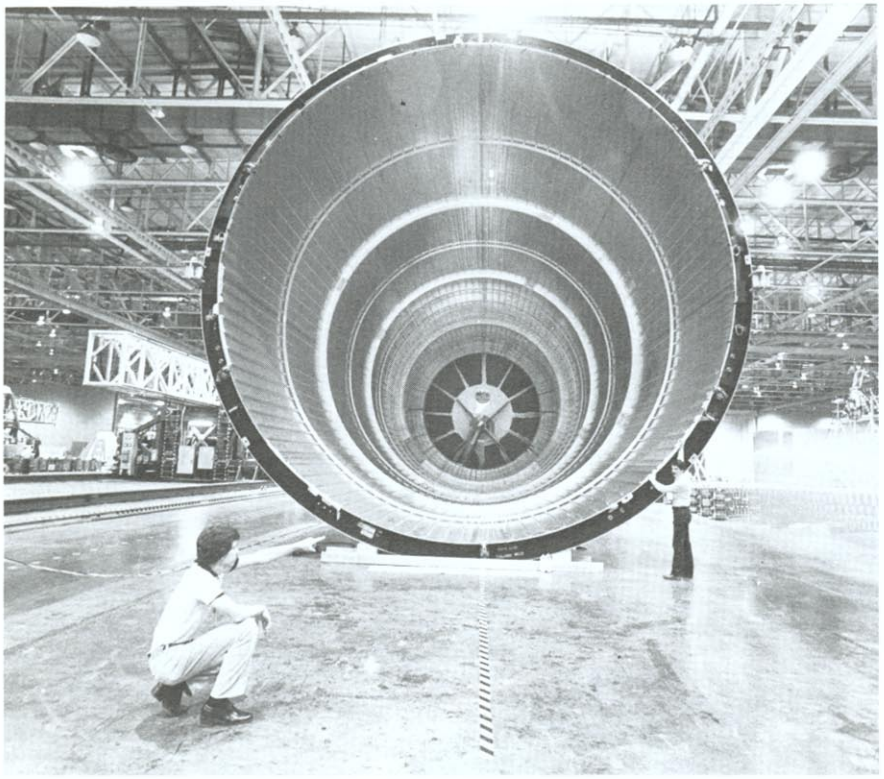


TOP . . . The immensity of the fuel tank can be seen in this view of the interior, with Louis Cazenavette almost dwarfed in comparison. Fellow design engineer Hal Simoneaux is in the foreground.

ABOVE . . . A-B products in one area of the Martin Marietta plant include (L to R) a PLC-2/20 with 1771 I/O racks, a 1770 industrial terminal, and a PTI Bul. 1340.

RIGHT . . . The external fuel tank of the Space Shuttle is manufactured at the Martin Marietta Aerospace Michoud operation in New Orleans. Like a proud parent records the growth of a child, markers on the scaffolding indicate the height of "E.T.," as the fuel tank has been dubbed by Martin Marietta workers. Throughout construction, A-B equipment is used in manufacturing and testing the tank.

HELPING THE SHUTTLE GET OFF THE GROUND

IT is countdown at NASA's Kennedy Space Flight Center. The Space Shuttle—America's newest and most versatile manned spacecraft — sits on the launching pad like a huge arrow, pointed to the heart of outer space.

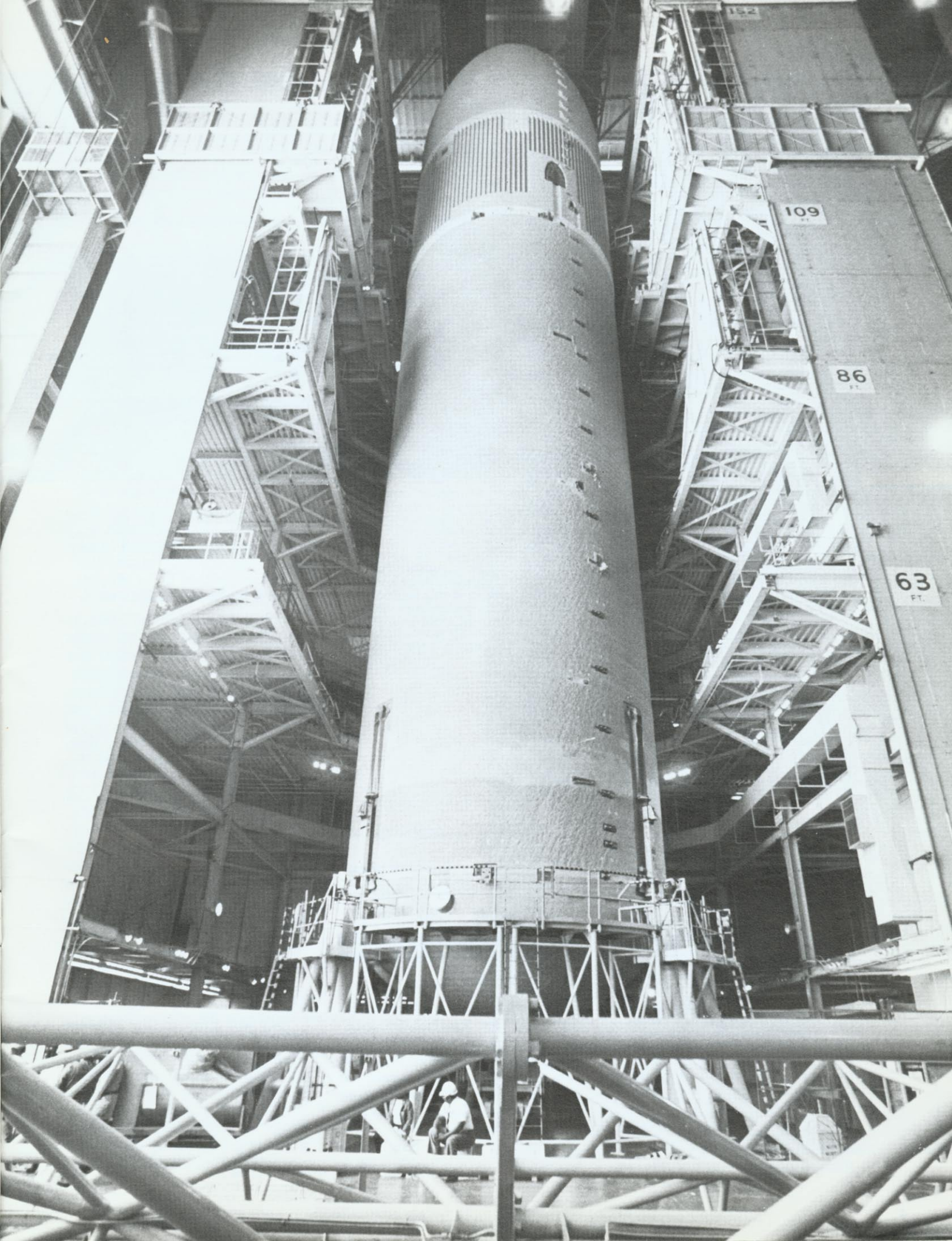
It is a moment of intense concentration for the hundreds of space engineers who have helped construct the spacecraft. And for Allen-Bradley engineers, it is a moment filled with no small amount of pride. For A-B's expertise in the areas of programmable controls, AC and DC drives and motor control centers contributed to the Space Shuttle's success story.

A visit to the Martin Marietta Aerospace Michoud operation in New Orleans offers an exciting glimpse of how A-B technology works to help the Space Shuttle literally get off the ground. It is here that Martin Marietta makes the gigantic external fuel tank portion of the shuttle.

William LeBlanc, supervisor of the Control Systems in the Design Test Operations Engineering Department at Michoud, explained that A-B equipment is used extensively in manufacturing and testing the 153 foot external tank — affectionately called "E.T."

Backbone of the Shuttle

The tank, LeBlanc said, serves a dual purpose: it provides the structural backbone of the Space Shuttle during launch operations and contains and delivers liquid hydrogen and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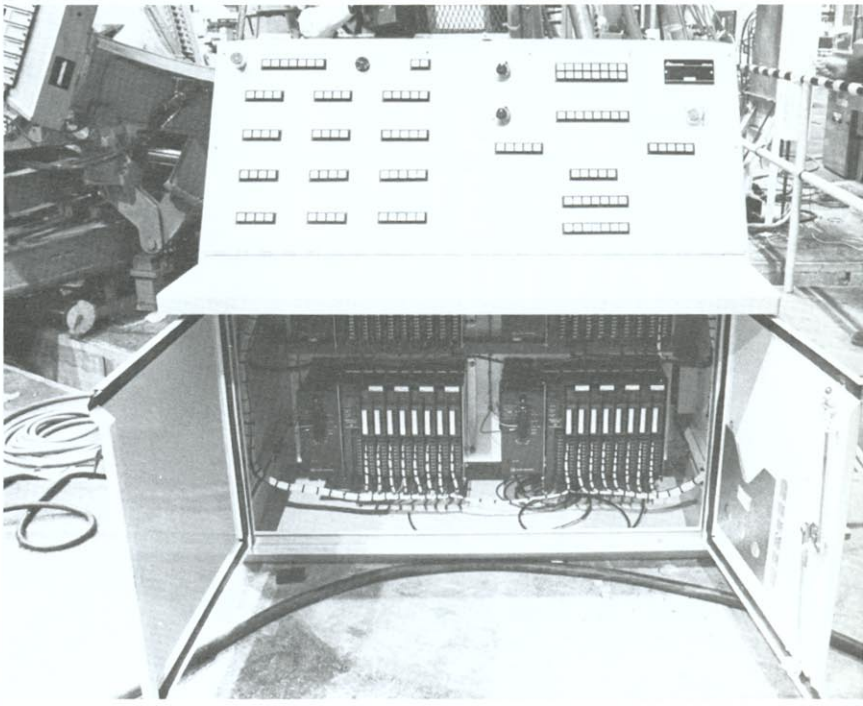

The Allen-Bradley PLC-2/20 at the right was recently installed at Martin Marietta to replace the relay system at the left. Newer technology makes the equipment more efficient and easier to repair.

Design engineer Louis Cazenavette checks out a bank of A-B equipment. From the left are a Bul. 1373 DC drive and a Bul. 1790 unit which contains a 1774 PLC.

liquid oxygen propellants for the Orbiter's three main engines.

"It is the one portion of the Space Shuttle that is not re-used," LeBlanc said with a smile. "That means we get to keep making them."

Building a fuel tank of such enormous proportions—particularly as it has to withstand inordinate amounts of stress and heat—takes every bit of technology available today. A-B controls, drives and systems are used in virtually every phase of the tank's construction, from welding the aluminum foundation together to administering the application of the thermal protection system.

"About a third of our work on the tank," LeBlanc said, "is applying thermal protection around the outside of the tank to prevent the fuel from boiling off.

"We first apply an epoxy primer, then a super light ablator (SLA, a substance that looks a little like dark cork), and then, the final step, sprayed on foam insulation (SOFI)."

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While an explanation of the insulation process may sound simple, the procedure is actually quite complicated, primarily because the covering must fulfill a triple purpose:

It keeps the fuel tank cool, inhibits ice build-up on the tank's surface, and provides some protection from heat generated by atmospheric friction in the passage toward orbital space.

A-B products play big part

With all those jobs to do, naturally the thermal coating must be applied with absolute precision. That's one place A-B equipment comes into play.

In order to explain the A-B input, design engineers Hal Simoneaux and Louis Cazenavette led a tour of the Michoud plant—some 43 acres under one roof that was originally the site of a sugar cane plantation.

"It all begins here, in what we call the 'Grey Box,'" Simoneaux said. "It is here where the various pieces of aluminum that make up the shell of the tank are welded together and eventually assembled. A-B controls move the portable carriages and welding heads, and any positioning equipment."

He pointed out other construction areas—called cells—where the thermal protection coating is applied in several stages.

"PCs and drives are the backbone of these systems," Simoneaux said. "The PLCs monitor the environmental condition of the cell—and that's quite critical—and verify 'go' conditions for the spraying operation. Proper control is essential, because if we are one parameter out of tolerance, the operation is aborted and has

to be reperformed. And that costs a substantial amount of money."

As he walked through the plant, he pointed to first one A-B control and then another. He explained that without A-B technology in the area of PCs and drives, assembling "E.T." would be far more difficult.

Good distributor back-up

"We chose A-B controls partly because they are so dependable," Simoneaux said. "We have excellent back-up with the distributor in this area and by using a single brand of equipment — which keeps us from having to learn about several other manufacturers'—we can eliminate a lot of problems."

He stopped inside one of the huge cells and ticked off the adjacent A-B equipment:

"Behind us is the 1774 PLC, off to the side we have the 1374 Drive units, and upstairs we have the 2100 Motor Control Center."

Walking back to the control systems design department, Cazenavette noted that as new technology became available, the job of building the fuel tank would become easier. He pointed to a new A-B PLC-2/20 and compared it to the old control of another manufacturer that had recently been replaced.

"Notice how much more efficient the new equipment is," he said. "So many fewer wires, no need for so much cable. It is much, much easier to repair and makes doing the job so much simpler."

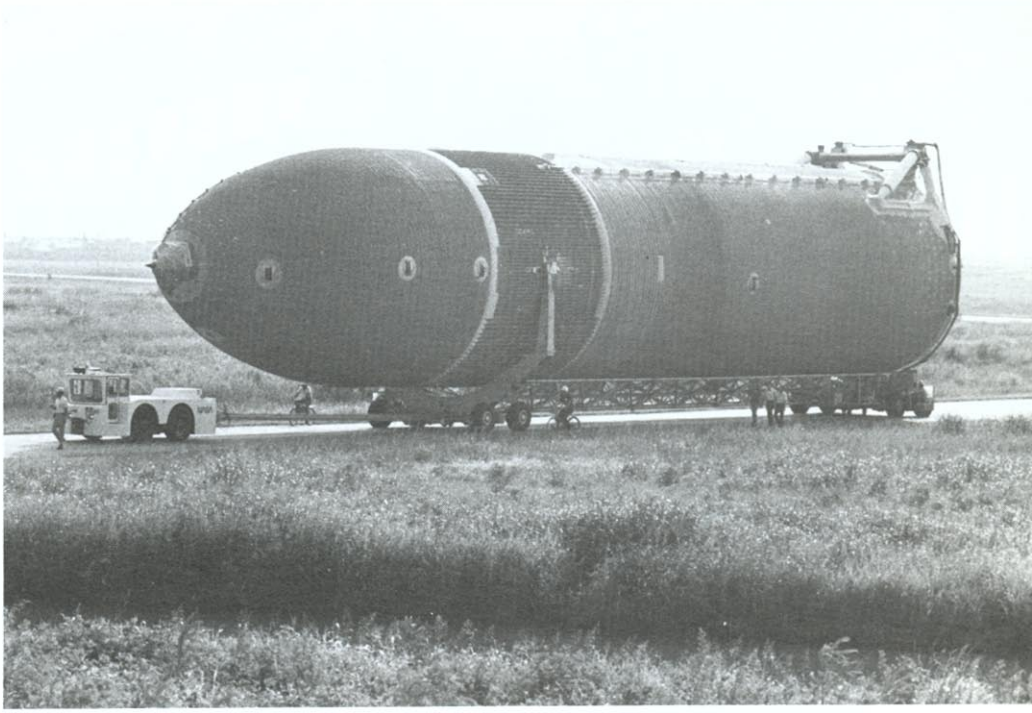
Such improvements will go a long way, they said, in meeting a 1985 schedule predicted to be 24 tanks a year for NASA and Vandenburg Air Force Base.

The newest tanks, the engineers said, are a step above those familiar to so many television viewers. The latest tanks will be seen in hues of yellowish brown, the natural color of the final foam covering that is sprayed over the 15,000 feet of surface.

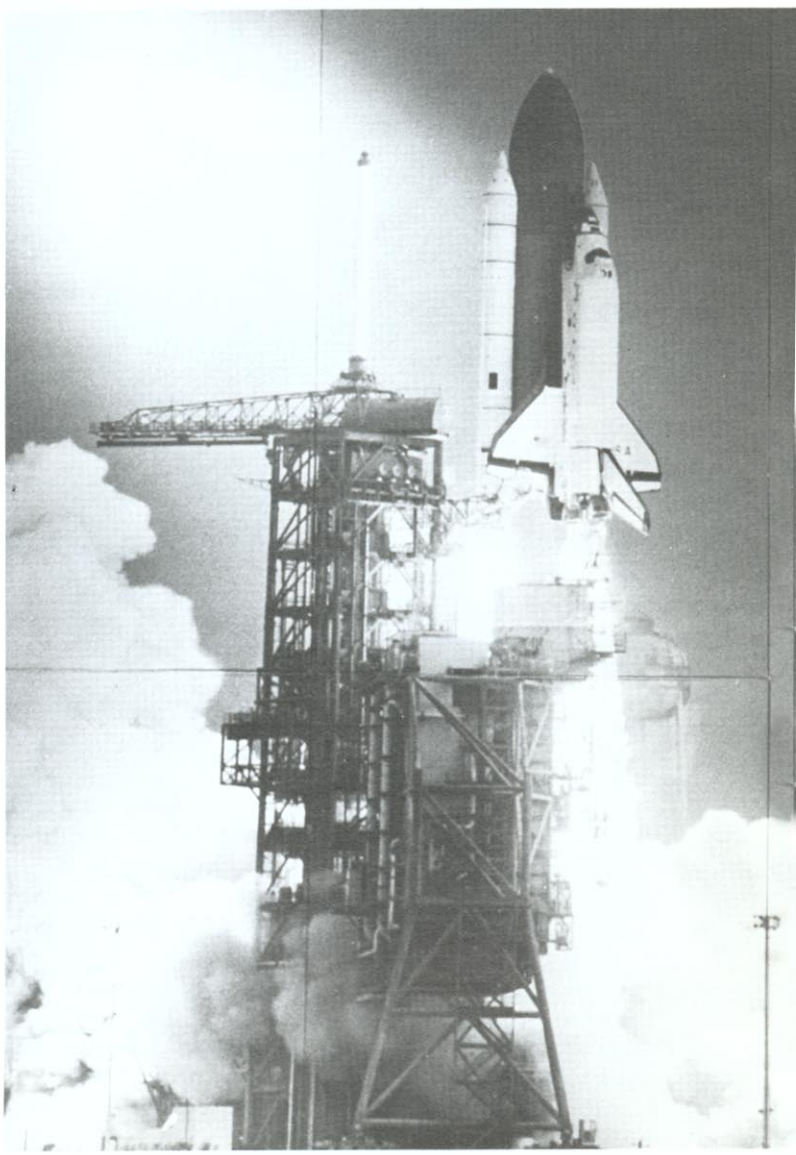
"We're leaving off the white paint in order to take 600 pounds off the overall weight," LeBlanc explained.

The new color is one of those changes we can all see. But other, more significant, technological changes —one that will help ensure even more successful Space Shuttle operations— are going on under the many roofs of the Allen-Bradley Company.

—Alice Anne Conner



On its way to the barge that will carry it to the Kennedy Space Flight Center, the tank is transported on its own specially built trailer. The tank provides the backbone of the Space Shuttle during launch operations and delivers the propellants for Orbiter's engines.



BLASTOFF! And a moment of pride for Martin Marietta Aerospace and A-B employees alike.