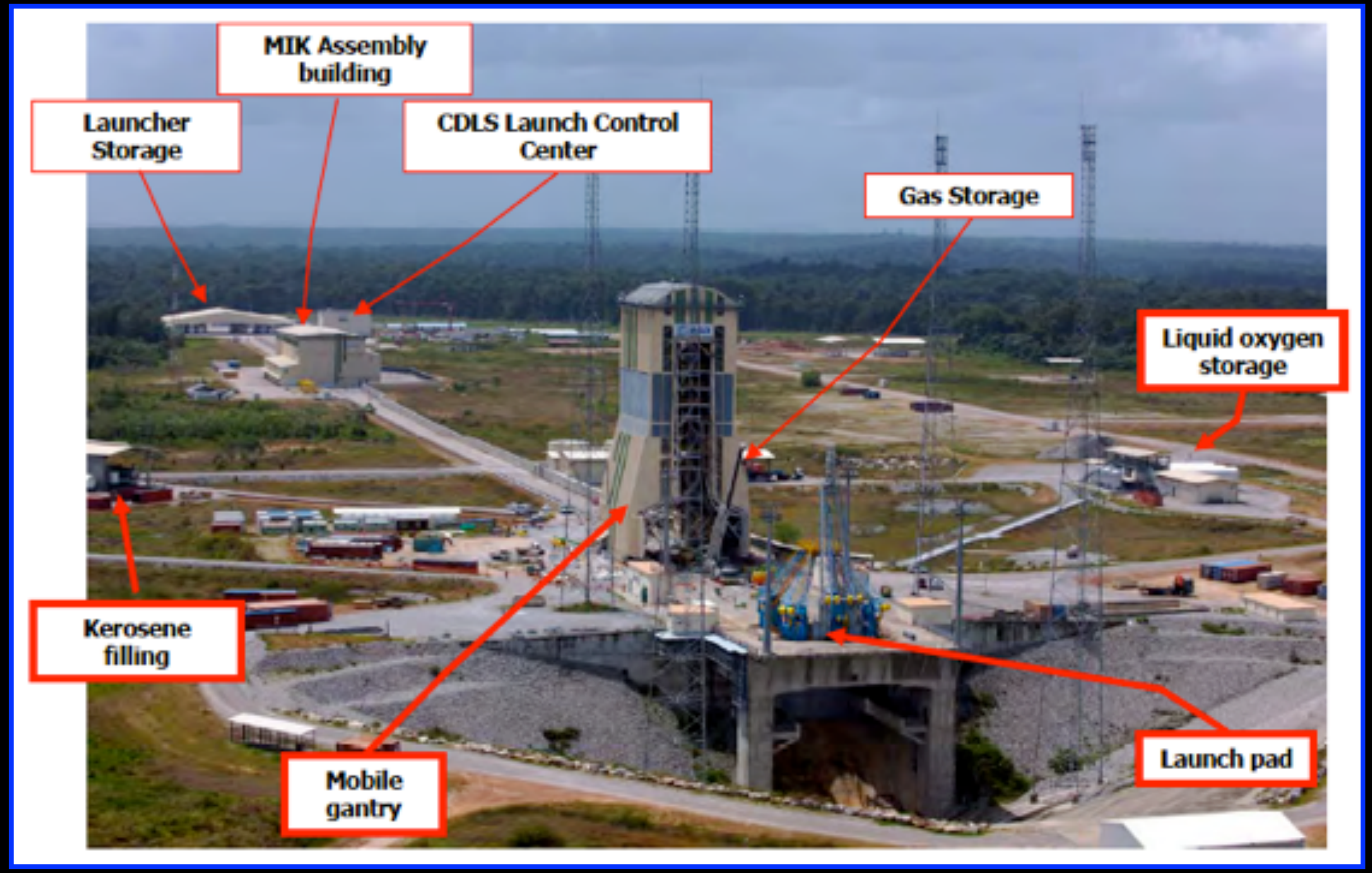


Orbit Specifications	SOYUZ ST 2-1A	SOYUZ ST 2-1B
GTO (Dv = 1500 m/s)	2.730 kg	3.060 kg
Sub - GTO (Dv = 1905 m/s)	3.230 kg	3.610 kg
SSO Orbit (98.1° / 660 km)	4.450 kg	4.900 kg
MEO (56° / 23616 km)	1.180 kg	1.570 kg
HEO (63.4° / 39100 km x 1200 km)	2.200 kg	2.470 kg



FREGAT : Re-ignitable Upper Stage
7.1 T d'UDMH & N2O4
2 T thrust; Up to 20 re-ignitions

SOYUZ @ KOUROU



SOYUZ flight VS01 assembly

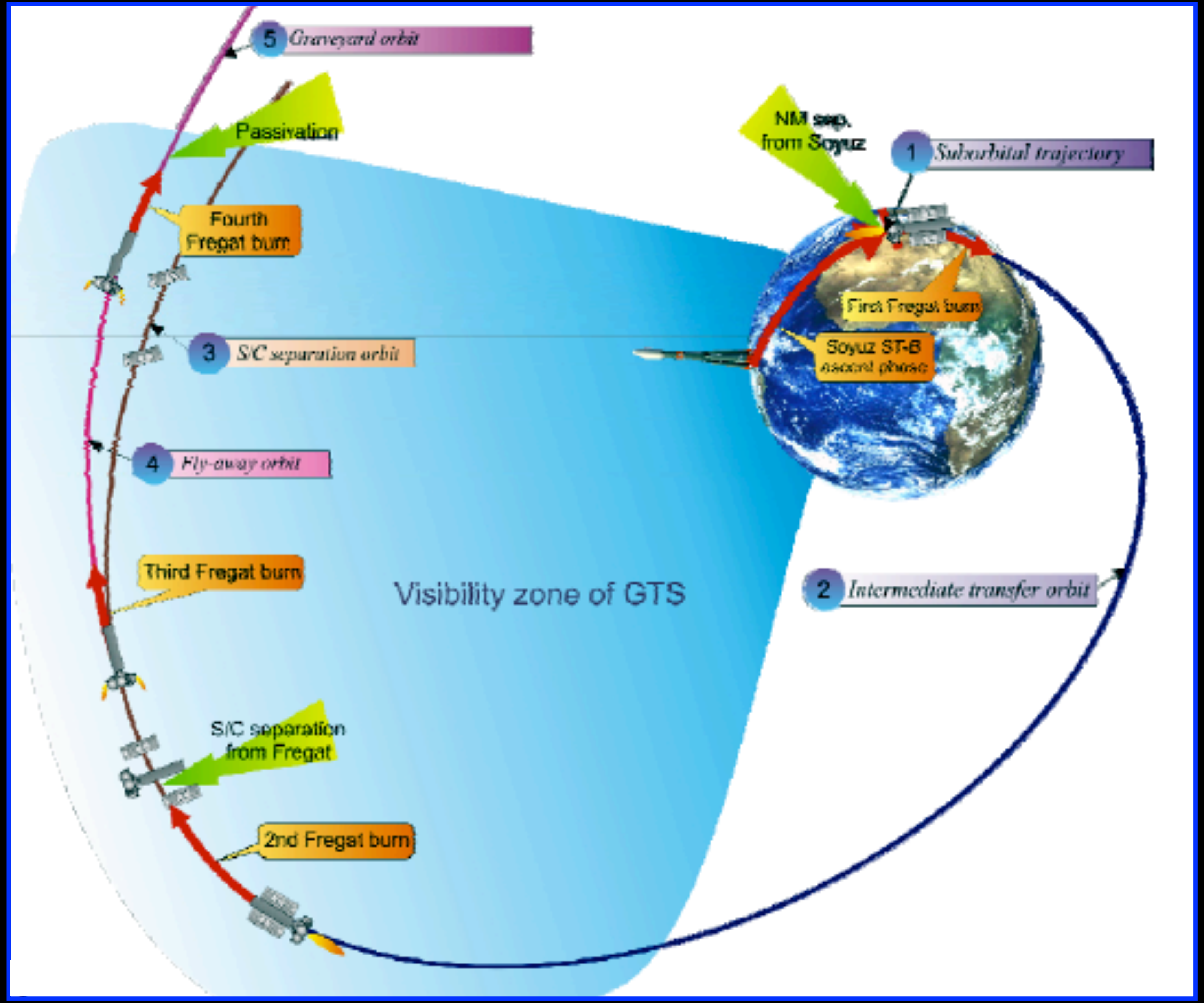
Europe's Spaceport 13-19 september 2011

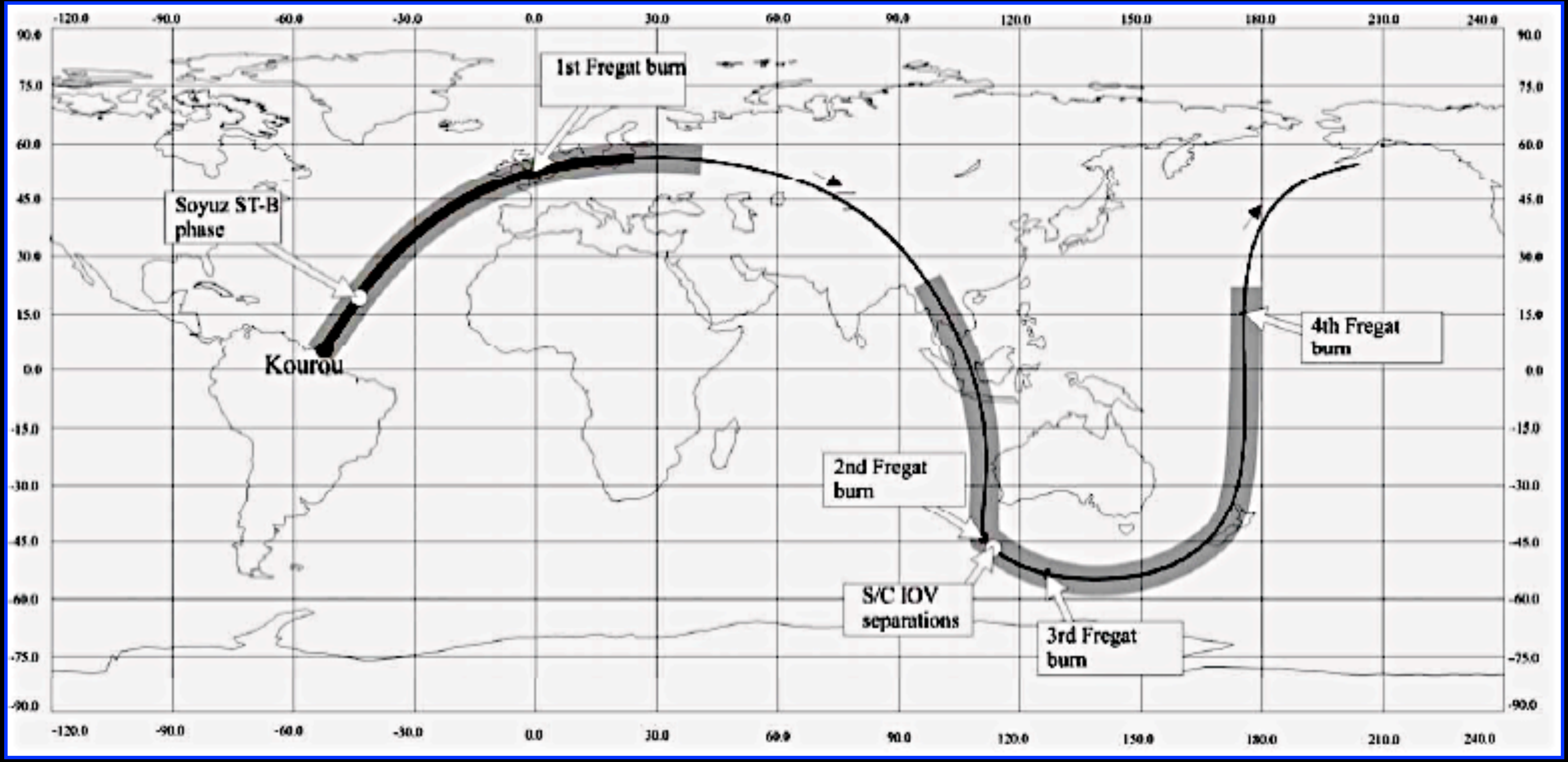
Soyuz VS01 with IOV-1 Launch campaign

Europe's Spaceport 14 to 21 october 2011

SOYUZ @ KOUROU

1st SOYUZ launch from Kourou 21/10/2011
Galileo Satellites 1 & 2
23.200 km circular orbit @ 56° inclination

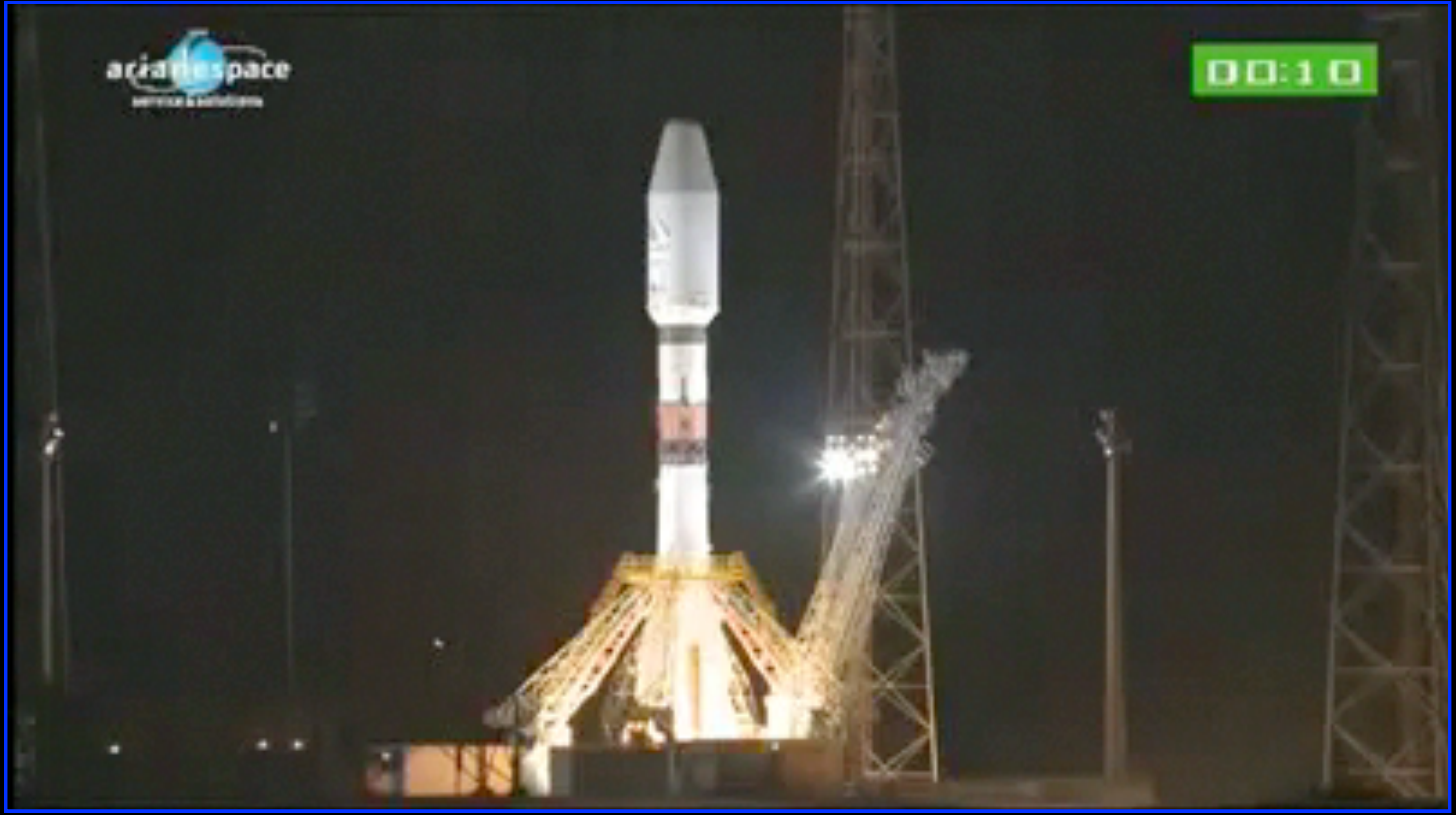




2012 : European Launchers' Family

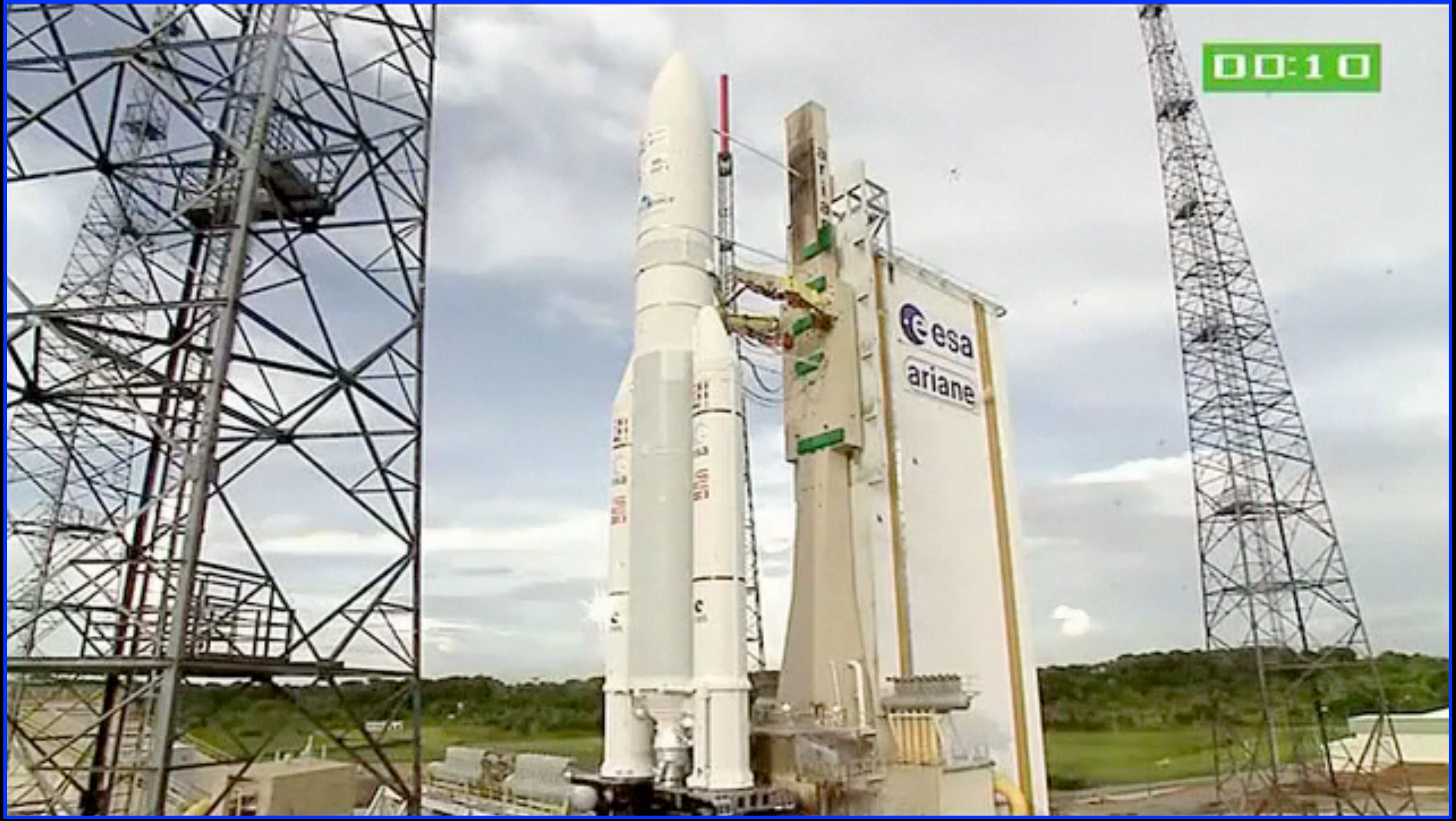
2012 : European Launchers’ Family

Vega



Soyuz

Ariane 5



Thank you for your Attention

Do You Have Any Questions ?