How We Lost The Ability To Travel To The Moon

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The capsule that safely delivered Apollo 14 astronauts Edgar Mitchell, Alan Shepard and Stuart Roosa... [+]

How did we lose the technology to go to the Moon? originally appeared on Quora - the knowledge sharing network where compelling questions are answered by people with unique insights.

Answer by Robert Frost, Instructor and Flight Controller at NASA , on Quora.

Why does it take three years to develop a new car, when it shares 90% of its "DNA" with the previous model? Why does it take six years to develop a new airplane when it shares 90% of its "DNA" with the previous model?

The answer is that they are complex devices. A launch vehicle and spacecraft destined to go to the moon is much more complex and operates at the edge of the envelope where there is little tolerance for imprecision and error.

When operating on the edge of the envelope, thousands and thousands of hours go into testing and tweaking. The development and operations teams acquire expertise that no one else on the planet has. The vehicle cannot be built or operated without that expertise.

Operating a space mission involves reams of paper in the forms of flight rules and operational procedures. Those rules and procedures are drafted over thousands of hours of test and simulations. A change in the vehicle can send ripples of changes through those documents.

The Saturn V rocket had over three million parts. The command and service modules and lunar module were composed of millions of additional parts. An individual person cannot contemplate the scale of detail needed to assemble and operate those vehicles.

So, when the Apollo program ended, the factories that assembled those vehicles were retasked or shut down. The jigs were disassembled. The molds were destroyed. The technicians, engineers, scientists, and flight controllers moved onto other jobs. Over time, some of the materials used became obsolete.

If we, today, said - "Let us build another Saturn V rocket and Apollo CSM/LEM and go to the moon!" it would not be a simple task of pulling out the blueprints and bending and cutting metal.

We don't have the factories or tools. We don't have the materials. We don't have the expertise to understand how the real vehicle differed from the

drawings. We don't have the expertise to operate the vehicle.

We would have to substitute modern materials. That changes the vehicle. It changes the mass, it changes the stresses and strains, it changes the interactions. It changes the possible malfunctions. It changes the capabilities of the vehicle.

We would have to spend a few years re-developing the expertise. We would have to conduct new tests and simulations. We would have to draft new flight rules and procedures. We would have to certify new flight controllers and crew.

We would essentially be building a new vehicle.

And that's what we are doing. As similar as Orion looks to an Apollo Command Module, as much as we think we understand heat shields and parachute deploy systems - we have to understand these specific heat shields and parachute deploy systems. NASA has people doing these tests, every day.

Ars Technica did an excellent story on the work NASA needed to do to reconstruct the F-1 engine from the Saturn V for use on the SLS. Take a look at it, here: How NASA brought the monstrous F-1 “moon rocket” engine back to life

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