

## Early History of Spacecraft and Rocketry

The concerted effort in ballistic missiles and space technology would make France the third country launching satellites. Although CNES was created to lead the French space effort and had a primary responsibility for the planned first satellite, designated *D-1A*, the satellite program witnessed a turf battle when — in 1963 — the *National Office of Aerospace Studies and Research (Office National d'Études et de Réalisations Aéronautiques — ONERA)* presented an alternative proposal to launch a satellite.

ONERA specialized in building solid-propellant missiles, and it proposed the launch of a small 3.5-kg (7.7-lb) spacecraft by its *Berenice* rocket in 1964. This proposed ONERA launch would have occurred one year earlier than the planned launch of the CNES satellite by a new *Diamant* (*diamond* in English) rocket. Interference of high-level government officials stopped the rivalry between two organizations and preserved the bureaucratic supremacy of CNES.

CNES conducted development of the first French space launcher, the *Diamant-A*, for 43 months in great secrecy. The rocket's technology relied to a large degree on the so-called “Gem Stones” (*Pierres Precieuses*) program. Under this program, a series of single-stage technological rockets including *Agate*, *Topaze*, and *Emeraude* (*agate*, *topaz*, and *emerald* in English) was developed for the Ministry of Defense.

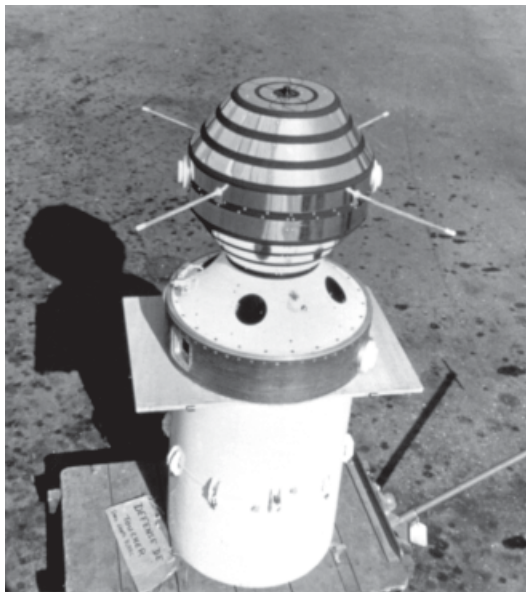


Fig. 17.3. The first French satellite, *technological spacecraft A-1*, also named *Astérix*. The diameter of the Matra-built spacecraft was 50 cm (19.7 in.) and height 53.6 cm (21.1 in.). Nine black stripes were optimized to provide the desired passive thermal control. The spacecraft did not transmit any information because of the damaged antennas, but it was tracked by radar. Photo courtesy of Centre National d'Études Spatiales, France.

The three-stage *Diamant-A* launcher consisted of the modified *Emeraude* and *Agate* and the specially built P-6 as the first, second, and third stages, respectively. These *Diamant* stages were demonstrated on two two-stage test vehicles, the *Saphir* and *Rubis* (*sapphire* and *ruby* in English). The *Saphir* consisted of the liquid-propellant (turpentine fuel and nitric acid oxidizer) *Emeraude* and the solid-propellant *Agate* as the first and second stages, respectively. The rocket was fired three times during 1965. The *Agate* served, in turn, as the first stage of the other test vehicle, *Rubis*. The solid-propellant stage P-6 flew as the second stage of the *Rubis*. Eight test launches of the *Rubis* vehicles were conducted in 1964 and 1965.

**First  
French  
Satellite**

**ONERA's  
Challenge**

**Pierres  
Precieuses**

**Diamant-A  
Launcher**

M. Gruntman, *Blazing the Trail, The Early History of Spacecraft and Rocketry*, AIAA, Reston, Va., 2004; <http://www.astronauticsnow.com/blazingthetrail/>