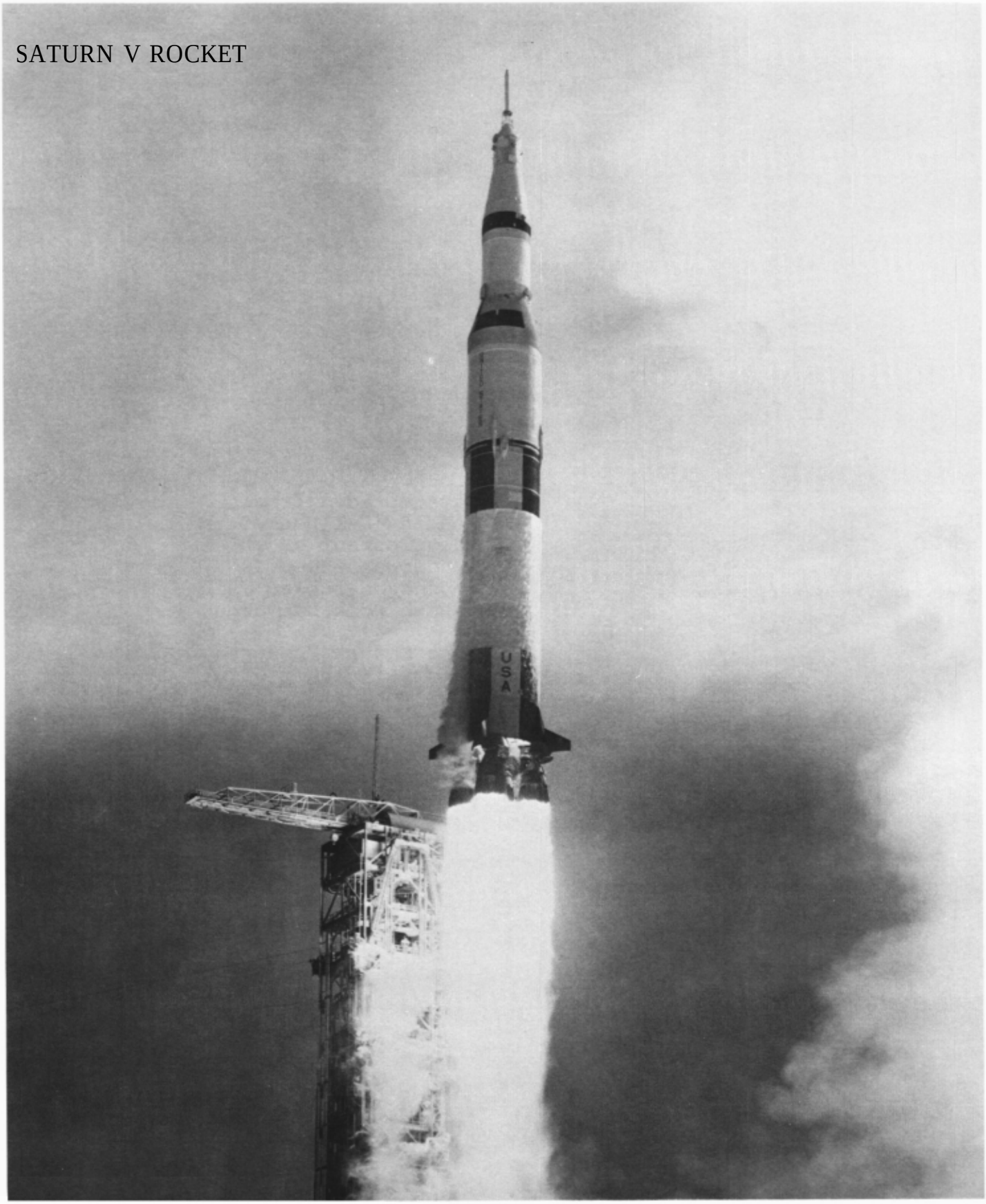
SATURN V ROCKET



NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK

The American Society of Mechanical Engineers

July 16, 1980

Plaque Wording:

The largest rocket built at the time of the historic first missions to the moon, the Saturn V carried aloft the 45-ton Apollo Spacecraft on earth orbital and lunar missions from 1967 to 1972. It also launched the 120-ton Skylab into earth orbit on May 14, 1973.

Design and fabrication of the Saturn V were carried out by a Government/Industry team which included the National Aeronautics and Space Administration, the Boeing Company, North American Rockwell, McDonnell Douglas Corporation, International Business Machines, and their sub-contractors. Many of the design features were outgrowths of the earlier development work accomplished by military service organizations and their contractors.

INTRODUCTION

On April 11, 1961, Major Yuri Gagarin made his historic voyage around the world. The Soviet Union and the United States became involved in a technical race for prominence in space. On May 25, 1961, President John F. Kennedy addressed Congress. His speech launched an historic challenge to technology:

"Now it is time to take longer strides... time for this nation to take a clearly leading role in space achievement which in many ways may hold the key to our future on earth...I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely...In a very real sense, it will not be one man going to the moon, it will be an entire nation."

When the decision to undertake a manned lunar landing effort was made, there was no rocket in the country even approaching the needed capability. On January 10, 1962, the National Aeronautics and Space Administration announced that it would develop a new rocket, much larger than any previously attempted. It would be based on the F-1 rocket engine, the development of which had been underway since 1958, and on the hydrogen-fueled J-2 engine, upon which work had begun in 1960.

The Saturn V program was the biggest rocket effort undertaken in this country. Its total cost was above $7 billion. It consisted of three stages and an instrument unit. When completed it was 363 feet tall, and weighed approximately 6.1 million pounds when fully loaded.

The first step towad the moon was the launch of a smaller-class Saturn vehicle in October 1961. By December 1961, concepts for the C-2, the C-3, and NOVA had evolved to the Saturn V. Developmental work through the 1960s culminated in the first launch of the Saturn V on November 9, 1967. On December 21, 1968, the first manned flight (and third launch) of the Saturn V took place with Borman, Lovell, and Anders in the Apollo 8. Two more flights carried men both around the earth and around the moon to

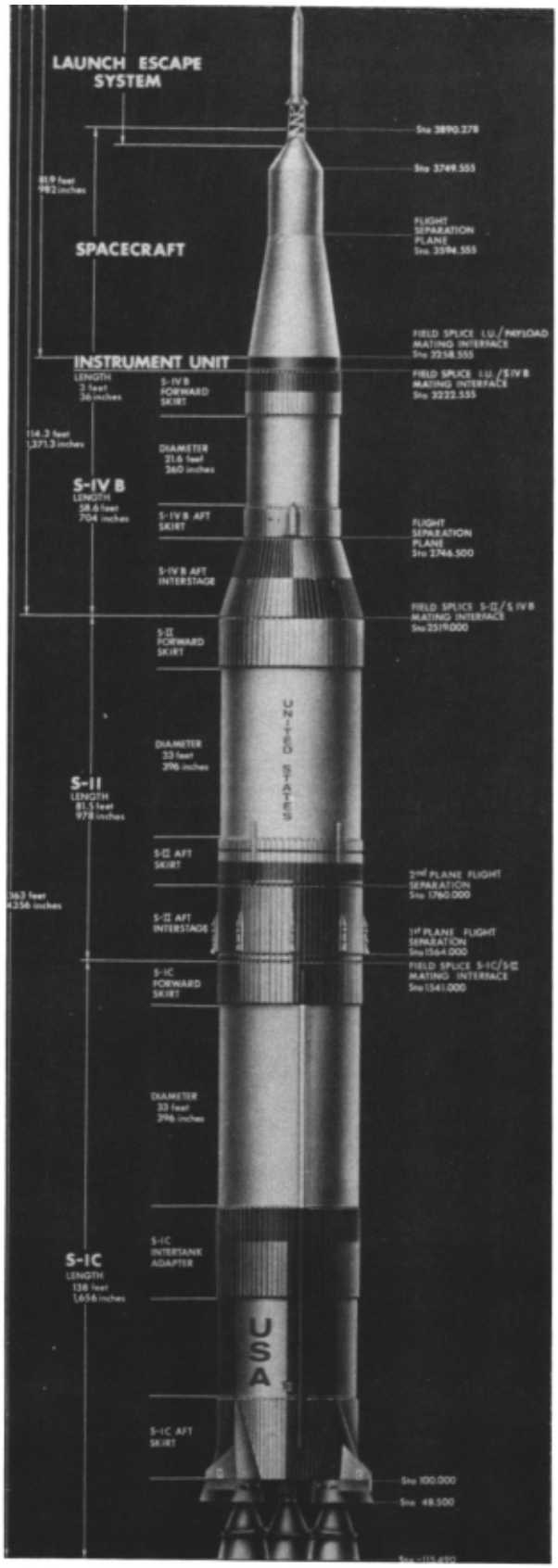
test the hardware for the attempt at a manned landing. In July of 1969, the sixth launch of the Saturn V carried the Apollo XI mission of Armstrong, Collins, and Aldrin to the first manned landing on the moon. Six additional launches succeeded in achieving five more lunar landings through December 1972. The last launch of the Saturn V orbited the unmanned Skylab Workshop.

13 vehicles were launched between November 19, 1967 and May 14, 1973. Today the last three Saturn V vehicles are on display. One is located at the Kennedy Space Center, Florida, another at the Marshall Space Flight Center, Alabama, and the third at the Johnson Space Center in Texas.

THE FIRST STAGE

The S-IC stage provides the first stage boost of the Saturn V launch vehicle to an altitude of about 200,000 feet (approximately 38 miles) and accelerates the vehicle velocity to 7,700 feet per second. It is 300,000 pounds, is 33 feet in diameter and is 138 feet long. It is powered by five F-1 engines generating 7.5 pounds thrust. The booster burns 203,000 gallons of refined kerosene, and 33,000 gallons of liquid oxygen in 2.5 minutes, its total burn time.

SATURN V ROCKET



THE SECOND STAGE

The S-II stage provides the second stage boost for the Saturn V. This stage is powered by five J-2 engines that generate a total thrust of a million pounds. It is 33 feet in diameter and weights 95,000 pounds empty and more than a million pounds when loaded. It burns 260,000 gallons of liquid hydrogen and 83,000 gallons of liquid oxygen during its 6 minute flight. At engine cut-off, the S-II stage separates and re-enters the atmosphere where it disintegrates.

THE THIRD STAGE

The S-IVB is the third booster stage. Its single J-2 engine is designed to boost the payload into a circular orbit on the first burn, then boost the payload to a proper position and velocity for lunar intercept with a second burn. This stage weighs approximately 34,000 pounds dry. The vehicle is 21 feet and 8 inches in diameter, and 58 feet and 6 inches long. The typical burn time is 2.75 minutes for the first burn and 5.2 minutes for the second.

THE INSTRUMENT UNIT

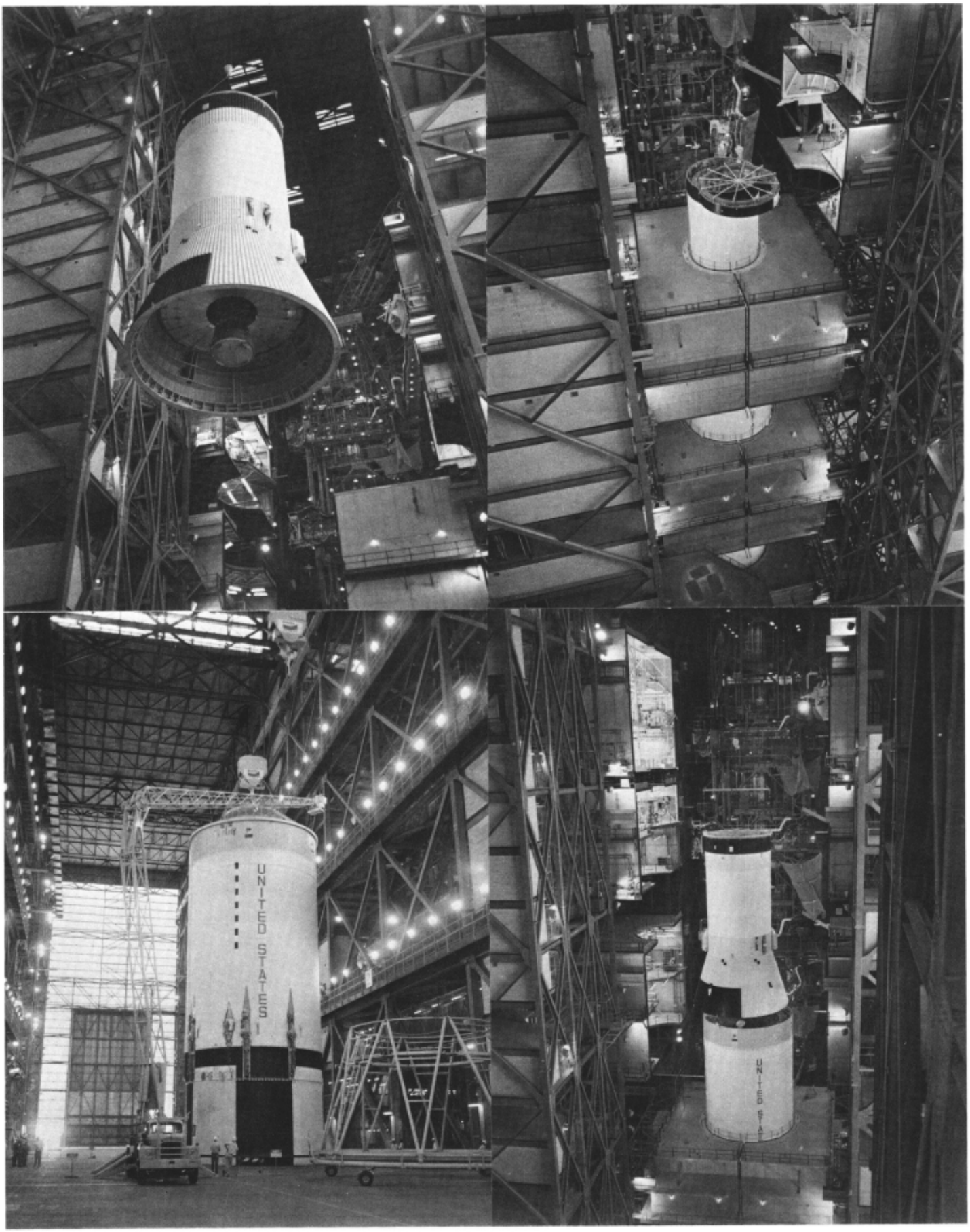
The vehicle instrument unit (IU) sits atop the third stage. This unit, which weighs approximately 4,500 pounds, contains the electronic gear that controls engine ignition and cutoff. The IU contains the guidance, navigation, and control equipment which will guide the vehicle through its earth orbit and subsequently into its mission trajectory. Diameter of the IU is 21 feet and 8 inches, and the height is 3 feet.

CONCLUSION

The Marshall Space Flight Center directed the work for NASA. The Boeing Company, Space Division of North American Aviation, Inc., and the Douglas Aircraft Company acted as prime contractors for the Saturn V first, second, and third stages, respectively. Engines were developed by the Rocketdyne Division of North American. Michoud Assembly Facility (MSFC) designed the instrument unit and awarded a production contract to International Business Machines Corporation.

Three new government operations were established: the launch complex in Florida operated by the NASA-Kennedy Space Center; two new elements of MSFC in New Orleans, Louisiana for the production of Boosters; and the Mississippi Test Facility Bay, St. Louis, Missouri for the captive firing of the stages.

The Saturn V was the first large vehicle in the U.S. space program to be conceived and developed for a specific purpose. This peaceful use of technology completely held the attention of the human race for several years. Lessons learned from this vehicle have launched the U.S. into its space age.



"Stacking" of the Saturn V launch vehicle for the Apollo 15. The S-II, lower left, being erected atop the S-IC booster stage. The S-IV third stage, upper left and lower right, being placed on the second stage. The instrument unit, upper right, being placed on to the third stage.

ACKNOWLEDGEMENTS

The Canaveral Section of The American Society of Mechanical Engineers gratefully acknowledges the efforts of all who cooperated on the landmark dedication of the Saturn V Rocket. A special thank you to the North Alabama Section and the South Texas Section for their participation.

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ASME would like to thank NASA for their help and assistance. The cooperation of the Kennedy Space Center, the Marhsall Space Flight Center, and the Johnson Space Center helped to make this ceremony possible.

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