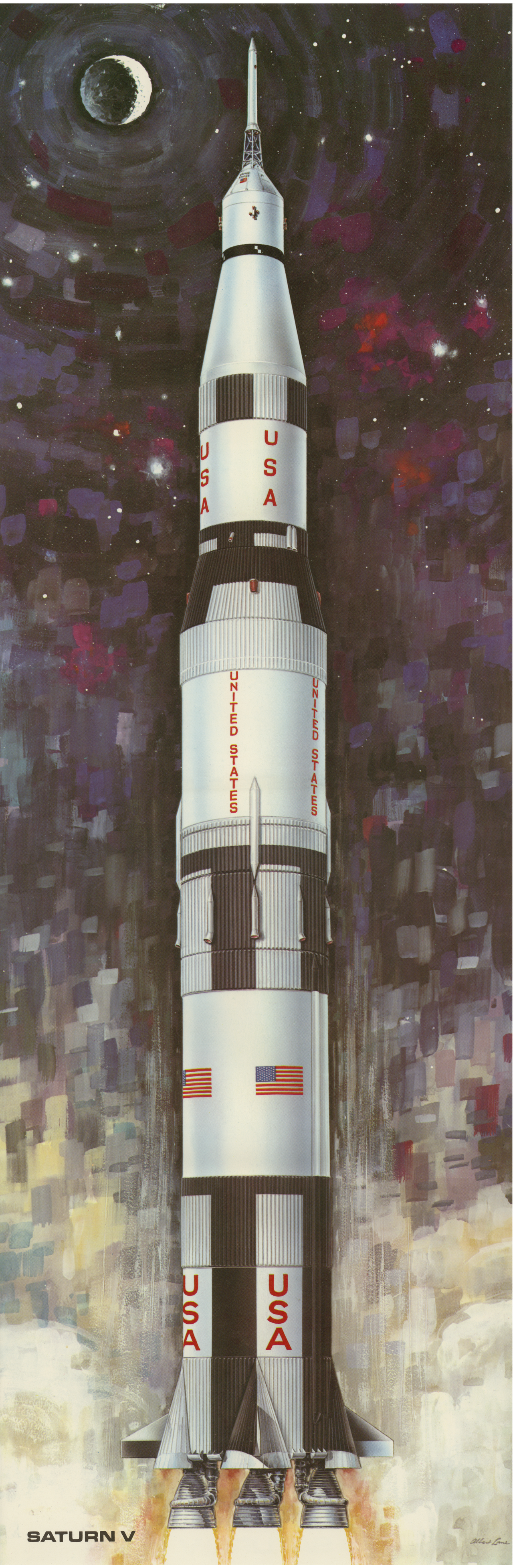

NASA FACTS

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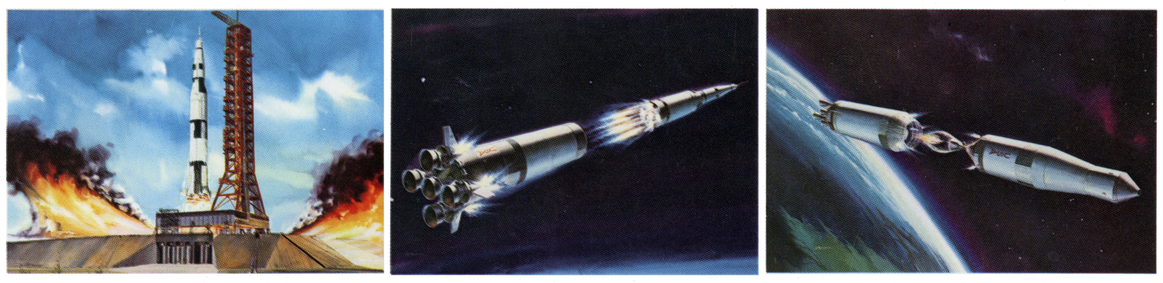
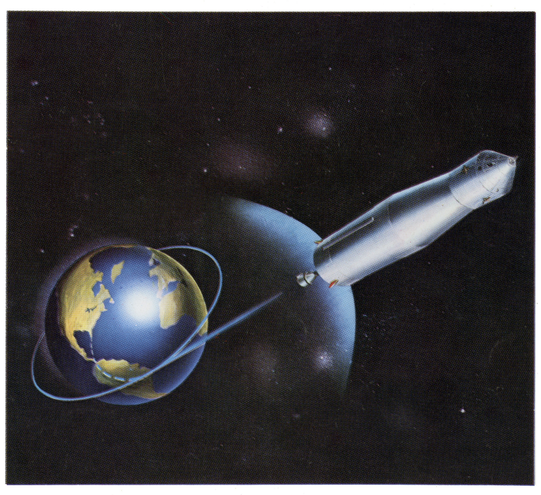
SATURN V

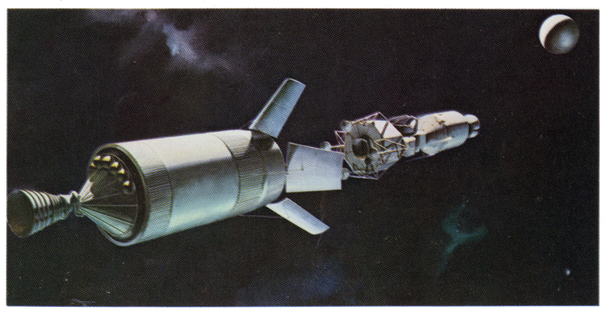
MANNED FLIGHT TO THE MOON

The Saturn V provides capability, in the United States space program, to put into earth orbit 280,000 pounds of payload or to send 95,000 pounds to the moon. Largest in the U.S. family of launch vehicles, the Saturn V has the mission of launching the Apollo spacecraft which will carry men to the moon before the end of this decade, and is available for other missions requiring comparable lifting ability.





In the three pictures above, lift-off, second stage ignition and third stage ignition are illustrated. The third stage takes itself and the spacecraft into earth orbit. At left is a description of the earth parking orbit and subsequent re-ignition of the third stage engine to send the vehicle out of earth orbit and into a lunar escape trajectory. Below, the spacecraft pulls away from the third stage and continues its lunar journey.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALABAMA

SATURN V-Mightiest Space Vehicle

AMERICA'S MOON ROCKET

The first stage of the Saturn V launch vehicle starts the Apollo spacecraft, with three astronauts aboard, on the journey to the moon. The second and third stages place the spacecraft in earth orbit and on the trajectory to the moon.

The Apollo Program is directed by NASA's office of Manned Space Flight. The Marshall Center is providing the Saturn launch vehicles. The Manned Spacecraft Center at Houston is providing the three separate modules of the spacecraft, selecting and training the astronauts, and will operate the Mission Control Center. The Kennedy Space Center in Florida will launch the astronauts on their epic flight.

When fully operational, the Saturn V will be able to launch into orbit more than a quarter of a million pounds. The total orbiting tonnage in the lunar mission will be about 280,000 pounds. This includes the weight of the third stage and instrument unit section. The fully fueled and loaded Apollo Spacecraft, in its lunar mission configuration, will weigh about 95,000 pounds.

The Saturn V, with its Apollo payload, is 365 feet tall. Physical and performance characteristics of the stages, in a mission such as the lunar trip, are as follows:

FIRST STAGE

The first stage burns over 15 tons of propellants per second during its two and one-half minutes of operation to take the vehicle to a height of about 36 miles and to a speed of about 6,000 miles-per-hour. The stage is 138 feet long and 33 feet in diameter.

SECOND STAGE

The second stage burns over one ton of propellants per second during about six and one-half minutes of operation to take the vehicle to an altitude of about 108 miles and a speed of near orbital velocity, which in this case is about 17,400 miles-per-hour. It is 33 feet in diameter and 81½ feet long.

THIRD STAGE

The third stage has two important operations during the Project Apollo lunar mission. After the second stage drops away, the third ignites and burns for about two minutes to place itself and the spacecraft into the desired earth orbit. At the proper time during this earth parking orbit, the third stage is re-ignited to speed the Apollo spacecraft to escape velocity of 24,900 miles per hour. In this second sequence, the stage burns for about six minutes. The stage is 58 feet long and 21.7 feet in diameter.

INSTRUMENT UNIT

The instrument unit, located atop the third stage, between the stage and the payload, contains guidance and control equipment for the launch vehicle. It is 3 feet long and 21.7 feet in diameter.

APOLLO SPACECRAFT

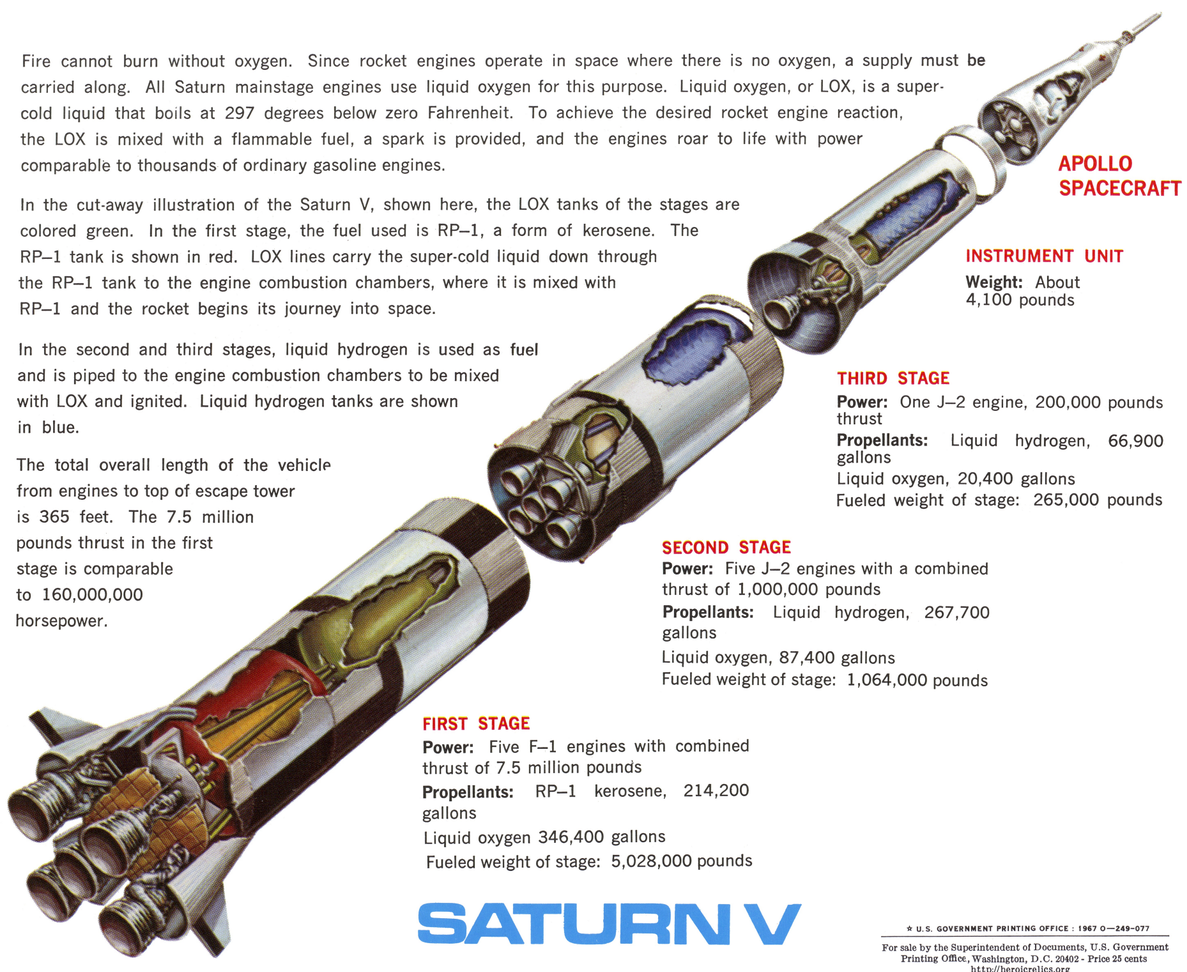
Command Module: 13 feet in diameter; weight, 11,000 pounds.
Service Module: 13 feet in diameter, 22 feet in height; weight, 52,000 pounds; 22,000-pound thrust engine.
Lunar Module: Two stages; total weight, 32,000 pounds. Descent engine's thrust can be varied from 1,050 to 10,500 pounds.

Fire cannot burn without oxygen. Since rocket engines operate in space where there is no oxygen, a supply must be carried along. All Saturn mainstage engines use liquid oxygen for this purpose. Liquid oxygen, or LOX, is a super-cold liquid that boils at 297 degrees below zero Fahrenheit. To achieve the desired rocket engine reaction, the LOX is mixed with a flammable fuel, a spark is provided, and the engines roar to life with power comparable to thousands of ordinary gasoline engines.

In the cut-away illustration of the Saturn V, shown here, the LOX tanks of the stages are colored green. In the first stage, the fuel used is RP–1, a form of kerosene. The RP–1 tank is shown in red. LOX lines carry the super-cold liquid down through the RP–1 tank to the engine combustion chambers, where it is mixed with RP–1 and the rocket begins its journey into space.

In the second and third stages, liquid hydrogen is used as fuel and is piped to the engine combustion chambers to be mixed with LOX and ignited. Liquid hydrogen tanks are shown in blue.

The total overall length of the vehicle from engines to top of escape tower is 365 feet. The 7.5 million pounds thrust in the first stage is comparable to 160,000,000 horsepower.



APOLLO SPACECRAFT

INSTRUMENT UNIT
Weight: About 4,100 pounds

THIRD STAGE
Power: One J–2 engine, 200,000 pounds thrust
Propellants: Liquid hydrogen, 66,900 gallons
Liquid oxygen, 20,400 gallons
Fueled weight of stage: 265,000 pounds

SECOND STAGE
Power: Five J–2 engines with a combined thrust of 1,000,000 pounds
Propellants: Liquid hydrogen, 267,700 gallons
Liquid oxygen, 87,400 gallons
Fueled weight of stage: 1,064,000 pounds

FIRST STAGE
Power: Five F–1 engines with combined thrust of 7.5 million pounds
Propellants: RP–1 kerosene, 214,200 gallons
Liquid oxygen 346,400 gallons
Fueled weight of stage: 5,028,000 pounds

SATURN V

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