

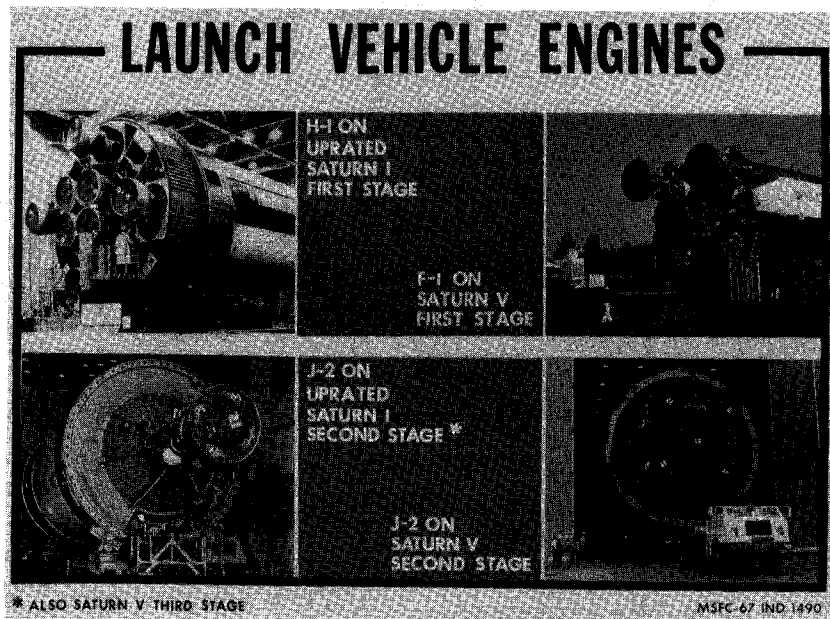


FIGURE 39

ure. We have never lost a mission nor equipment because of engine failure.

All H-1 engines for the current Apollo uprated Saturn I buy have been delivered. You can imagine that engines are long-lead-time items. All of our engines are manufactured by Rocketdyne, a division of North American, and must be manufactured, individually static tested, and then shipped to the stage manufacturer to be available at the right time for the stage fabrication sequence. We feel quite confident that we can retain the high standard of quality and performance on the J-2 and F-1 engines that we have enjoyed on the H-1.

We have a wealth of experience in engine test time; over 13,000 seconds have been logged in actual flight time on the Saturn I and uprated Saturn I programs (fig. 40). There are 155 J-2 engines on order to support the entire Apollo Saturn program, and 100 of these have been delivered. These 100 engines represent, for example, the last J-2 engine to equip Saturn V vehicles through AS-507. We are already half way through delivering the J-2 engines for the entire Saturn V program. We have 273,903 seconds of test time on the J-2 engine, and some good experience, in excess of 1,000 seconds, in actual flight. One hundred and six F-1 engines are on order to support the Apollo Saturn program. Again, half of these have already been delivered to Boeing at Michoud. We are approaching 200,000 seconds of developmental test time on the engine and, of course, we cannot acquire any flight time until the first Saturn V is launched.

I mentioned earlier some of the disappointing things that can happen when a program of this magnitude is spread out over the United