FILM SCRIPT

for

SATURN QUARTERLY FILM REPORT NO. 9

(Covering July, August, September, 1961)

FILM	NARRATION
Fade in	
UNCLASSIFIED title	MUSIC
Dissolve	
Open with ground-level shot of SA-1 vehicle standing on launching pad at Cape	
Superimpose first title: The GEORGE C. MARSHALL SPACE FLIGHT CENTER Presents...	
Then, superimpose second title: SATURN QUARTERLY FILM REPORT NO. 9 (Covering July, August, September, 1961)	

FILM	NARRATION
Continue same scene used with titles; then, cut to two or three different views, ending with aerial	As this report period ended, on September 30th, the first Saturn space vehicle, SA-1, had been erected on its launching pad at Cape Canaveral, Florida, and was undergoing final preparation for its history-making launch. The three eventful months of work and planning leading up to that climactic moment will be covered in this film report.
Overall view of SA-1 booster in Quality Div. (with upper stages alongside, too)	Final checkout of the SA-1 booster, together with its dummy second stage and payload, had been underway in the Quality Division at Marshall Space Flight Center since June 12th.
ST-90 on turn-tilt stand (from Quality Div. film)	Among the items checked was the vehicle's stabilized platform, known as ST-90, which was mechanically tilted on this platform to simulate vehicle attitude changes. In this manner, attitude errors could be introduced and correction by the control system observed.

FILM	NARRATION
Interior of ground telemetry station (from Quality Div. film)	Also verified was the telemeter ground station--the instrumentation system used to monitor information on the operation of all systems during flight. The station is equipped to receive 900 channels of information.
Control room activity during simulated flight test (from Quality Div. film--without the lip sync)	Culminating the various systems tests was the simulated flight test--in which all functions were performed in launch and flight sequence. With the successful accomplishment of this test, the SA-1 booster was accepted as flight-ready and released for shipment to the launch site.
Preparation for shipping SA-1	On August 1st, the SA-1 booster, dummy S-IV stage, and dummy payload were "touched up" for shipping. The S-V dummy stage had already been shipped last April on the trial run of the Saturn barge "Palaemon."

FILM	NARRATION
SA-1 booster on transporter, moving from FA&E; along road	On August 5th, the SA-1 booster and payload were transported to the Saturn barge dock on the Tennessee River. The S-IV had been moved the previous day.
Loading SA-1 booster aboard "Palaemon"; leaving dock	Here the units were loaded aboard the "Palaemon" to begin the first leg of their 2,200-mile trip to the Cape.
Unloading SA-1 units off "Palaemon"	Several hours later, the "Palaemon's" cargo was unloaded just above the damaged Wheeler Dam, where collapse of a lock last June had temporarily interrupted river traffic.
Movement of SA-1 units on road around dam	The units were then hauled about one mile overland, around the dam, on a road which had been specially built by the Tennessee Valley Authority...,
Loading SA-1 units onto "Compromise"	...and loaded onto a second barge, the modified surplus Navy vessel named "Compromise."

FILM	NARRATION
Loading booster simulator onto "Palaemon"; loading onto "Compromise"	The day prior to movement of the flight booster and inert payload, the water-ballasted Saturn booster simulator plus the flight S-IV dummy stage had been taken over the Huntsville-Wheeler leg of the trip, to verify loading and unloading procedures.
"Compromise" leaving Wheeler Dam	The entire transfer operation of all units from Marshall around the dam to the "Compromise" went smoothly.
"Compromise" travel scenes (might throw in water scenes from "Palaemon")	The "Compromise's" circuitous voyage took it through waters of the Tennessee, Ohio, and Mississippi Rivers, the Gulf of Mexico, and the Atlantic Seaboard.
"Compromise" arriving at Cape	On August 15th, after a 10-day journey averaging about nine miles an hour, the Saturn-carrying craft arrived safely at its destination, Cape Canaveral.

FILM	NARRATION
Unloading dummy payload	The dummy payload was the first unit to be unloaded from the "Compromise."
Unloading booster; towing to pad	Then the huge Saturn booster was taken off..., and towed directly to the launching pad about two miles away.
Unloading dummy S-IV; towing to Hangar D	The dummy S-IV stage followed. Both the S-IV and the payload were hauled to Launch Operations Directorate's Hangar D for temporary storage.
Checkout of support and holddown arms on launching pedestal	After checkout and adjustment of the launching pedestal's support and holddown arms...,
Preparation for erecting booster; men studying manual	...LOD personnel prepared for the painstaking task of erecting the gigantic booster. Following the steps outlined in the erection procedure manual...,

FILM	NARRATION
Erecting SA-1 booster	...the Saturn booster--some 80 feet in length and 21 $^{1}/_{2}$ feet in diameter--was raised for positioning in the 310-foot-tall movable service structure.
Setting booster onto pedestal	Then the booster was slowly lowered onto the pedestal from which it would be fired....,
Service structure's work platforms embracing booster	...and the horizontally-retracting work platforms of the service structure were adjusted to embrace the vehicle.
Installation of long cable mast	Installation of the long cable mast was next accomplished. The mast provides electrical, pneumatic, and cooling connections for booster checkout, monitoring, countdown, and rapid disconnect for the booster prior to liftoff. The long cable mast will be used for SA-1 through SA-4 in lieu of the umbilical tower.

FILM	NARRATION
Lifting and mating dummy S-IV	After the booster was in place, the inert S-IV or second stage--measuring 40 feet long and 18 feet in diameter--was raised into position and mated to the first stage.
Lifting and mating dummy S-V	Then the inert S-V or third stage -- 20 feet long and 10 feet in diameter--was hoisted aloft and mated to the second stage.
Lifting and mating dummy payload	Finally, the inert payload for the first Saturn flight--a Jupiter nose cone and aft section--was lifted and mated to the third stage...,
Full SA-1 vehicle in service structure	... and the fully assembled Saturn--162 feet high--stood enclosed by the work platforms of the service structure, ready to undergo vertical checkout and flight preparations.

FILM	NARRATION
Service structure being rolled away	Later, the service structure was rolled away....,
Saturn standing alone on launching pad	...and the Saturn stood alone on the launching pad for the first time, while various radio frequency tests were conducted.
Simulated flight test using IBM 7090 computor	Long before the Saturn was erected, though, back at the Marshall Center's Computation Division, the vehicle was being mathematically "flown" thousands of times inside this powerful IBM 7090 digital computor. Such simulated flights save NASA months of man-effort and many thousands of dollars.
LS, man at <u>analog</u> computor	Using <u>analog</u> computors, Computation Division had also solved numerous Saturn problems....,

FILM	NARRATION
Man studies drawing of Saturn tanks and equation, checks diagram	...for example, equations which describe the draining of the liquid oxygen tanks when the booster is fired.
Man turns to computor, plugs in wires, turns dial, pushes button	Parameters of the system, such as orifice sizes and tank diameters, may be varied by adjustment of potentiometer dials.
Recorder draws graph; close with overall of man and computor	Variables of the system, such as liquid levels or draining rates, are automatically graphed on the X-Y plotter in order to provide engineers with necessary design information.
Schlieren wind tunnel test	Continuing Saturn wind tunnel tests--such as this one using the Schlieren optical technique--were run this quarter by Marshall's Aeroballistics Division. The test produces a picture of the air flow present around a Saturn model, thereby revealing any undesirable aerodynamic effects caused by body shapes or test conditions.

FILM	NARRATION
Saturn booster model test in Tullahoma wind tunnel	A 1/20th scale Saturn booster model was also tested in a 16-foot-diameter wind tunnel at Tullahoma, Tennessee, to measure the heat around the booster's base while undergoing various flight conditions.
	(INSERT SOUND EFFECTS OF EXPLOSIONS AT APPROPRIATE TIMES.)
Saturn demolition tests; open with a rather long look at the tank before it blows up; use as many successive tests as necessary to fill time	Using these small tanks, a series of demolition tests--photographed at high speed--were run by Structures and Mechanics Division to determine the most effective means of Range Safety destruction of a Saturn vehicle in the event it should veer dangerously off course. Employing 100 grain primacord and flexible shaped charges as the explosive devices, tests indicated that the latter will initiate an explosion of less violent intensity, resulting in a minimum amount of blast destruction--thus realizing a higher degree of safety for both personnel and equipment without sacrifice of reliability.

FILM	NARRATION
SA-D in dynamic test stand (before wind screens added)	Dynamic vibration testing of the test booster called SA-D in the new dynamic test stand was delayed from June 23rd to July 3rd...
Dynamic test stand with wind screens	...in order to allow time for installation of wind screens around the stand. The screens enable testing to be carried out in winds up to 15 miles per hour.
Dynamic vibration testing of SA-D	The SA-D vehicle, a simulation of the SA-1 configuration, was suspended on steel cables and excited through a frequency range sufficient to determine the significant bending, torsional, and longitudinal mode shapes and frequencies, including the damping coefficients associated with each mode.

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Continue action (close with overall view of dynamic test stand)	Flight time conditions tested included: lift-off; 35 seconds; 63 seconds, at which maximum aerodynamic pressure is reached; and 119 seconds, or cut-off. Tests were conducted by S&M Division together with Guidance and Control Division.
Flight simulation and actuator load tests	The huge SA-D booster is suspended in the dynamic test stand in a manner similar to this tiny functional model, which is used by G&C Division to conduct preliminary investigations. Such information as effect of suspension on bending modes, spring resonance effects, and pendulum motions can be studied here, since the model can be pre-calculated.

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Air bearing research	Research on a new method of measuring torques in air bearings--used in Saturn's guidance and control system--was also conducted by G&C. The flow of air within an air bearing gyroscope exerts a small undesirable force which tends to rotate the floating member of the bearing. Since the gyro cannot differentiate between this force and an actual change in vehicle attitude, it became necessary to devise this apparatus to accurately measure the force--in units of dyne centimeters of torque--for analysis and elimination of its causes.

FILM	NARRATION
Static test firing of a Saturn booster (stock)	(SOUND EFFECTS: STATIC FIRING) Static testing continued this quarter, with five firings of the SA-T2 booster, which simulates the second flight booster, SA-2. The final SA-T2 firing, on August 25th, was a successful engine-out capability test, in which one engine was intentionally cut off at 94 seconds while the others ran to 114 seconds duration.
Booster final assembly (stock)	Assembly of the SA-2 booster, begun on December 27th of last year, was completed on August 1st...,
Checkout of SA-2 vehicle in Quality (if nothing was shot on SA-2, just use SA-1 scene)	...and checkout of the vehicle by Quality Division started the same day.

FILM	NARRATION
Beginning assembly of a Saturn booster (stock)	Assembly of the third Saturn flight booster, SA-3, got underway July 31st, and the last tank was installed near the close of this report period.
Welding 105-inch tank (stock)	Fabrication was initiated on the fourth flight booster, SA-4, on July 31st.
Micro-welding	The relatively new process of micro-welding, in which the operator must use a magnifying glass or microscope, illustrates the wide range of activity--from the mammoth to the minute--being accomplished in Marshall's FA&E Division. Wires or sheets as small as one-thousandth of an inch in diameter or thickness may be joined by this process. While booster and dummy S-IV fabrication continued at Marshall...,

FILM	NARRATION
Use series of scenes from Douglas Quarterly Film Report No. 4 (you may have to shorten them somewhat): Scene no. 10--Sheridan press; Scene no. 40--welding fixture; Scene no. 43--welding; Scene no. 60--cylindrical tank welding	...manufacture of the flight S-IV stage was underway by the contractor, Douglas Aircraft Company in California.
Scene no. 26, 27, 28, Douglas Report No. 4 (explosive forming)	The new technique of "explosive" forming, shown being tested in this slow motion sequence, is expected to accelerate S-IV tank segment fabrication.
Scene no. 75--G.S.E. area; Scene no. 76--Test set fabrication Scene no. 77--control panel; Scene no. 78--propellant system panel	Besides vehicle manufacturing, work also moved ahead on ground support equipment, with several G.S.E. test sets and control panels virtually completed.

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Scene no. 92--liquid hydrogen tank; Scene no. 93--liquid oxygen tanks	Construction of Douglas' 90,000-gallon liquid hydrogen storage tank, and liquid oxygen storage tanks, has recently been concluded.
Excavation for new static test stand	A concentrated build-up of facilities at the Marshall Space Flight Center was also in progress this quarter, including excavation work on the new $10.8 million static test facility...,
FA&E construction	...additions to the Fabrication and Assembly Engineering Division...,
S&M construction	...a five-story addition to Structures and Mechanics Division...
New pressure test cell at Quality Div.	...and a large new pressure test cell for Quality Division.

FILM	NARRATION
Aerial view of site for VLF 37	And at Cape Canaveral, site clearing and earth fill was being done for construction of a new Saturn complex, Vertical Launch Facility 37, designed to handle launching of Saturn vehicles through the more advanced stages.
Aerial view of SA-1 vehicle on pad; MS, men working; close with same ground-level view of SA-1 vehicle used at beginning of film	Meanwhile, approximately 5,000 feet to the south at Cape Canaveral, the first Saturn flight vehicle stood poised on its launching pad at Complex 34, and preparations were well underway for its scheduled date with history.