Film Script
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FILM SCRIPT

for

SATURN C-1/C-1B QUARTERLY FILM REPORT

No. 13

(Covering July, August, September, 1962)

(Unclassified)

FILM	NARRATION
Scene No. 1: LS of three Saturn models (C-1 at left, C-1B in center, and C-5 at right).	A new concept of the Saturn space vehicle was announced on July 11th by NASA headquarters...
Scene No. 2: CU of C-1B model	...the C-1B configuration. C-1B will represent an interim step...
Scene No. 3: CU of C-1 model	...between the present Saturn C-1 configuration...
Scene No. 4: CU of C-5 model	...and the Advanced Saturn C-5 configuration.
Scene No. 5: CU of first stage only of C-1B model	The first stage of the C-1B will be essentially a C-1 Block II booster.

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Scene No. 6: CU of second stage (S-IVB, without Apollo) of C-1B model; CU, engine	The second stage will be a S-IVB now being designed as the third stage of the C-5. Flight reliability can thus be built up before its use on C-5.
Scene No. 7: CU, Apollo portion of C-1B model; cutaway drawing of Apollo	Saturn C-1B will place the three-man Apollo spacecraft into earth orbit, prior to its launching by C-5 on lunar flights.
Scene No. 8: CU of command module (drawing)	The Apollo command module, at the top, will carry the three astronauts plus guidance and control instruments.
Scene No. 9: CU of service module (drawing)	Directly below is the service module, containing the primary spacecraft propulsion elements.

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Scene No. 10:	
CU, lunar excursion module (drawing)	At bottom is the lunar excursion module.
Scene No. 11:	
Chart indicating orbit of C-1B/Apollo around earth; CU of vehicle	Qualification testing of the Saturn C-1B/Apollo in orbit around the earth will include...
Scene No. 12:	
Animation showing Apollo in earth orbit, separation of modules, turn-over of one, and re-joining for transfer	...the transfer of two astronauts from the command module to the lunar excursion module. This maneuver will ultimately be performed in lunar orbit in preparation for lunar landing.
Scene No. 13:	
Chart indicating R&D C-1B vehicles planned	Four C-1B research and development flights are tentatively planned, with operational flights to follow.

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Scene No. 14: Final checkout of SA-3 booster in Quality Div.	As C-1B planning proceeded, the third Saturn C-1 configuration flight vehicle, SA-3, underwent final checkout at the Marshall Center's Quality Assurance Division.
Scene No. 15: Loading booster aboard "Promise"; barge leaving dock; water scene en-route	And on September 9th, the vehicle left Huntsville aboard the Saturn barge "Promise," enroute for its launching pad at Cape Canaveral.
Scene No. 16: Barge arriving at Cape (stock)	It arrived on schedule 10 days later.
Scene No. 17: Saturn vehicle fully erected on pad (stock)	Now fully erected and being checked out again, SA-3 is set for launching next quarter.

FILM	NARRATION
Scene No. 18: Saturn booster static test firing (stock); use shots slightly different from those in Report no. 12; end the scene with the booster still firing, not cut off	Meanwhile, the booster for the fourth flight vehicle, SA-4, underwent two successful static test firings at Marshall's Test Division--one for 30 seconds and the other full duration, 120 seconds. Prior to that, the SA-T-4 test booster had been fired a total of four times.
Scene No. 19: Overall view of ST-124P stabilized platform	Wiring, assembly, and functional checkout of the ST-124P stabilized platform, which will fly as a passenger aboard SA-3 and SA-4, were accomplished at Marshall's Astrionics Division.

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Scene No. 20: CU of units within ST-124P	The ST-124P is a prototype of the ST-124, which will be operative on SA-7 and subsequent flights. ST-124 production models will be delivered by the contractor, Bendix Corporation, next quarter.
Scene No. 21: LS and CU, calibration testing equipment	Stabilized platform testing includes calibration of the attitude command signals and accelerometers, drift tests for calibrating telemetering signals, and short vibration tests.
Scene No. 22: ST-90 stabilized platform	While the ST-124P will be functional as a passenger on SA-3 and 4, the <u>command</u> unit for those flights will be the already-proven ST-90, which differs slightly in that it is an inner-gimballed system.

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Scene No. 23: SA-5 assembly; emplacement of tail section in assembly fixture	Assembly of the booster for the fifth Saturn C-1 flight vehicle, SA-5, (of greatly modified design) began at Marshall's Manufacturing Engineering Division on July 6th, with emplacement of the tail section into the horizontal assembly fixture. Block II changes, such as strengthening of the thrust ring and barrel assembly, were made generally to provide increased vehicle stability required for manned flight-to follow later.

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Scene No. 24:	
SA-5 assembly; mating 105-inch center tank to thrust frame barrel	Mating of the 105-inch-diameter center liquid oxygen tank to the thrust frame barrel constituted the next step in the SA-5 assembly operation. Elongation of the propellant tankage allows the Block II booster to carry some 100,000 pounds more propellant than Block I's, thus providing for longer burning time.
Scene No. 25:	
SA-5 assembly; positioning spider beam assembly, and mating to 105-inch tank	The spider beam assembly, which ties together the clustered tanks at the forward end, was next mated to the upper end of the 105-inch tank. The S-IV upper stage will be attached directly to the spider beam, eliminating need for the Block I upper stage adapter. The Block II spider beam carries 15 large spheres containing gaseous nitrogen, instead of the 48 smaller spheres used on Block I, to pressurize the booster's fuel tanks.

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Scene No. 26:	
SA-5 assembly; positioning and attaching of <u>first</u> 70-inch tank; dissolve to shot showing booster with four or five tanks attached, and another going on	The vehicle's eight 70-inch tanks were next individually attached, each tank having been previously equipped with its internal hardware. Part of the re-tooling required for Block II was modification of the assembly fixture to accommodate the longer tanks. Upon completion of Marshall's C-1 booster assembly program, new tooling will be used to supplement the tooling program at Marshall's Michoud Operations in New Orleans, future assembly site for S-I stages.
Scene No. 27:	
SA-5 assembly; positioning and attaching of <u>final</u> 70-inch tank	Once all tanks were in place, various interconnecting lines, cable trunks, and mechanical components were added.

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Scene No. 28: SA-5 assembly; attaching fourth engine	The booster's four inboard H-1 engines have been attached. The four outboard engines--plus the aerodynamic shrouding and heat shield--will go on early next quarter. The SA-5 booster is expected to be ready for static tests in December.
Scene No. 29: SA-5 assembly; overall view of booster (with 4 engines)	The booster's four stub fins--another new Block II feature--will be attached prior to shipment to Cape Canaveral.
Scene No. 30: Overall view of large fin	The large fins, now undergoing structural qualification tests at Marshall, will be temporarily attached for fitting purposes only. For flight, they will be shipped to the Cape and attached permanently there.

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Scene No. 31:	
Tie plates attached to side of fin	By linking tie plates to a system of hydraulic cylinders and rubber tension pads, proper stress level and stress distribution can be determined.
Scene No. 32:	
Man preparing for dynamic testing	Vibration tests determine resonant frequencies and lateral mode shapes of the fin.
Scene No. 33:	
CU of thermo-couples and instrumentation units	By means of laboratory techniques, aerodynamic heating is simulated and controlled by thermo-couples. Thermal stresses are monitored by high-temperature gages, and overall fin deflection is determined.

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Scene No. 34: Overall view of centrifuge	Centrifuge testing of various Saturn components is being carried out at Marshall's Quality Assurance Division. This six-foot-diameter centrifuge is capable of spinning loads through 75 G's.
Scene No. 35: LS, centrifuge rotating acceleration arm	The centrifuge consists basically of a balanced rotating acceleration arm upon which the object to be tested is mounted.
Scene No. 36: MS, console control panel	A simple console panel accurately governs the speed of the rotating arm. A precision counter and timer gives an exact count of revolutions in a pre-determined period.

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Scene No. 37: MS, optical equipment	To facilitate monitoring of tests, an optical system provides for viewing the component as it is rotated.
Scene No. 38: LS, centrifuge in operation	In this test, the centrifuge is being used to subject relays to acceleration in order to determine at what "G" level failure will occur.
Scene No. 39: Overall view of Electronics Fabrication and Assembly Section area	A new facility for electronic fabrication and assembly work was completed at Marshall this quarter, in time for use in connection with assembly of SA-5.

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Scene No. 40:	
MS, man working on module; dolly shot, moving along line of workers	Here, new manufacturing techniques are developed and evaluated to incorporate improved or novel materials, components, and manufacturing facilities. Work is performed on measuring and guidance control components, including telemetering interconnecting cable harnesses... and flight modules requiring modifications to incorporate system changes.
Scene No. 41:	
Overall view of Block II instrument unit	Fabrication of a prototype Block II instrument unit, to be used by Marshall's Astrionics Division for test purposes, was accomplished this quarter. Later, a similar unit will be built for initial flight aboard the SA-5 vehicle, located in the forward area of the S-IV stage. The center and four outboard tubes, which are pressurized and air-conditioned, house the guidance instrumentation packages.

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Scene No. 42:	
Interior of unit	The remaining structure houses cooling equipment and other support components not required to be cooled and pressurized.
Scene No. 43:	
SA-5 mock-up static hold-down ring (0-588); ring being moved into position and attached to booster mock-up	Marshall engineers continued to check out Block II design through use of full-scale component mock-ups, including a quarter-section of the static hold-down ring, which restrains the Saturn booster during captive firing. On the Block II booster, the hold-down ring attaches to captive firing brackets located at the eight points where the stage's fins will be attached later.

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Scene No. 44:	
Overall view of three umbilical swing arms	The three umbilical swing arms to be used for servicing the SA-5 vehicle were tested at Marshall this quarter.
Scene No. 45:	
LS of swing arm, showing quick disconnect and solenoid apparatus	By use of these arms, internal vehicle plumbing has been cut to a minimum, thus reducing the possibility of propellant loss through leakage.
Scene No. 46:	
CU of above	The swing arms will service the valves and solenoids controlling pneumatics, electrical services, and flow of liquid hydrogen and liquid oxygen. The arms will also service the instrument compartment used for telemetering and guidance of all stages.

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Scene No. 47:	
CU of air-conditioned arms; LS of vehicle lift-off simulator	All lines are air-conditioned and fully vented. Until lift-off, monitoring of the vehicle will be accomplished through the swing arms.
Scene No. 48:	
Overall view of tank before detonation; Tank exploding (slow motion)	Preliminary testing of Block II range safety destruct devices was conducted by Marshall's Propulsion and Vehicle Engineering Division, using scale-model tanks to represent boosters. Primacord housed in a conduit inside the tank detonates the RP-1 and LOX propellants. Blast pressure and temperature is measured, and records are kept for comparison tests. Information from these tests will be used in designing the S-I stage propellant dispersion system for manned flights.

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Scene No. 49: Instrumentation camera recovery package in test set-up; Paraballoon pops up (slow motion)	Paraballoon recovery packages for the instrumentation cameras to be initially flown aboard SA-5 were tested in a vacuum chamber at the Marshall Center. The units had previously undergone heat tests up to 1,350 degrees Fahrenheit--the temperature they will reach during re-entry into the earth's atmosphere.
Scene No. 50: Aluminum chaff flying about	Aluminum chaff will be released from the package as a recovery aid for search planes' and ships' radar.
Scene No. 51: Radio beacon pops up	Other redundant recovery aids include a beacon and flashing light.

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Scene No. 52: Quick scenes of men loading capsule onto plane, uncrating it, tossing it out; capsule flying out window (use scene where balloon is not opened). (OM-591)	Drop tests of the camera pods and recovery packages were also conducted, using a C-54 aircraft flying at 10,000 feet altitude over the Atlantic Ocean near Cape Canaveral. In operation on Saturn flights, the Paraballoon will open at about 14,000 feet. The unit actually slows higher in the atmosphere, due to its high drag configuration.
Scene No. 53: Footage taken by camera in capsule (sky, plane, water, land); (OM-591)	This is film shot by the instrumentation camera, to study stability and motion of the unit during descent.
Scene No. 54: Capsule descending, plunging into sea; capsule being hauled aboard ship; footage taken by camera aboard ship (man's shoes, hands, face) (OM-591)	Eight of these cameras will be ejected from cylinders mounted along the spider beam of the Saturn booster, and will be recovered to provide a photographic record of vehicle actions during booster flight and stage separation.

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Scene No. 55: Footage shot by camera aboard Atlas (use scene looking up as sustainer stage separates; then cut to scene looking down as booster engines fall away) (OM-590)	In another test, two Saturn instrumentation cameras were flown aboard an Atlas missile, through cooperation of the U. S. Air Force, and shot these "on-the-spot" pictures of the booster engines separating and falling away from the sustainer stage.
Scene No. 56: Ling-Temco-Vought input; man walking inside tank	Fabrication of the 70 and 105-inch fuel and liquid oxygen tanks for Block II Saturn boosters continued this quarter at the Ling-Temco-Vought plant near Dallas.
Scene No. 57: From L-T-V input, scenes on hydrostatic testing	Prior to shipment to Marshall for assembly, all tanks undergo checkout in this hydrostatic test tower. For testing, 80 psi pressure is induced for Lox tanks and 33 psi for fuel tanks.

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Scene No. 58: Rocketdyne input on Neosho plant; open with establishing shot of Neosho plant; interior, rows of engines; man inspecting engine; aerial test stand firing	The Rocketdyne plant at Neosho, Missouri, is now under way in production of H-1 engines for use on Saturn C-1 boosters. A NASA contract was awarded Rocketdyne this quarter for a two-year continuation of the H-1 research and development program--including preliminary flight rating tests of the up-rated H-1, which develops 188,000 pounds of thrust.
Scene No. 59: H-1 engine gimbal test Quality Div.	At Marshall, a hydraulic checkout is conducted on H-1 engines delivered to the Center. The engine is gimballed at one-half cycle per second full amplitude for approximately one hour, while the auxiliary system is operating, and voltage, amperage, and pressure and recorded.

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Scene No. 60:	
SA-D-5 booster assembly	Assembly of the new Block II dynamic test booster, SA-D-5, was underway at Marshall during this report period.
Scene No. 61:	
LS, dynamic test stand (stock)	SA-D-5 will be installed next quarter in Marshall's dynamic test stand, which will be modified slightly to accept the new configuration.
Scene No. 62:	
Modification of MSFC static test stand (surveyor standing in foreground; tilt up to show stand)	Modification work has begun on Marshall's static test stand, where a second test position will be built--allowing the stand to accommodate two Saturn C-1 boosters simultaneously.

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Scene No. 63: Scenes 1, 2, 3, P&W input OM-581	At Pratt and Whitney, West Palm Beach, Florida, test firings of the RL-10 engine--for use on Saturn's S-IV stage--continued during this report period. A number of the tests were made as part of the reduced oxidizer cool-down program. The first five RL-10 production engines have been delivered to Douglas Aircraft Company.
Scene No. 64: Choose from Scenes 4 through 11	Vibration tests were conducted to gather data on a particular thrust chamber problem--the cracking of tubes. As a result of these studies, stiffener bands have been designed to reduce tube stresses.

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Scene No. 65: Choose from Scenes 12 through 24	Tests were also performed to determine what factors may contribute to tube corrosion in engine chambers, and to attempt to find ways of limiting or controlling these factors.
Scene No. 66: Overall view of catch bucket test set-up; Exterior of vacuum chamber	A novel new solution--involving a common catch bucket--to the problem of disposing of the RL-10 engines' Lox chilldown flow is being tried in vacuum chamber tests at the Marshall Center.

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Scene No. 67: Transfer of liquid nitrogen from trucks to chamber; man at console, etc.; Ln_2 flowing into bucket	Liquid nitrogen is used in the test to simulate Lox, for safety reasons. After flowing through the engine, it falls through a large funnel into the catch bucket beneath--where it is gasified through control of pressure and temperature. The catch buckets would be mounted in a cluster atop the booster, and would fall away after the RL-10 engines ignite.
Scene No. 68: Overall view of RL-10 test facility at MSFC; personnel readying engine for "hot" firing test	The first "hot" firing of an RL-10 engine at the Marshall Center's Test Division was conducted in July--followed by a second firing in September. Test firings are held in a vacuum chamber which simulates atmospheric pressure of about 12 miles altitude.

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Scene No. 69:	
RL-10 "hot" firing	(SOUND EFFECTS: RL-10 ENGINE STATIC TEST; LOWER SOUND EFFECTS, AND VOICE OVER--) Purpose of the tests, which are continuing, is to familiarize Marshall personnel with liquid hydrogen as a propellant, and to prepare them for the larger LH_2 engines now under development by NASA.
Scene No. 70:	
Sacramento Test Stand No. 1 just before firing	At Douglas Aircraft Company's Sacramento Test Facility, a major milestone in the Saturn program was attained on August 17th when all six of the S-IV stage's cluster of RL-10 engines were successfully static-fired for the first time.

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Scene No. 71: Firing	The 10-second firing, at a peak thrust of 90,000 pounds, marked the beginning of S-IV development firings which will lead to static firings of the first actual flight vehicle. (SOUND EFFECTS: BRING IN SOUND OF FIRING, UNDER NARRATION, AT PROPER TIME.)
Scene No. 72: President Kennedy getting off plane; shaking hands with von Braun; von Braun briefing President in Saturn assembly area	President Kennedy--together with Vice-President Johnson and other key government officials--visited the Marshall Space Flight Center on September 11th for a two-hour tour of facilities and a briefing on the Saturn program by the Center's Director, Dr. von Braun.

FILM	NARRATION
Scene No. 73:	
LS of test area (showing static stand in background) as President enters viewing shed; CU of President; LS of firing (close with firing still going on)	Climaxing the tour, at Marshall's static test area, the President and his party witnessed a 30-second-duration static firing of a Saturn C-1 booster.

END