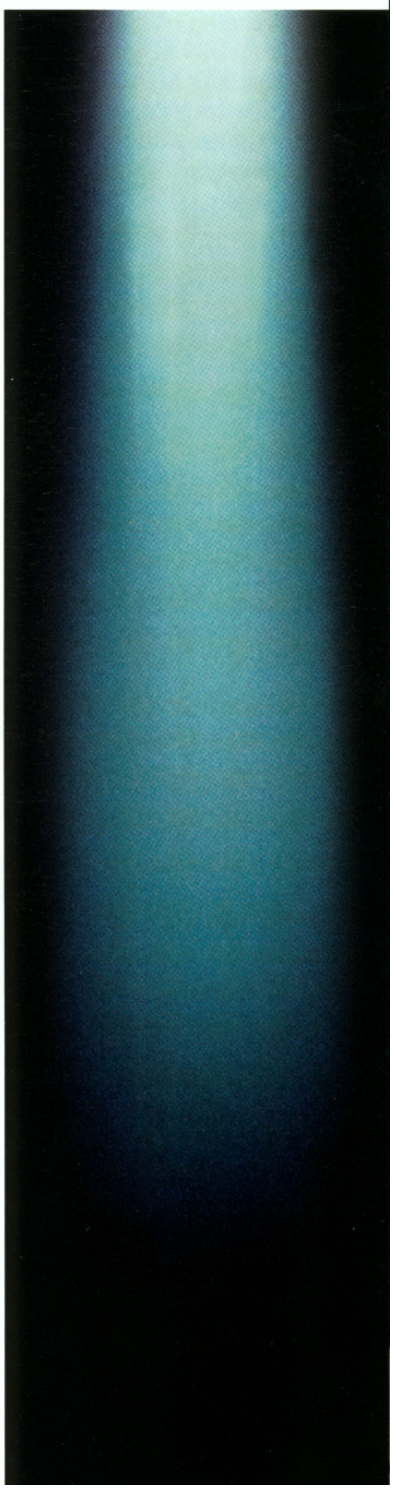
astrium

RITA
The Ion Propulsion System for the Future

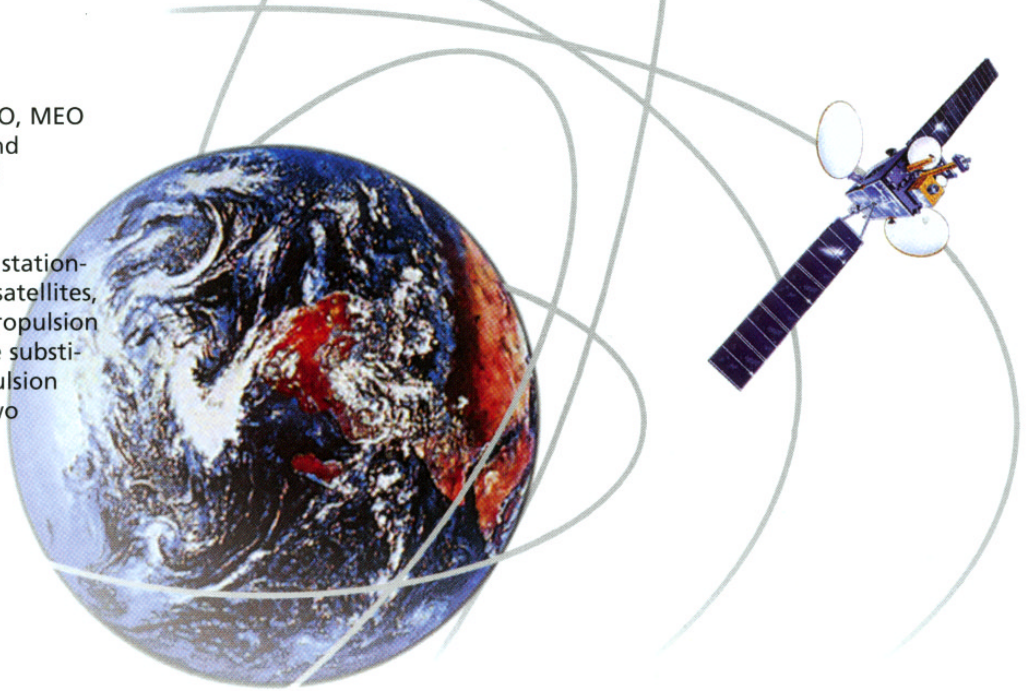


RITA is the first name of a world-famous American filmstar.

RITA is the first name of many thousands of girls and women around the globe.

RITA is the name of our advanced propulsion system, which will certainly never achieve the publicity of an international filmstar, but will propel numerous satellites around the globe in the coming decades.

RITA means R... Th...



Potential Applications

- Stationkeeping
- Attitude control
- Orbit Transfer between LEO, MEO and GEO (Low, Medium and Geostationary Earth Orbit)
- Deep space trajectories
- Starting with North/South stationkeeping of geostationary satellites, together with other ion propulsion systems, RITA will stepwise substitute today's satellite propulsion systems within the next two decades.

Customers will appreciate RITA

For comparable propulsion operations RITA consumes

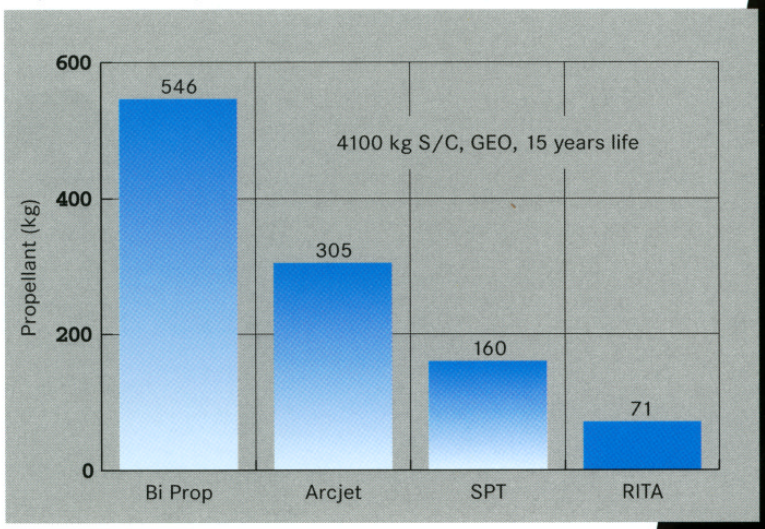
- 85 % less propellant mass than chemical bipropellant thrusters
- 50 % less propellant mass than competing ion propulsion systems.

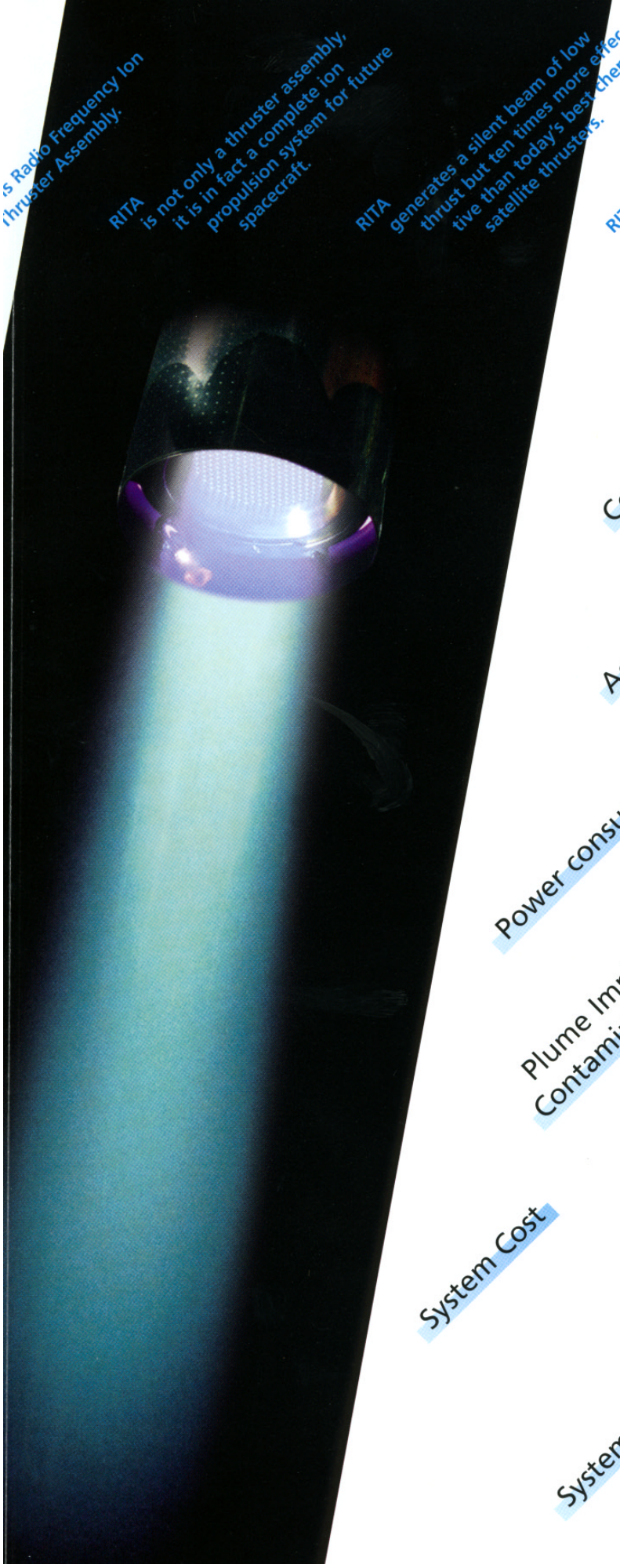
Customers know better than we do how to use a mas saving of a few 100 kg on a satellite.

They will use it for

- More satellite payload, or
- Less launch cost, or
- Longer mission life, or
- any combination of all three.

Propellant Consumption for N/S Station Keeping





System Aspects

RITA is not simply an accessory unit of a spacecraft. A satellite designer will certainly aim for a trade-off between various aspects to achieve optimum use of an ion propulsion system. Amongst basic propulsion requirements (e.g. thrust level, thrust vectors, total impulse) he will consider

Configuration

Accomodation

Power consumption

Thermal Interaction, Cooling Surfaces

Plume Impingement, Contamination, Erosion

Dynamic System Behaviour

Electrical Ar
Batte

System Cost

Power, Mass, Propellant Budgets

Operational and Control Effort

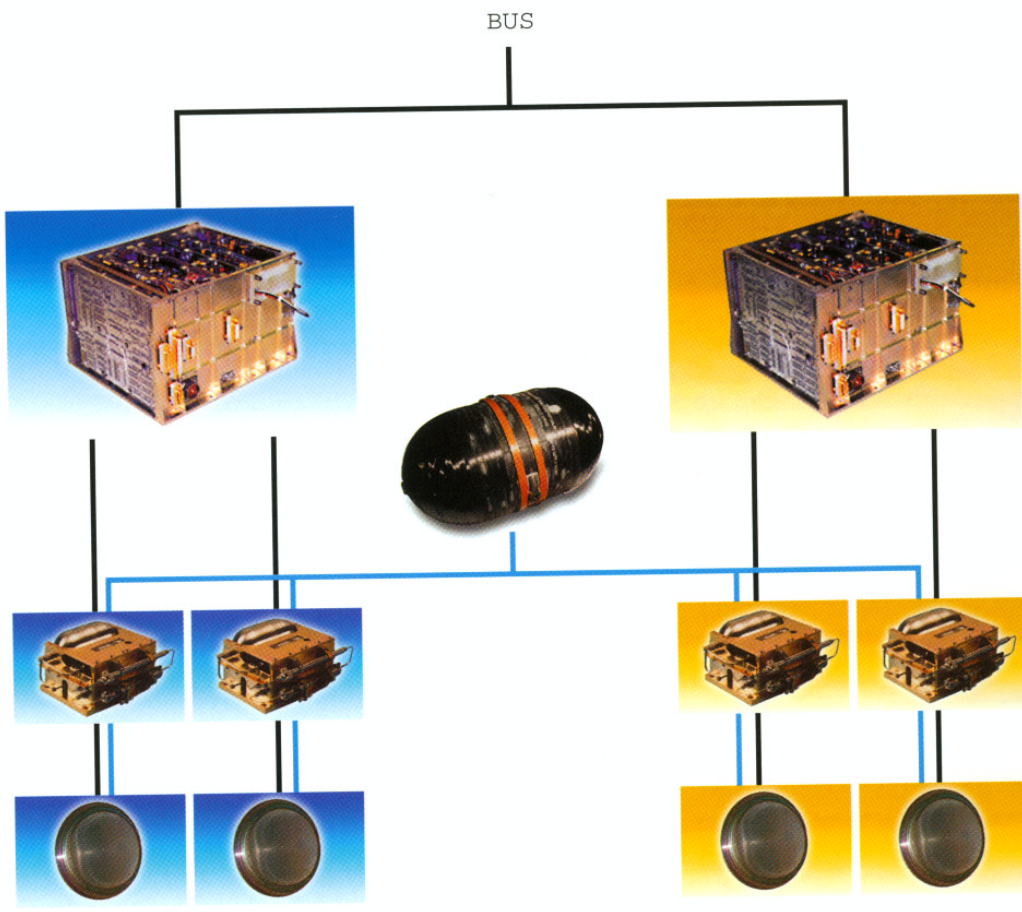
Electron

System Reliability

Daily Operation Cycles

Accumulated Operation Time, Life

System C

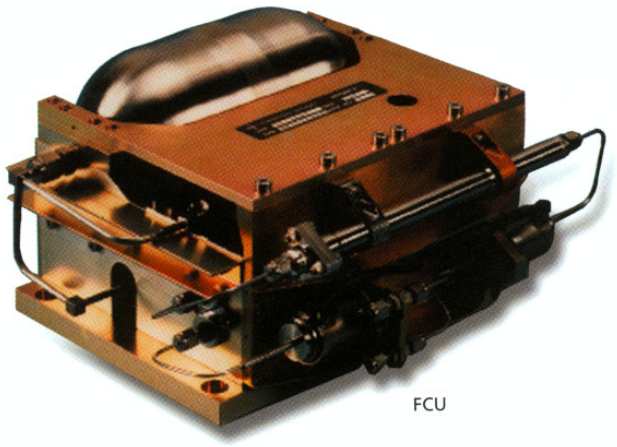


The RITA System Components

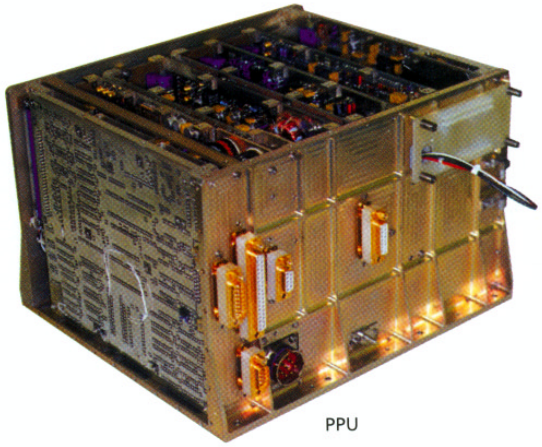
These are the major RITA components:

The Propellant Flow Control Unit:	FCU
The Power Processing Unit	PPU
The Thruster:	RIT

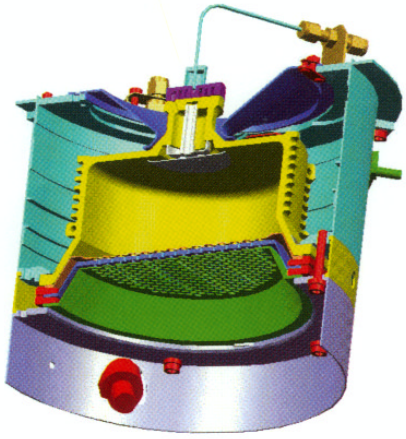
And, of course, Xenon tank, pipework and harness are also parts of RITA.



FCU



PPU



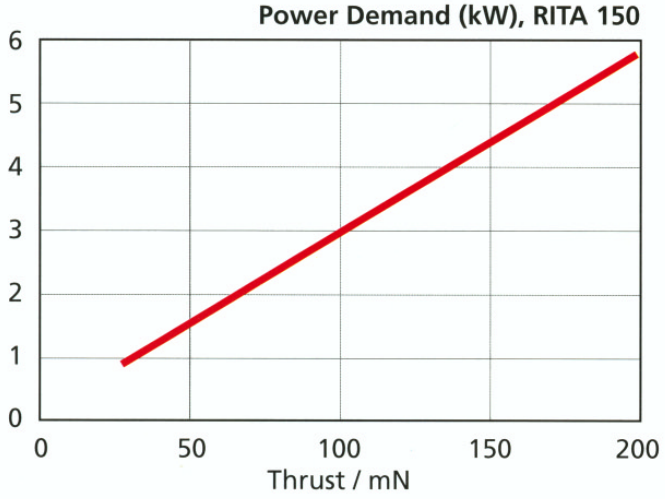
RITA's operation principle appears so simple:

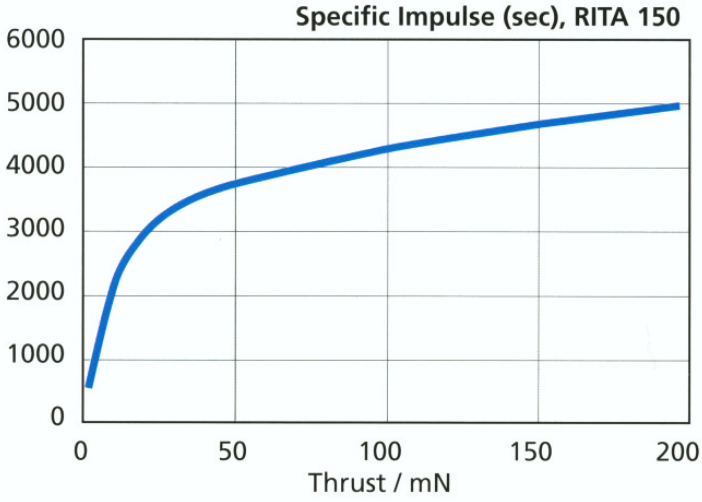
The propellant Xenon is stored under high pressure. For system operation a Flow Control Unit reduces drastically the pressure of the Xenon gas which feeds the thrusters. A radio frequency field ionizes the Xenon in the discharge chamber of each thruster. An electrostatic high voltage field accelerates the ions in a well collimated beam generating the thrust.

Electrons are fed into the beam by a hollow cathode neutralizer to avoid negative charging of the spacecraft.

RITA
Thruster Model Data

	RITA 15	RITA 150
Thrust Level	15 mN	150 mN
Ionizer Diameter	10 cm	22 cm
Beam Voltage	1,500 V	1,200 V
Power Demand	540 W	4,300 W





- Outstanding Specific Impulse 3000 sec to 5000 sec
- Adjustable thrust from 15 % to 135 %
- Narrow ion beam 95 % ions within ± 12° halfcone
- Longlife graphite acceleration electrode
- No electron emitter in discharge chamber
- Operating life more than 20,000 hours

RITA 15

Complete Systems:
Mass budget of a four-thruster system for
N/S sation keeping of a 4,100 kg S/C, GEO, 15 years life.
Two thrusters may be operated at a time.

	RITA 15	RITA 150
4 Thrusters	7.2 kg	24.0 kg
4 Flow Control Units	8.0 kg	8.0 kg
2 Power Processing Units	21.0 kg	27.6 kg
Tubing and Harness	2.0 kg	4.0 kg
Miscellaneous	1 kg	2.0 kg
Fixed Dry Mass	**39.2 kg**	**65.6 kg**
Tank	17.0 kg	17.0 kg
Xenon	71.0 kg	71.0 kg
Total Mass	**127.2 kg**	**153.6 kg**

RITA 150

Brilliant Background

The RITA system can look back on a long development history.

Initial research was conducted by the University of Giessen (Germany) back in the 1960s. Astrium's predecessor Messerschmitt-Bölkow-Blohm (MBB) joined this development team and took over the industrial leadership in 1970.

However, it was not until 1992 that the chance for a first application arose with an European experimental spacecraft. A RITA 10 system flew with ESA's EUropean REtrievable CArrier EURECA at that year.

A RITA 15 system is ready to fly with ESA's experimental telecommunication satellite ARTEMIS which will be launched in the year 2001.

We owe thanks to our longstanding partners for their excellent contributions to RITA:

- Justus Liebig University of Giessen, Germany
- European Space Technology Center (ESTEC), Noordwijk, Netherlands
- Officine Galileo, Milano, Italia
- LABEN/PROEL, Firenze, Italia

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