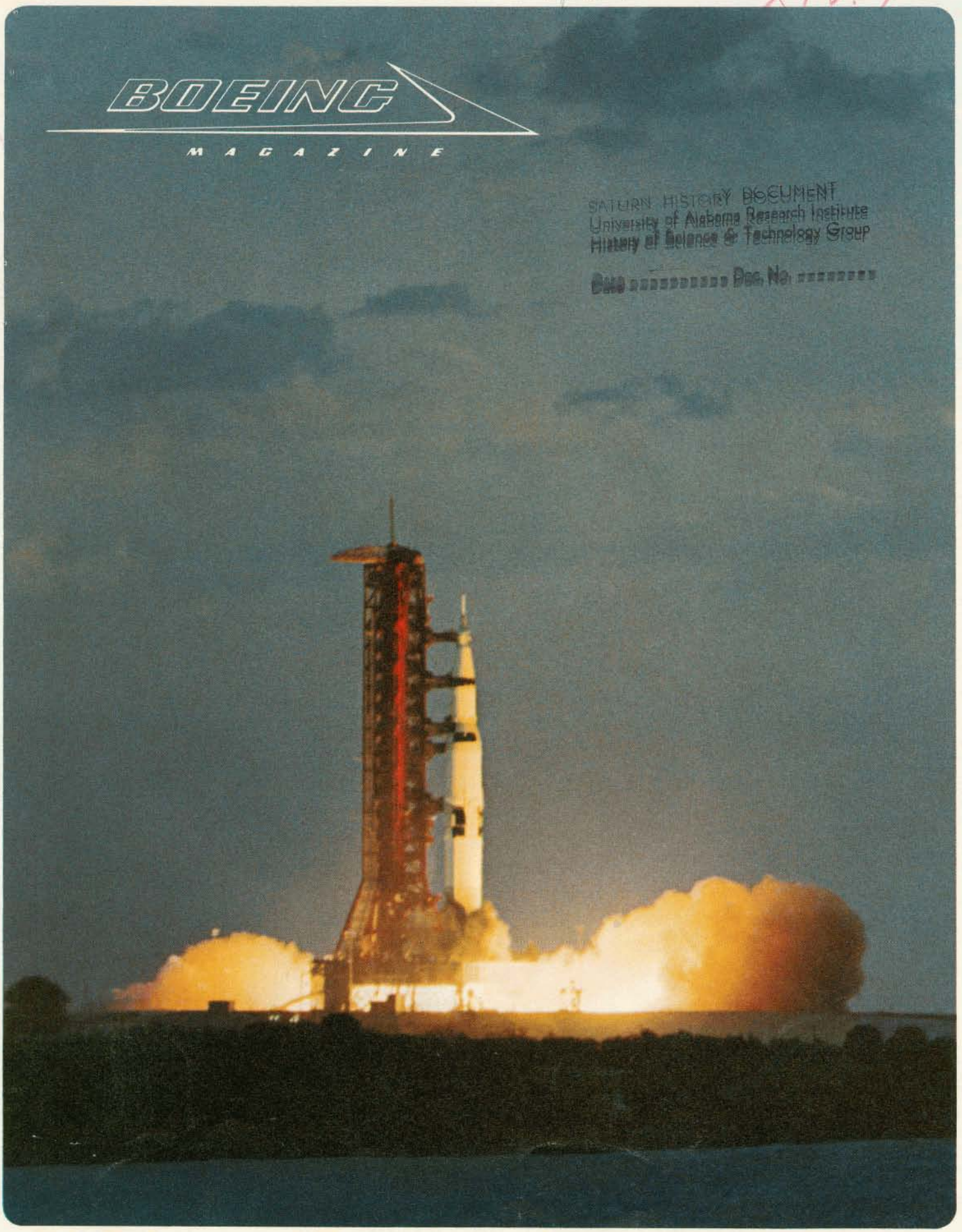
Apollo 4 XIV.7

BOEING MAGAZINE



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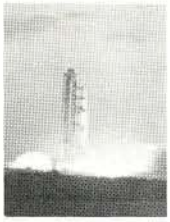
Director of Public Relations: CARL M. CLEVELAND
Editorial Supervisor: WILLIAM L. WORDEN
Art and Production Manager: KEITH KINSMAN

Editor: KENNETH L. CALKINS
Consulting Editor: CHESTER CHATFIELD
Associate Editor: DARRELL BARTEE (Wichita)
Art, Layout and Design: ALDEN METCALF

In This Issue

CONTRIBUTORS—Photo: Vernon Rutledge (cover, 8); Vernon Manion (2, 10, 12); Keith Petrich (3, 5); Gordon Williams (4); National Aeronautics and Space Administration (6, 7); Paul Wagner (14); Tom Cusick (15); Art: Alden Metcalf (11); Bill Ryan (9).



ON OUR COVER—At 7 a.m. November 9, 1967, the world's largest space booster slowly rose on a fiery tail from a launch pad at Cape Kennedy, Florida. It was the first flight of an unmanned Apollo/Saturn 5 which will later carry man to the moon.

THE BOEING COMPANY
HEADQUARTERS OFFICES
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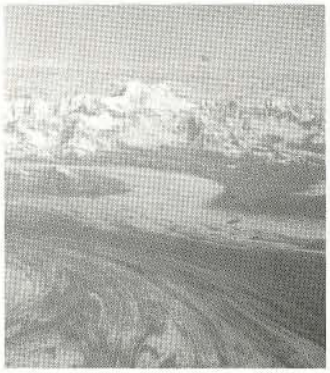
Briefing

River of Ice



On a trip to Alaska to take pictures for a *Boeing Magazine* story ("Gravel Gertie," December issue), staff photographer Vernon Manion exercised his camera a few times on the flight. He snapped the accompanying photograph from an Alaska Airlines Model 727 on its way to arctic Kotzebue. What appears to be a river in the photograph is a moving glacier—solid ice oozing down the mountain in a lava-like flow but infinitely slower.

Hear the Wind Blow

Enrique B. Santos, editor of *The PALiner*, employee newspaper of Philippine Air Lines, explained to his readers how PAL had contributed to the antique airplane collection of the Smithsonian Institution in 1946. Three unnamed antique aircraft were on display at the Oakland (California) Airport. The Smithsonian had bid for the planes but been turned down by their owners. Came the day when PAL began its first transpacific service, its DC-4 on the apron near the antique airplanes. "Then our pilots fired up the engines," wrote Santos, "increased power to taxi away and blew the three airplanes into pieces on the ramp." The owners were at last willing to sell the airplanes to the Smithsonian—piece by piece. "Thus, in a manner of speaking," concludes Santos, "did PAL make a contribution to the Smithsonian."

The Flying Sieve

Master Sergeant Stephen N. Garlock, 22nd Air Force detachment at Hickam Air Force Base, Hawaii, was looking at a group of posters commemorating the Air Force's 20th anniversary in September. He saw a picture of the B-17 *Thunderbird*, a plane on which he flew the Mannheim mission in 1944. He was a gunnery instructor checking out a new man in the squadron. The objective was to teach the new man gunnery under fire. The lesson was almost too good. When *Thunderbird* came home to Molesworth, England, Sergeant Garlock counted more than 200 flak holes in the plane.

In Vietnam old Stratoliners are

'A pleasure to our eyes'

By KENNETH L. CALKINS

IN APRIL, *Boeing Magazine* carried a small item in the page 2 "Briefing," an item which asked readers for more information on three Model 307s reportedly in service in South Vietnam. The readers responded, among them John C. Greenaway of Air America, Bob Cousens of Qantas, Keith Petrich of Pan American World Airways, David Gauthier of Northwest Orient Airlines and M. J. Hardy, air transport journalist in Angmering, England; Dennis Powell, aircraft historian of Nairobi, Kenya; Wilf G. White of Glasgow, Scotland; and Philip G. Mack, Robert G. Struth, David Anderson, Frank Manely and C. G. Robinson, all of Boeing.

From them and from materials supplied by them, we've compiled a rather complete account of what has happened to the 10 Model 307 *Stratoliners* built by Boeing in 1939 and 1940.

Boeing sold five of the original 10 planes to Transcontinental & Western (now Trans World Airlines), three to Pan American, one to Howard Hughes and one was lost on a company demonstration flight in 1939.

J. M. G. Gradidge, writing in the British publication *Air Pictorial* in February, 1966, and Robert H. Scheppler, writing in the *Journal of the American Aviation Historical Society,* Spring 1963, gave brief run-downs on the other nine planes. *Clipper Rainbow* (C/n 1995) was one of the Pan American planes. A Pan Am crew flew it for the U.S. Army Air Forces during World War 2, returning it to Pan Am duty after the war.

From 1948 until 1951 *Rainbow* was owned by Airline Training, Inc., and was then sold to Aerovias Ecuatorianas, C. A. In 1957, it was purchased by Aigle Azur Extreme Orient, a privately owned French airline based in Saigon. It was leased to Air Laos in 1960 and damaged on May 22, 1961, attempting a three-engine landing at Tan-Son-Nhut, Saigon. There were no injuries and the plane is now used as a source of parts for other *Stratoliners* in Vietnam.

Old 307 in Vietnam is viewed from under wing of Pan American 707.

Trans World's *Comanche* (C/n 1996) also saw war duty as a C-75 and then returned to civilian life as a TWA airliner. It too went to Aigle Azur which leased it to Air Laos. Later, the plane was owned by Compagnie Internationale de Transports Civil Aeriens (CITCA) and operated for the International Control Commission. The ICC was established by the Geneva Agreement of 1954 to monitor compliance of parties to that agreement. *Comanche* disappeared on a flight from Vietiane, Laos, to Hanoi in October, 1965.

The reason for the disappearance is unknown but might be surmised from an account in *Life* magazine several months ago of a Vietiane-to-Hanoi flight. *Life* writer Lee Lockwood told about a recent trip he made to Hanoi aboard a Model 307 *Stratoliner:*

"At Phnom Penh, the capital of Cambodia, I picked up the International Control Commission plane, which flies every Friday and every other Tuesday to Hanoi. . . . The ICC plane, piloted by three Frenchmen, was an ancient four-engine Boeing 307. We let down en route at Vietiane, Laos. The plane had to leave from here and arrive in Hanoi —exactly on schedule, flying within a 20-mile corridor. Clearance for any deviation in flight plan must be obtained several days in advance—from the North Vietnamese, the U. S. Air Force, the U. S. Navy, the Royal Laotian military and the commands of the Pathet Lao guerrilla forces, any of which is quite likely to open fire on any stray airplanes."

In the 1940s the TWA Cherokee was a luxury ship in air transportation.

The next Model 307 off the Boeing assembly line after the *Commanche* was the Howard Hughes *Stratoliner* (C/n 1997), purchased by that world-famous industrialist for an around-the-world flight which, because of World War 2, was never made. Hughes sold the plane in 1948 to Glenn McCarthy, Texas hotel magnate and oil man. The present owner is Joseph F. MacCaughtry who has named it "The Flying Penthouse."

The plane received storm damage while at Broward International Airport, Fort Lauderdale, Florida, in the winter of 1965. Hurricane Cleo almost broke the old bird's back but she has been repaired, has a new wing and a luxuriously furnished cabin, according to Dennis Powell, one of our correspondents mentioned earlier.

The fifth plane, *Cherokee,* (C/n 1998) was one of the original five TWA planes. As C-75s working for the Army Air Force Air Transport Command, these five planes flew 7½ million miles in 45,000 airborne hours which included 9,000 transatlantic crossings. Famous passengers who traveled by C-75 during the war included President Roosevelt, President Vargas of Brazil, Queen Wilhelmina of The Netherlands, Madame Chiang-Kai-Shek, General Giraud, and General James Doolittle. On one particular flight from Bolling Field, Washington, D.C., in March of 1942, the passenger list included General George Marshall, General H. H. Arnold, General Dwight Eisenhower, Admiral E. J. King and Admiral John H. Towers.

On one flight for the Army in November, 1942, a Pan American 307 was headed westward from Iceland when it was hit in the tail by 20-mm shell fire. The plane completed the flight without mishap. It was determined later that the *Stratoliner* probably had been mistaken for a German bomber by an Allied freighter.

Cherokee was another of the *Stratoliners* leased by Aigle Azure

to Air Laos and later sold to CITCA for operation for the International Control Commission in Vietnam. At this writing, it is still on duty there.

Another TWA *Stratoliner, Zuni,* (C/n 1999) followed the same route as *Cherokee* and is now working for the ICC. The same is true of the old TWA 307 *Apache* (C/n 2000), which accounts for the three *Stratoliners* now in Vietnam. Originally designed to carry 33 passengers, the Vietnam Model 307s are equipped to carry 60 passengers in the five-abreast seating, according to Capt. J. R. Greenaway, an Air America pilot in South Vietnam. The three planes make 18 flights a month to Hanoi via Phom Penh and Vietiane and return.

Navajo, still another TWA 307 (C/n 2001), had a similar history to its sister ships until 1959. Aigle Azur leased the plane to Airnautic that year and Mr. Gradidge tersely reports it crashed December 29, 1962, on Monte Renosa, Corsica.

Clipper Comet (C/n 2002), an original Pan American 307, had a different history. Pan Am sold it in about 1950 to Aerovias Ecuatorianas C. A., of Quito, Ecuador. It was the second Pan Am *Stratoliner* purchased by the South American airline. In 1955 and for some two years after that, the *Comet* was operated in the U. S. by Quaker City Airways. In 1958 the plane was modified by placing additional tanks in the fuselage to increase its range. On October 5, 1958, the *Comet* caught fire on a test flight and was landed on a butte 15 miles west of Madras, Oregon. The crew was uninjured but could not control the fire. The plane was completely burned out.

The 10th and last Model 307 was also a Pan American plane, *Clipper Flying Cloud* (C/n 2003). The ship was sold to an airplane chartering company and thence to a pilot training firm before it joined the Haitian Army Aviation Corps in 1954. It was operated as an airliner by Cie. Haitienne de Transports Aerien until 1957 when it was returned to the USA.

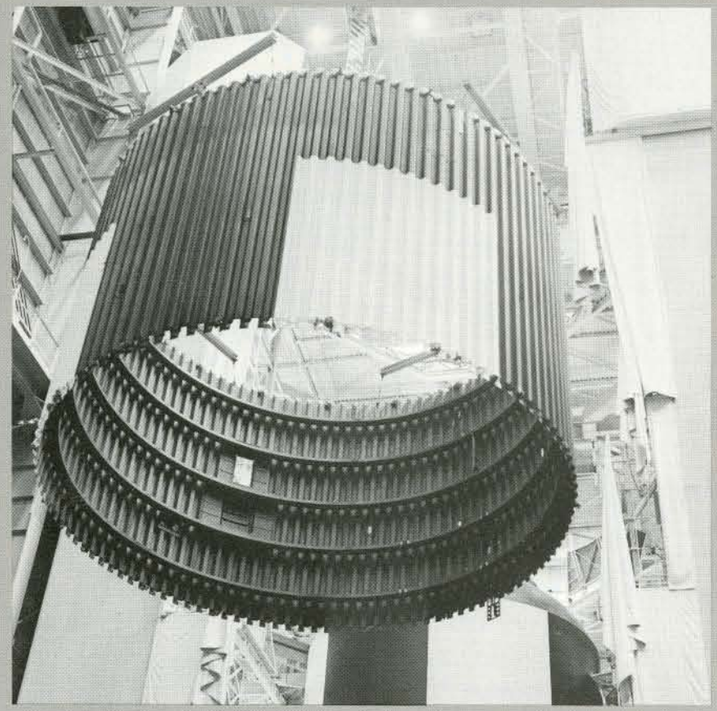
In May, 1967, Robert Struth, Boeing quality control supervisor stationed at Barksdale Air Force Base, Louisiana, reported that the *Flying Cloud* was being offered for sale in Shreveport, Louisiana. The asking price was $70,000. Struth wrote that the plane appeared to be in fine shape. It last flew, according to its log book, on November 27, 1966, giving it a total flight time of 20,520 hours and 50 minutes.

This accounts for all 10 of the *Stratoliners.* Five of them are in flying shape, three on duty in Vietnam. Five are gone. But none of them will ever quite be forgotten. Captain Greenaway wrote last month that the "307s are a pleasure to our eyes over here. They are being well kept."

"After discussing the aircraft with the head of the CITCA maintenance department and some of the mechanics," said Captain Greenaway, "it became very obvious that all of the people involved in the work on and flying of the planes are highly impressed with their old beauties.... (The planes') appearance . . . is spotless, highly polished paint work always fresh. Their interiors are clean and neat. The cockpits look like new, all equipment present and accounted for. It is most interesting to see the face of a disbelieving young fighter pilot as the 307s trundle out and take gracefully to the air among supersonic F-4s and new Boeing 707s."

That's about all anyone could ask for—to know that the sturdy old planes are being used and are being given the respect due the aged.

Stratoliner (old TWA Apache) readies for flight to Hanoi from Saigon.



The Saturn 5 intertank gets a

New paint job

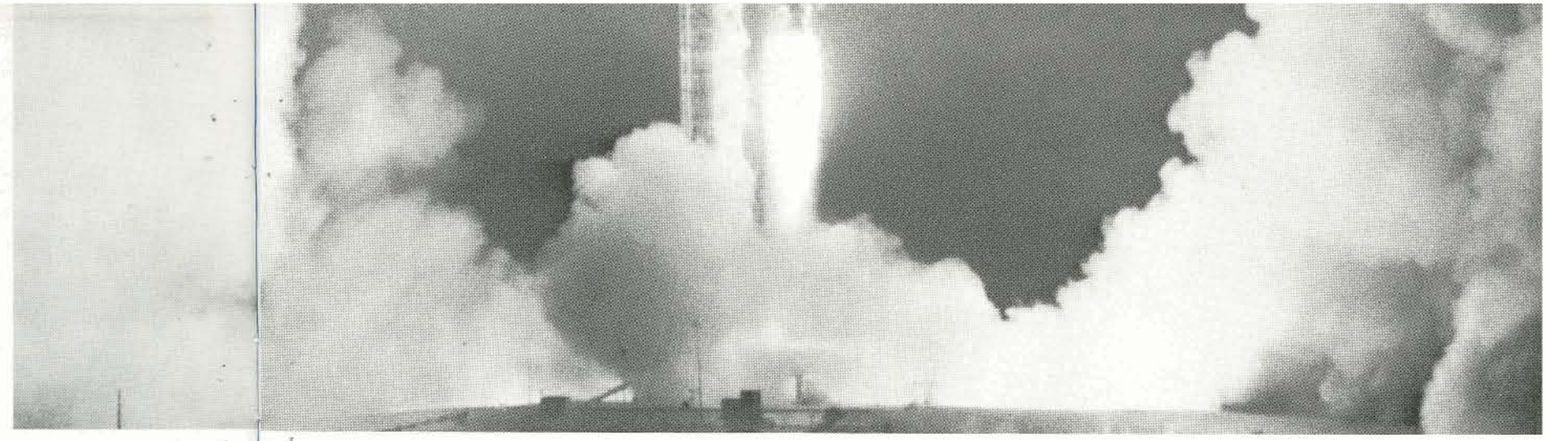
By MILTON ALBERSTADT

ROCKET DEVOTEES, accustomed to the eye-catching black-and-white pattern on the S-1C, first stage of the Apollo/Saturn 5 moon rocket, were in for a surprise when the first flight model made its debut on the launching pad.

The 21-foot center section of the rocket booster, called the intertank, has been repainted from the old checkerboard pattern to a new, all-white design. The change was made because the lighter color reflects heat more evenly, resulting in less temperature differences in the stage's interior. This in turn improves the accuracy of strain gauge readings in the intertank.

Seven flight stages, already assembled into complete boosters, have been repainted. Others will get the new color before they reach final assembly.

In the photograph above, an intertank with the old paint design is lifted into the vertical assembly tower at the National Aeronautics and Space Administration's Michoud plant, New Orleans, Louisiana. The new color scheme appears in the cover photo. The remainder of the rocket stage retains the familiar black stripes.



To 12,000 employees, the Apollo 4 mission was a

Six-year gasp

By WILLIAM W. CLARKE

TO THE REST of the world it was the launch of the nation's largest rocket. To the 12,000 Boeing employees intimately associated with Apollo 4 it was a "six-year-gasp"—a 2½-minute culmination of six years of intensive, painstaking, preparatory work.

When the first launch of a Saturn 5 booster mated to an Apollo capsule lifted off in November, amid unprecedented quantities of flame, smoke and noise, it released an emotional flow almost as voluminous as Saturn's own 7½ million pounds of thrust. More than one Boeing man stood at the launch site with tears running down his cheeks. Walter Cronkite, the normally detached, urbane TV newsman, lost objectivity for a moment and shouted "Look . . . at . . . that . . . rocket . . . go!" Hundreds gathered at the Cape Kennedy, Florida, launch site—technicians, press, VIPs and viewers—stood, cheered and bellowed encouragement.

Apollo 4—the name given to both launch and mission—went beautifully. Not only was it a success, but in the words of National Aeronautics and Space Administration's Dr. Wernher von Braun, director of Marshall Space Flight Center, it was a "textbook flight"—perfect in almost every detail.

The Boeing team from New Orleans was ecstatic. The engineering support group launched its chief, Walter Jerominski, into an involuntary trajectory which ended in a programmed splash-down in a swimming pool. He emerged dripping but forgiving.

There were good reasons for such an emotional outburst. Those reasons began in 1962 when Boeing men first walked into the cavernous, 43-acre Michoud Assembly Facility in New Orleans, where the bulk of the Saturn first stages were to be built. These men were embarking on a job never before attempted. "You stood there in that big empty plant," one engineer recalled recently, "and you suddenly realized that this was *really* a job."

The project, given to Boeing a few months before, was to do the detail engineering and assembly of the biggest rocket stage in the world, the first stage of the Saturn 5. It was to be 33 feet in diameter, 138 feet tall. It would hold a half million gallons of propellant and would have to lift six million pounds from the pad. Buried in spaces between tanks in the structure would be 77 miles of wire, 44,000 electrical connections, hundreds of feet of tubing—almost three quarters of a million parts, each of which had to perform its function perfectly.

Saturn's success was not a Boeing exclusive. There were other contractors and subcontractors and Dr. Von Braun's team of rocket experts at Huntsville, Alabama. The NASA Huntsville group has already proved its competence with the successful Saturn 1 program and is overseeing the Saturn 5 work at each step. Further, the first stage of 501—the name given the launch vehicle for the Apollo 4 mission—was assembled by NASA employees at Huntsville. Still Boeing was an intimate part of the first launch. Seventy per cent of the hardware for 501 was supplied by Boeing from the New Orleans plant. An even higher percentage of the electronic gear came from Boeing. And finally, the job of holding hands with the first stage at Cape Kennedy, after it was delivered, fell to Boeing. That was a quick-step effort of running down technical problems, making and carrying out engineering changes and mating the first stage with the rest of the rocket. Boeing had been given that job several years before. It was called "systems engineering and integration"—a Boeing responsibility which has since been expanded to cover all the Apollo, from first stage to the top of the tower.

The first launch was climactic but there were other high points in the program. The first test firing of a complete stage at Huntsville in 1965 was an occasion for shouts and joy. It went perfectly, justifying another several hundred engineering decisions.

There were also some low points. Early in the program, a seemingly simple manufacturing technique, old-fashioned welding, created havoc. The job was to weld together giant sheets of a new kind of aluminum to make the biggest aluminum tanks ever constructed. As one problem of metal distortion or welding flaw was solved, another arose to take its place. Problems proliferated faster than welders could pour out metal. More than one man in more than one department began to wonder if the job could be done at all. But the problems slowly gave way. "We overwhelmed it," said one technician.

There were others: parts that failed after they had operated perfectly in test for years on other programs and on other rockets; equipment that should have worked perfectly but wouldn't; jobs that seemed simple but weren't.

In the end, after excruciating reexamination and renewed technical effort, the problems were whittled away. By the time the Saturn 5 was ready to go on November 9, nothing had been left to chance and nothing was unresolved.

The launch was scheduled for 7 a.m., Eastern Standard Time (6 a.m. in New Orleans and Huntsville, 4 a.m. in Seattle). When most of the on-site viewers arrived, the sky was

still dark and the Saturn 5, 363 feet tall, looked like a giant icicle, parts of it covered with frost from the ultra-cold propellants.

Virtually everyone expected holds in the countdown. "There always are holds," one rocket-launch veteran newsman pointed out. But the countdown on 501, which had been going on for a number of hours, clicked off to zero without stopping and the six-million-pound rocket lifted off slowly, very slowly. It took one second to climb 7 inches, another 10 seconds to clear the mobile launch tower. Then it climbed away, trailing a jagged tail of flame at least twice its own length. Eventually it reached an altitude of 39 miles and a speed of 5,200 miles per hour before the first stage separated and tumbled into the sea. The second- and third-stage rockets pushed the Apollo capsule farther and faster into space. The capsule was recovered later.

It was spectacular, but even more spectacular to the engineers were some of the test results. The first stage flew to within a mile of its appointed location in space, just over one second from being perfectly on time and within 30 miles an hour of its anticipated speed — incredible accuracy.

The engineering data—information radioed back to Earth by the rocket's telemetry — indicated that almost all systems and subsystems had performed better than anyone had hoped. Many of them performed exactly between acceptable limits. The only major miss was the estimate of the temperature around the heat shield at the base of the stage. The engineers had estimated it at 1,000 degrees Fahrenheit and it reached only half of that — the right way to be wrong.

The biggest question created by the launch was, as one engineer put it, "What are we going to do for an encore?" The answer: Make the 502 perform as well.

Design improvements on the SST put

Wings on the nose

LAST MONTH Boeing released a list of design improvements on the 1,800-mile-an-hour supersonic transport.

The most apparent change is the addition of a canard near the nose. This pair of small wings gives the plane, which has been lengthened 12 feet to 318 feet over all, improved longitudinal (pitch) control. The added length decreases drag.

The prototype design is of a 675,000-pound, fueled and loaded airplane whose weight, distributed on 16 main gear wheels and the two-wheel nose gear, exerts no more runway pressure per tire than that of today's long-range subsonic jetliners.

Another change involves the plane's nose which, in the earlier design, had been double-hinged so it could be lowered during takeoff and landing to provide better pilot vision. The new nose is single-hinged and incorporates a movable visor for the cockpit windshield. The simpler design reduces structural weight without loss of pilot vision.

Latest SST design is 12 feet longer.

Did I hear you ask

How is SRAM doing?

By FRED MAXWELL
Project Manager, SRAM Program

IT HAS been a little more than a year since Boeing was awarded the SRAM missile contract. This is a good time to evaluate the progress. For those who have forgotten, SRAM stands for Short-Range Attack Missile. A strategic weapon with a nuclear warhead and supersonic speed, SRAM will be used to arm the FB-111 and late-model B-52 aircraft, giving such aircraft the ability to "stand off" from their targets while the missiles penetrate enemy defenses.

Today, hardware for nearly all of the SRAM weapon system exists and is being tested. For example, Boeing crews are "road testing" all of the hardware and computer programs needed for navigating a SRAM-armed B-52 bomber to the point of missile launch. A standard truck van equipped with a master computer, an inertial measurement platform, and aircraft signal-conditioning and switching units is "flying" SRAM missions on highways near the company's Seattle (Washington) headquarters. In these tests, the units have been hooked up and have "played together" satisfactorily. The navigation system concept has been proved.

Next, the missile's guidance and control system will be plugged in and the complete navigation and guidance package flight tested at the Air Force's Holloman Test Center near Alamogordo, New Mexico.

All of the other missile subsystems have been undergoing rigorous testing: impact tests of the nose section and fuze, ground firings to test motor propellant, insulation, igniter and nozzle; wind-tunnel tests of fins, aerodynamic flow patterns, and missile flight control loads.

In December, the project began systems integration tests in which several separately designed and developed missile systems are operated together to see if they interfere or conflict in any way with each other. This month, a test crew at Wichita will launch dummy missiles from a B-52 pylon—a wing-mounted strut which will carry several missiles.

Most SRAM hardware is small, but not all of it is, and the B-52 pylon is an example of the not-so-small. Two of these SRAM-loaded pylons have been flown in tests on the big bomber but no pylon missiles have been released. That's the next step.

Another fair-sized SRAM article is a rotary launcher for the B-52 bomb bay. A kind of Gatling gun loaded with SRAM missiles, a launcher has been installed in a B-52. On December 6, a dummy missile was launched from a high altitude over the Smoky Hill Bombing range near Salina, Kansas. The drop test confirmed wind-tunnel findings on the aerodynamics of the SRAM shape. Pylons, rotary launcher and dummy missiles were all built by Boeing's Missile and Information Systems Division in Seattle. The B-52 was modified and the SRAM flight test performed by the company's Wichita (Kansas) Division.

During the next few months, the SRAM program's subsystems will stand Air Force inspections called "critical design reviews"—wording which means just what it says.

So there's where we stand on SRAM after the first year: a crescendo of development and early flight tests. It's a good record and at least part of it can be credited to the stringent terms of the U. S. Air Force's "total package" contract —Boeing's first experience with such a contract. The "total package," as the name implies, covers a product from drawing board to battlefield readiness, including the prices charged for the finished product. It spells out both the government's and the contractor's responsibilities and incorporates rigorous conditions and guarantees. The customer is the Air Force's Aeronautical Systems Division (ASD), Wright-Patterson Air Force Base, Dayton, Ohio.

The SRAM contract, offering several options from which the Air Force will later choose, is based on firm prices. They were set after a spirited competition among bidding companies. These fixed prices represent tough targets for any development contractor. However, the contract includes an incentive arrangement where Boeing can earn a profit for producing the missile at or less than the agreed price. If the costs go over the agreed price, Boeing must pay a portion of the overrun.

That has made quite a difference. For example, SRAM engineers have redesigned some system elements, at considerable added cost, to make them cheaper to manufacture. These redesign efforts have reduced Boeing contract earnings during design and development but will result in more economical production costs.

One difference between the SRAM program and others in Boeing experience is the amount and timeliness of progress and problem information given to the customer. The SRAM reporting system is giving the Air Force more costs, schedules and engineering information, and giving it to them more quickly, than any other military weapon system development program Boeing has had. Most planning and status information on SRAM is sent electronically to the ASD System Project Office in Dayton. It appears in the office's control room on a screen, much like a home television set, in the form of numbers, graphs and mathematical symbols. The same information, stored in computer electronic memory banks, is available to the Boeing program people in Seattle. This has been a significant step forward in management visibility for the customer.

But back to the question asked in the title of this article — "How is SRAM doing?" Very well, and thanks for asking.

Dummy missile was drop-tested last month in Kansas.

Drawing of FB-111 releasing SRAM

Aircraft dolly is lifted off floor on cushion of slippery air.

One man can tow forward section of United Air Lines Model 727.

By RICK KIEFER

AIR PRESSURE has long been a servant to man. Negative air pressure vacuums his rug, pulls cider through his straw and holds on his toupee. Positive air pressure rounds out his auto tires, blows out his birthday candles and fills his dinghy sail.

Boeing long has used air pressure, both negative and positive, for such jobs as holding sheet metal in place (vacuum chucks) and powering air motors (on drills and rivet guns). Air also has figured rather prominently as the medium in which most Boeing products are borne aloft. Recently, Boeing manufacturing shops have found still another transportation use for air. They move mountains with it.

In this case, the mountains are body sections of the Model 727 and, soon, whole Model 747s. For the past year, body sections of the Model 727 trijet airliner have been moved through factory final assembly on pads of air. One man, exerting 57 pounds of pull or push, can move the rear section of a 727 fuselage across the floor.

Call it air-cushion vehicle, ground-effects machine, air bearing or air flotation, it operates on the principle that if you force enough air downward against a dense surface, the air will carry anything riding on its back. Water flotation works the same way, but manufacturing is a little messy in a swimming pool.

Consumer products have adapted the air flotation principle to wheelless, powered lawn mowers and to refrigerators made airborne and mobile by pressure from the blower end of a vacuum cleaner.

In Boeing's Renton, Washington, plant, workers use an air pallet or pad which slithers across the floor on a cushion of air, carrying loads up to 57,000 pounds. The procedure is simple if somewhat complex in the telling. The airplane section sits on an air pad. When it is time to move the section to another position along the line, the pad is connected by hose to the shop's compressed air supply. Trailing its hose, the pad lifts the airplane section some 18 to 20 thousandths of an inch off the floor. With a little push, the whole unit swishes as far as its tether is long.

The air bearing has proved to be a time, money and energy saver. Before the system was put into use, two cranes and a crew of 30 moved the fore and aft fuselage sections through 24 line positions. Now the cranes are required only three times during the subassembly sequence; a three-man crew with air pads makes all other moves unaided.

Boeing plans to move whole Model 747 airplanes at the Everett, Washington, plant on air bearings. The 231-foot-long superjets, weighing up to 150 tons as they near the doorway at the end of the line, make molehills of the sleek Model 727 body sections. Each 747 in assembly will rest on five 8- by 9-foot air pads, one under each landing gear. The pads will lift the plane one thousandth of an inch. Because of the 747's weight, considerably more push than one man can muster is needed to move the superjet hulls. In fact, it will take two standard tow tractors.

In addition to saving time and money, the use of the air pads under the 747 will save factory space. Instead of canting the airplane assembly line positions so that each plane's nose is pointed toward the factory door, the giant jetliners can be placed side by side, pointed opposite ways with wings of neighboring airplanes nestled into one another. This cozy arrangement is not possible when a plane has to be pulled on its wheels, nose-first, out of one position and jockeyed into another position. But it *is* possible when each plane simply is "flown" sideways on air pads.

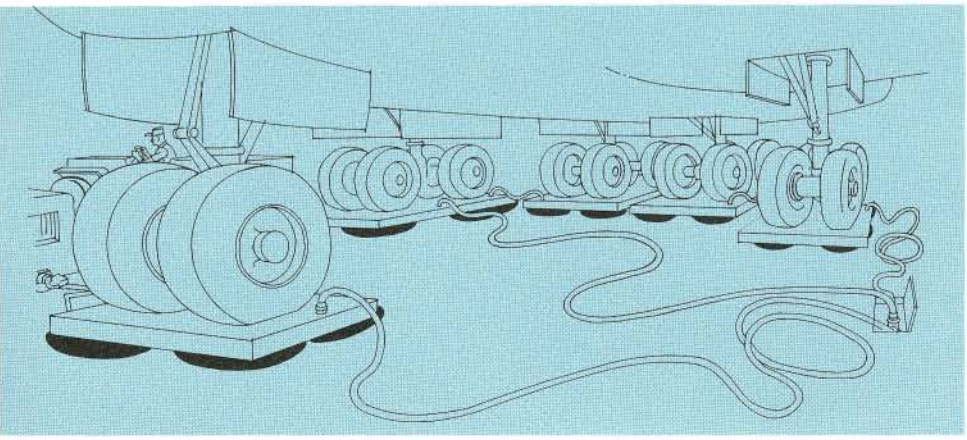
Assembly-line moves are not the only potential use for the air bearing on the 747. Studies are under way to determine how the air cushion might move cargo in and out of the world's largest airliner. Food-preparation galleys, mounted on air pads, also could be moved in and out of the 490-passenger aircraft, saving many hours in turnaround time at airports.

It is possible to adapt air flotation to almost any ground-moving job. Right now it is practical only where ample amounts of compressed air are readily available. Such is the case in Boeing factories, giving that company perhaps the only airplanes in industry that fly before they ever leave the factory.

Air pads give the factory its own

Flying carpet

Whole 747 airplane will be moved via air pads under all wheels.



Man in action

A CITIZEN'S DEBT

THERE ARE only 267 mayors in the state of Washington — a select group. Bruce W. Johnson campaigned for the job in Houghton, a small city near Seattle, Washington, and won the election.

Early on Sunday morning, two days after his inauguration, he was looking out the window of his home. The expanse of his city spread out before him. There he was—the mayor—the pinnacle of responsibility, authority and prestige. The telephone rang.

The telephone? It was 7:30 on a Sunday morning! Johnson moved to answer, then hesitated. Should he say, "Hello, Bruce Johnson speaking"? Or "Hello, Mayor Johnson speaking"? He decided the title sounded officious.

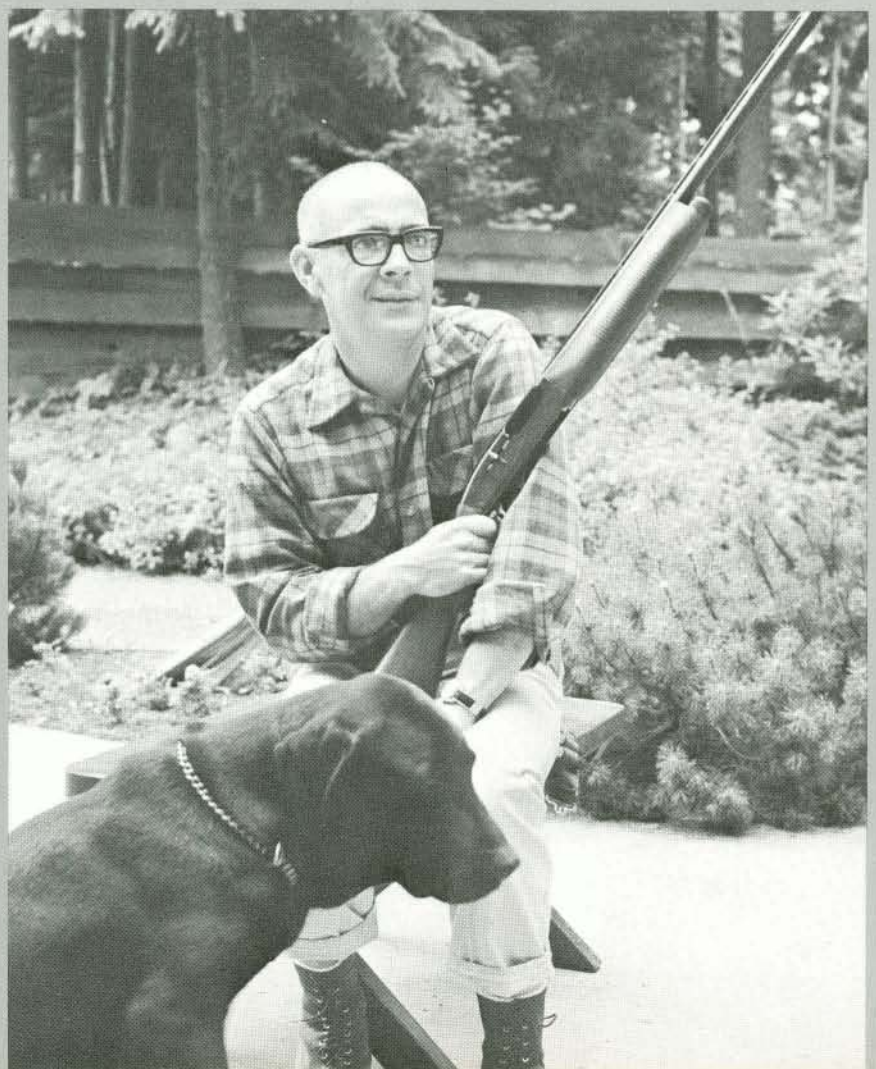
A voice on the receiver asked, "Are you the new mayor?"

"Yes, ma'am." He spoke firmly, — the captain at the helm.

"Well," she said accusingly, "my kitchen is full of flies."

Such is the life of a public servant. Within the scope of his vested powers and to the best of his ability, Mayor Johnson set about to solve that municipal problem. Johnson has since retired as mayor, but the experience and other activities in practical politics have given him a fine grasp of the real meaning of public affairs. And that is his job at Boeing: corporate director of public affairs.

Narrowly defined, Boeing public affairs are the company's relations with political-governmental bodies.



"Among other things we explain to state legislators, the industry or company position on tax and regulatory proposals," Johnson said. "In this era of explosive environmental change, we inform corporate officers what is going on on the outside and how best to shape our policy to live with change."

To carry out this assignment, Johnson must be aware of actions and trends in Washington, D.C., in several state capitals and local government units. He relies on a philosophy of community service, a philosophy which has made its impact on the Boeing organization.

"Community service is something that everyone owes to society. You cannot ask 'What's in it for me?' because, by and large, that question is immaterial. The question I ask myself is, 'If I don't do it, will it get done? And what is the outlook of those who *will* do it?' "

To understand and negotiate with government at all levels requires a politically educated cadre of informed persons. One of Johnson's first goals when he organized public affairs at Boeing was to start a course in practical politics. The classes, open to employees and their wives, are held after working hours on a voluntary basis. Some 5,000 persons have been graduated since 1960.

During Washington State's early fall, Johnson puts aside The Boeing Company, community service and politics—almost. Like many other Washingtonians, he is an avid game-bird hunter. The Bruce Johnson family (wife, Avonelle, and son Scott) loads clothing, guns and a Labrador retriever into a station wagon and heads for the grain fields of central Washington.

Rumor has it that Chinese pheasants are overpopulating the ranch of a certain state legislator who is chairman of the . . .

New machine laminates aluminum skins.

Wichita handles a sticky situation by making

An investment in bonds

By DARRELL BARTEE

AN INGENIOUS array of powered rollers, wheeling across an outsize work table, has stepped up the quality and speed of sandwich-making at Boeing's Wichita Division. In these sandwiches, the slices of bread are sheets of aluminum and the peanut butter is glue or — more accurately — adhesive.

A Boeing-invented machine applies strips of adhesive on a flat piece of airplane skin, places another aluminum sheet on top and squeezes the sandwich flat. The sheets are then ready for the oven where the two skins are permanently bonded together by heat and pressure. The process increases skin strength while adding less weight to the structure than do other fastening techniques. There is a massive amount of sandwich work to be done on Boeing jetliners.

Wichita's new laminating machine can roll the adhesive on the largest of the flat skins for the Model 737 twinjet in just 15 minutes, replacing hours of tedious handwork. The bottom sheet of the sandwich is held to the "bed" or work table by vacuum. One of a series of rollers on a turret, which rides the length of the 30-foot table on side rails, feeds out a strip of adhesive in seconds. Another roller automatically peels off the adhesive's paper backing. If the aluminum sheet is wider than the adhesive strip, the rollers make more than one pass.

Then the top skin of the sandwich is positioned over the adhesive and a rubber-covered roller applies a 900-pound pressure. Tiny air bubbles — voids which would weaken the bond — are squeezed out under the uniform and adjustable pressure of the roller. Afterward, the laminated skins are carried away by an overhead crane to an autoclave — a pressurized oven — for curing.

If the particular job requires it, an operator's walkway can be attached across the laminating machine's work table. The walkway and the roller rack are raised and lowered by air cylinders. The bed is large enough (10 feet by 30 feet) to accommodate several small skins at one time.

The laminating machine is mounted on wheels so that it can be moved between locations in the metal-bonding shop. In appearance, the machine is remindful of a large flat-bed printing press. While it may not be able to print the news, the Boeing laminating machine is *making* news in metal bonding.

The most memorable vacations have a plane beginning.

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