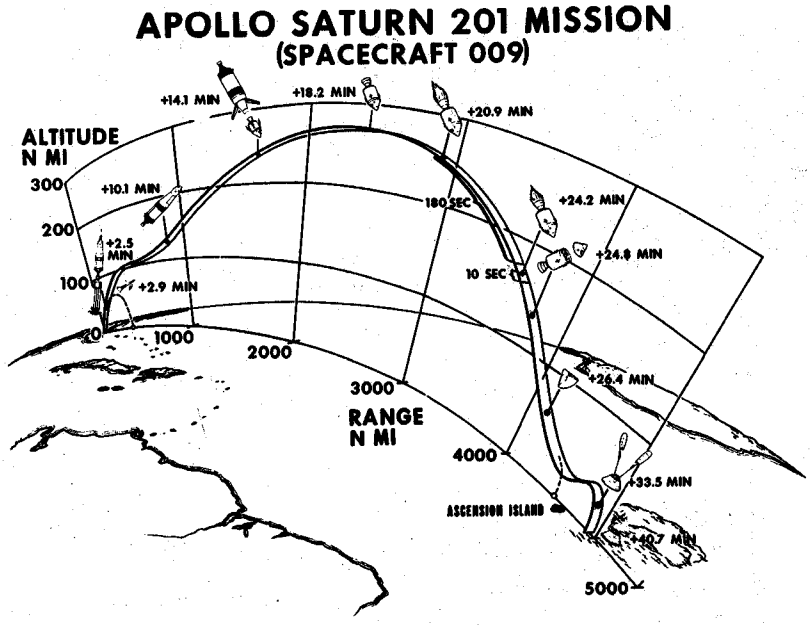
The big payoff came in these flights. Spacecraft 009 was launched in February (slide 37). It was a fairly complex mission for the first unmanned mission in the program. We went through boost and separation at about 10 minutes; we separated the command and service modules from the spacecraft LM adapter here in about 14 minutes. We use many of the systems of the spacecraft for that separation. We then went through a realignment of the spacecraft for a first burn, which lasted 180 seconds, on our service propulsion system. We stopped it, had a restart for 10 seconds, did a turnaround and separation, reentry, parachutes out, and landing. The major problem that we had in it was this helium ingestion problem in the service propulsion system, and I think that's interesting in itself. There was an ingestion of helium into the engine which changed the mixture ratio and changed the thrust of the engine. It didn't give us any safety problems on the flight; however, it did make the thrust of the engine uneven, so we changed the standpipe to eliminate that helium ingestion for the flight of spacecraft 011 and subsequent vehicles.

Mr. TEAGUE. Dale, did these objects come out of 009?

Mr. MYERS. Yes, those are pieces of 009's heat shield. As you can see, they aren't very heavily burned. The reentry velocities on 009 and 011 were up in the 29,000 feet-per-second range. We drive back in with the service module to increase the velocity higher than the normal reentry of an earth-orbiting satellite, but we don't get up to the lunar reentry velocities of 36,000 feet per second, so the heat shield doesn't really get burned too badly from these flights with the Saturn I–B.



SLIDE 37. APOLLO SATURN 201 MISSION—SPACECRAFT 009