APOLLO 11
MOON LANDING

Thiokol

CHEMICAL CORPORATION

Thiokol CHEMICAL CORPORATION

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FIFTEEN THIOKOL ROCKETS AID APOLLO LAUNCH

Bristol, Pa., July 16, 1969 -- Fifteen solid-propellant rocket motors built by Thiokol Chemical Corporation play important roles aboard the Apollo 11 space vehicle. Fourteen of the Thiokol solid fueled motors perform auxiliary propulsion missions on the first and third stages of the Saturn V launch vehicle. The fifteenth motor, located in the spacecraft escape tower atop the 363 foot vehicle, jettisons the escape system after a successful launch. The combined effective thrust of all Thiokol propulsion systems aboard is nearly 900,000 pounds.

There are a total of 95 engines on the giant bird ranging in size from the five 1.5-million pound thrust first stage F-1's, to the small motors that control and stabilize the command and service modules. Combined thrust of all Apollo-Saturn propulsion is about 9,000,000 pounds.

About two-and-a-half minutes after lift-off, Apollo/Saturn's five giant F-1 booster engines shut down and the smaller rockets aboard take over. First of the Thiokol solid propellant motors to see action are eight TE-M-424 retrorockets. These eight engines are mounted in pairs, in fairings around the base of the first stage.

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Developing a total thrust of about 700,000 pounds in less than one second, they insure positive separation of the booster from the second stage.

Thirty seconds after the five second-stage J-2 engines ignite -- at an altitude of about 45 miles -- the command is given to jettison the spacecraft escape system. Any abort could now be handled by normal command module reentry procedures. The boost protective cover and launch escape systems, with its unused escape and pitch motors, are separated from the command module and jettisoned. This is accomplished by a 33,000 lb. thrust solid rocket motor located in the tower just above the escape motor. Its dual nozzles carry the tower up and away from the spacecraft.

First-stage retro motors are supplied by Thiokol's Elkton Division to the Boeing Company's Launch Systems Branch, New Orleans; the tower jettison motor is made for North American Aviation, Space Systems Division, Downey, California.

The second stage burns for over six minutes. At cut-off the vehicle is nearly 117 miles high and traveling about 15,300 miles per hour. To separate the second stage, four solid-propellant retrorockets aboard and interstage section are ignited, providing a total decelerating thrust of about 140,000 pounds. This permits the third stage to pull away. Two small ullage motors, produced by Thiokol's Huntsville, Alabama, Division, are fired to force the third stage propellants into position to be pumped to the J-2 engine.

These retro and ullage motors are supplied by Thiokol to the McDonnell-Douglas Corporation's Douglas Missile & Space Division, Huntington Beach, California.

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NEW ELASTOMER USED IN APOLLO'S LUNAR MODULE

Bristol, Pa., July 16, 1969 -- A nonflammable flourelastomer -- CNR Nitroso Rubber -- is used throughout the Apollo 11 Lunar Module to enhance crew safety and mission reliability. CNR Nitroso Rubber, developed by Thiokol Chemical Corporation, will not ignite or burn even in a pure oxygen environment. It is one of several new materials whose development was accelerated through NASA'S intensive program to flameproof its spacecraft.

The Lunar Module (LM), which will land men on the surface of the moon, is built by the Grumman Aircraft Engineering Corporation, of Bethpage, New York. CNR is used in the LM to prevent the spread of fire. In addition CNR is used as an injection in the descent stage propulsion tank covers. Beta fabric, a non-burning fiberglass cloth used for debris bags, space suits and curtains, has been impregnated and coated with nonflammable CNR solutions to improve their abrasion resistance and weave locking.

CNR rubber also possesses exceptional resistance to the corrosive liquid oxidizer used in various on-board Apollo systems. It was selected for valve seats in pressurization-system check valves of the attitude-control propulsion units of all Apollo modules.

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STAGE-SEPARATION ROCKETS AID APOLLO LAUNCH

Bristol, Pa., July 16, 1969 --- Thirteen separate stage-separation rockets produced by the Elkton, Maryland, Division of Thiokol Chemical Corporation play critical roles during the first few minutes of (today's) Apollo-11 moon landing mission. The rockets are of three different types and range in thrust from about 33,000 to nearly 90,000 pounds apiece.

First of the Thiokol engines to see action are eight TE-M-24 retrorockets that are fired to separate the burned-out first-stage boosters about two and a half minutes after lift-off. The engines are mounted in pairs around the base of the stage. They fire upward -- that is, in the direction in which the vehicle is moving - to provide a reverse or braking thrust.

Less than a minute later, another separation rocket is fired at the opposite end of the giant bird. Its function is to jettison the escape tower that is fixed to the very tip of the 363-foot vehicle. The tower is designed to pull the man-carrying capsule free of the Saturn V launch vehicle in case of a near-ground emergency. After a successful blast-off the capsule could be returned by normal reentry procedures, so the escape tower is no longer needed. It is separated by Thiokol's high-impulse TE-M-380 motor.

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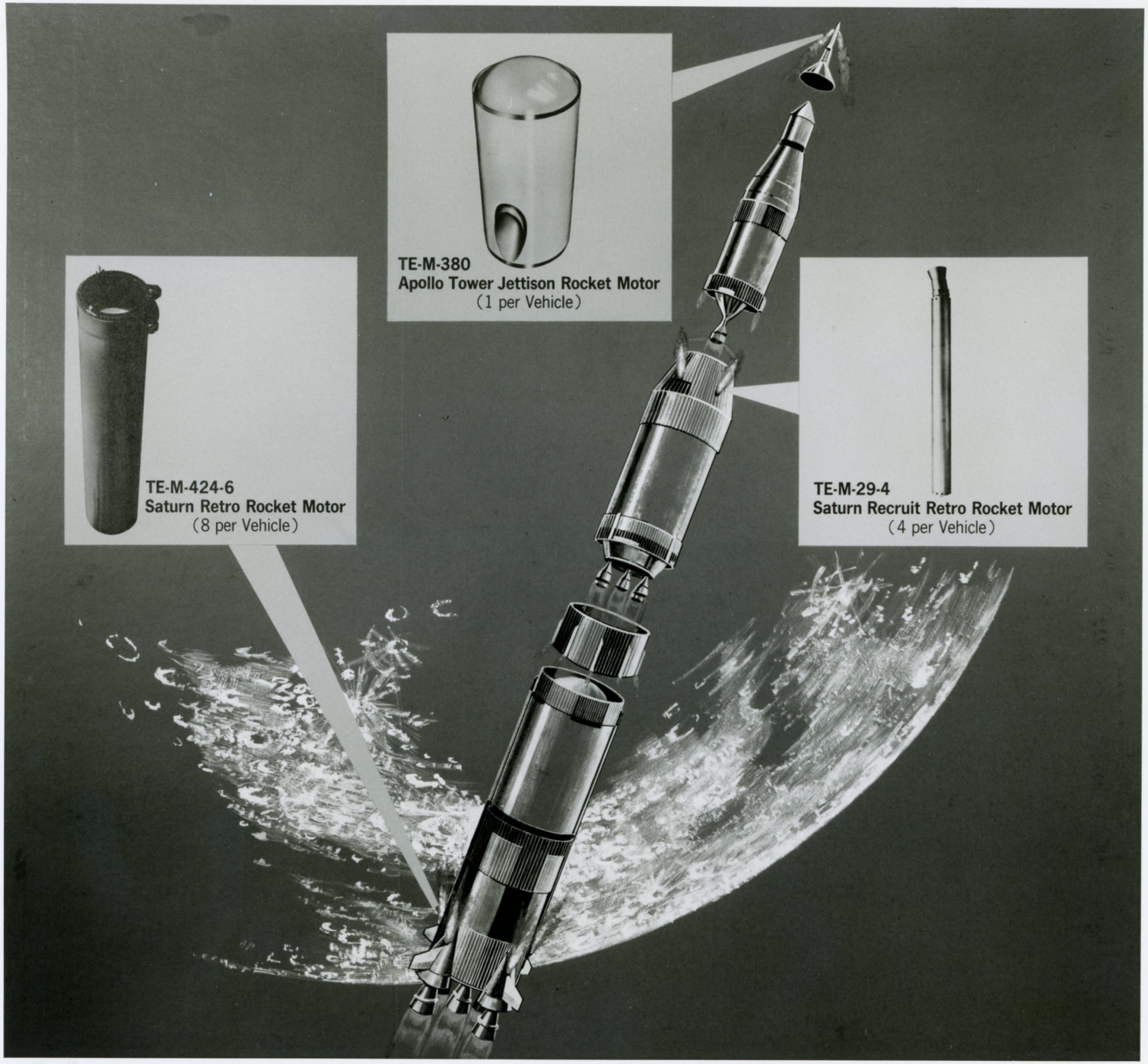
Following first-stage spearation, the second stage of the Saturn V burns for about six minutes. It is then separated in its turn by the firing of four TE-M-29 Recruit motors. The Recruit is one of Thiokol's -- and America's -- most thoroughly tested powerplants, having seen service in scores of space applications for more than a dozen years.


TE-M-380
Apollo Tower Jettison Rocket Motor
(1 per Vehicle)
TE-M-424-6
Saturn Retro Rocket Motor
(8 per Vehicle)
TE-M-29-4
Saturn Recruit Retro Rocket Motor
(4 per Vehicle)