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**ON OUR COVER**—Berlin's Tempelhof airport, where approaches must be made between rows of flats, is the latest in a series of difficult airfields to be proved usable by jets through tests by Boeing's agile 727, shown here as only a shadow on a wall.

THE **BOEING** COMPANY

HEADQUARTERS OFFICES

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# BRIEFING

➤ In mid-December Eastern Airlines announced its intention to purchase 10 additional 727s, which will swell its operational 727 fleet to 50 aircraft by the end of 1965. Other recent orders came from Northwest Orient Airlines, which will add six more 727s between January and August of 1966; American Airlines, scheduled to take delivery of three more 707-320C Astrojet Freighters in the fall of 1965, and Irish International Airlines, which is due to receive another 707-320C Intercontinental in April, 1966.

➤ Jerome C. Baer last month was appointed the company's Airplane Division representative in Dayton, Ohio. He will be concerned principally with Boeing-connected United States Air Force programs at Wright-Patterson Air Force Base near Dayton.

➤ Boeing's *Fresh 1*, the world's fastest hydrofoil boat, recently was accepted by the United States Navy after completing a new series of test runs on Puget Sound near Seattle. The 15-ton, twin-hulled craft was designed and built for the Bureau of Ships, making its first "flight" in 1963. It is designed to go faster than 100 miles an hour and to test a variety of foil shapes and arrangements. Boeing has built several different hydrofoil test craft and is continuing an advanced marine systems program which began more than six years ago.

➤ A decline in employment affecting approximately 3,000 employees at the Wichita Branch will take place over the next few months. The reduction follows completion of some B-52 bomber modification and parts production assignments. Wichita Branch work force was about 17,800 on December 10, 1964.

➤ A plastic-tooling system designed to replace metal tooling for short production runs has been licensed to Furane Plastics, Inc., of Los Angeles. The system, called Veritool, was developed jointly by Boeing and the Weyerhaeuser Company and is used in the molding and forming of plastic parts at high temperatures. Specific uses include autoclave molding, vacuum-bag molding, compression molding, casting dies and post-curing mandrels.





*Artist's conception shows how RC-135A photo-mapping plane will look.*

**Last of 135s may change map of world.**

## **MATS MAPPERS WILL GET JETS**

By TOM COLE

**A**S AN ENGINEER flipped a switch, a streamlined section of the smooth outer belly of the big jet airplane slid rearward with a muted rumble, exposing large glass viewing ports. From forty thousand feet, observers scanned hundreds of miles of twisted jungle below.

A technician adjusted controls. Precision cameras of advanced design, tied together through electronic consoles in the main cargo

area, began sweeping the terrain.

Electronic distance-measuring equipment aboard began interrogating ground station transponders several hundred miles away, measuring the distance between the aircraft and the ground stations to an accuracy of a few feet.

At the same time, an accurate plot of the terrain below the aircraft was being made with terrain-profile equipment. During this operation the latest precision navigation system controlled the track of the ship

automatically, holding it on a steady course at subsonic speeds.

As darkness moved in, technicians flipped switches. The electronic distance-measuring equipment went off. Under the afterbody, a minute point of super-brilliant light began flashing, to be recorded by equipment on the ground which would establish the exact position of the airplane in the sky.

This flight hasn't been made yet. But it will be, probably late in 1965. The place: somewhere over

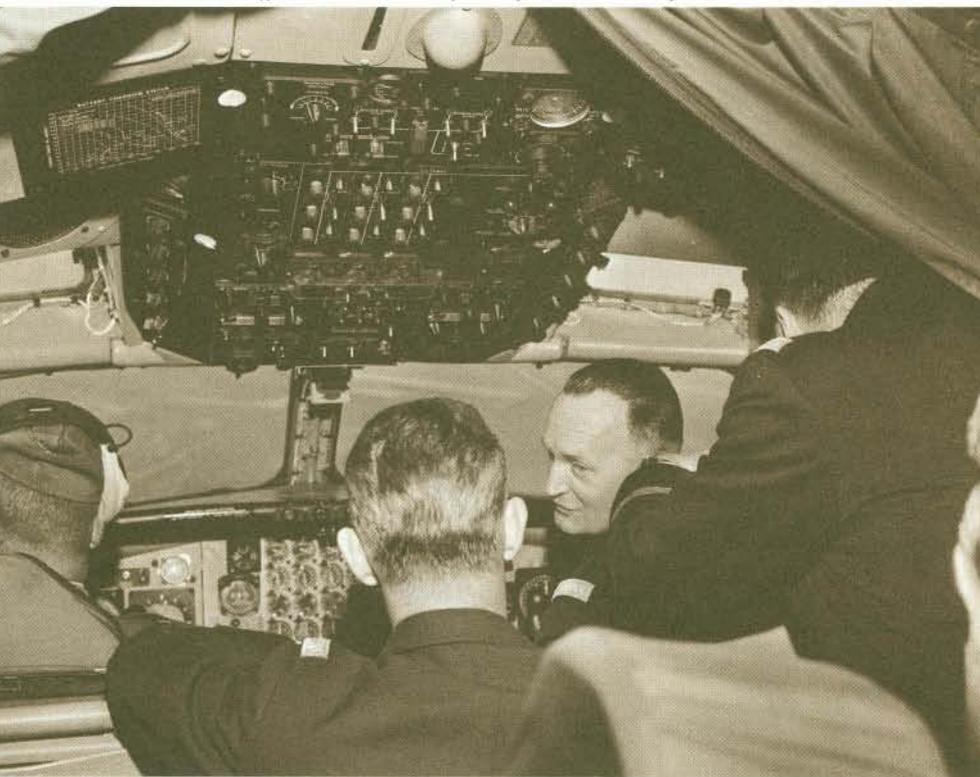


*Forty-five C-135 cargo-passenger planes were built for MATS.*



*Flying Boom reaches down from KC-135 to refuel B-52.*

*French officers check out first of 12 C-135Fs for French Air Force.*



South America. The airplane: one of four RC-135A jets, the last version of 820 aircraft of various models in the 135 family. The builder: Boeing's Airplane Division.

Today, these four photo-mapping electronic-surveying aircraft have not been completed. They are waiting in the factory at Renton, Washington, for installation of camera and survey equipment. The major body structures were produced in the regular military production line last year. Final assembly will be done on a commercial jet transport production line.

On December 30 another Air Force jet, the last RC-135B, built for electronic reconnaissance by the Strategic Air Command, rolled out the Renton factory door. This officially brought to a stop the company's military airplane production lines for the first time in 44½ years. The Boeing Vertol Division in Morton, Pennsylvania, however, is busy turning out military helicopters.

The last time the company was out of the military airplane business was in 1919 when it completed a Navy contract for 25 patrol flying boats called HS-2Ls.

The 44½-year run of military airplane production started in July, 1920, with the award of a contract for 10 GA-1 armored triplanes.

BOEING today is working closely with the Air Force on possible future aircraft programs, including a very large troop-and-cargo transport, a small vertical-takeoff transport and a vertical-takeoff fighter.

The sections of one of the RC-135As are being brought together this month in the final assembly area, although rollout is not scheduled until late March. This airplane, scheduled to be accepted by the Air Force in June, will be retained by Boeing for flight test of the new electronic and photo systems.

The second RC-135A rollout is scheduled in May with delivery in September, the third rollout in June with delivery in October and the last rollout in July with delivery in November.

All four RC-135As will be assigned to the Military Air Transport Service's Air Photographic and Charting Service for missions

throughout the free world. They will be operated by the 1370th Photo-Mapping Wing at Turner Air Force Base, Georgia, replacing propeller-driven RB-50 airplanes built by Boeing 15 years ago. An article describing these craft and their work was published in the November, 1964, *Boeing Magazine*, under the title *Big Balus Over New Guinea*.

The RC-135As will continue the APCS mission of accurately charting the world's surface. Because of their high-altitude ability and speed, they will survey much more area in the same time as the old B-50s.

ELECTRONIC surveying from the air, using a newly developed system of triangulation called SHIRAN, depends on manned ground stations. The SHIRAN equipment and the camera gear will be hooked together by the Kollsman Instrument Corporation of Elmhurst, New York, into a complete system called the USQ-28. The Cubic Corporation of San Diego developed SHIRAN, designated USQ-32, which is a longer-range version of HIRAN, already in use by APCS.

The SHIRAN system makes it possible to determine the exact distance between two widely separated points on the ground by bouncing timed signals between the airplane and two ground stations. Using earlier versions of this system, APCS has leapfrogged its way across much of the northern hemisphere, large parts of Central and South America, some of Africa and the Pacific from Hawaii to Australia.

Because of the pinpoint accuracy of this method compared to ground surveying, the map of the world already has had a number of major changes. For example, an APCS survey showed that Grand Bahama Island is actually seven miles from where previous maps had located it. This has proved of great value to United States tests of scientific satellite launch vehicles.

Measurements of foreign countries are undertaken at their request. The results are an aid in building highways and in other programs of national development.

The RC-135A is basically the

same airplane as other 135s, which have been in production for 10 years. The \$1.9-billion program has encompassed 820 aircraft in six major versions.

The major run was 732 KC-135A aerial tankers for the Strategic Air Command, the only production model aircraft in which the basic design of the aircraft required no major modifications throughout the run. The first of these tankers, and the granddaddy of the entire series, rolled out July 18, 1956. The last KC-135 rolled out December 2, 1964.

The next largest group of aircraft were 45 C-135s for the Military Air Transport Service. These were built without aerial refueling ability and with stronger cargo floors, as troop and cargo transports. They were built in an A series and a B series.

SEVENTEEN EC-135Cs were built for the U.S. Air Force as flying command posts, 12 C-135Fs were built for the French Air Force as tanker-transport, 10 RC-135Bs were built as aerial reconnaissance aircraft for the U.S. Air Force, in addition to the four RC-135As.

A number of the 732 tankers have been diverted to other uses, such as earlier model flying command posts, navigational aid checkers for the Federal Aviation Administration and as test beds for U.S. Air Force research programs.

Altogether, the massive program which during one year delivered 15 tankers per month to the Air Force, required 168,000,000 man hours of work by Boeing employees, or the total working time of one man for 84,000 years.

Now in action, 135s refuel bombers and fighters; airlift combat troops and priority battle equipment into hot zones of the cold war; provide jet-speed hard-to-find aerial command posts from which the country's leaders can direct operations in all-out war; act as test beds for research programs; provide long-range eyes for our military forces by aerial reconnaissance; map and survey continents for space research and peaceful uses, and check navigational aids for the FAA to aid flight safety. 



*Ten RC-135B electronic-recon planes were delivered to the Strategic Air Command.*

*Last KC-135 heads for final assembly.*



**Making rocket anchors is giant job.**

## **HITCHING POSTS FOR SATURN**

By DARRELL BARTEE

**O**UT-SIZED aluminum forgings, among the largest ever produced in the forging centers of this country, are being used by Boeing for a part of the thrust structure on the Saturn V moon rocket.

These giant components are designed as anchors to hold the big bird in place until the end of the count down. Four of them will be installed between the engines as the hold-down posts at equi-distant points around the base of the first-stage booster.

Boeing's Wichita Branch obtains the raw forgings from the Wyman Gordon Company, Worcester, Massachusetts. They arrive at the Wichita plant in the general contour of triangular, tapered posts, with rough ridges and flanges run-

ning lengthwise and crossways. Each one is 14 feet long and weighs 1,800 pounds. Wyman Gordon officials say it is one of the most massive aluminum closed-die forgings ever fabricated at their plant. It is made on the largest press at the company's facility, which is one of two presses in the United States capable of 50,000 tons of pressure.

At Wichita the rough forging is transformed into a complex, precision-machined, space-age hitching post, hollowed out and cut down to a weight of about 670 pounds. When ready for shipment to the Michoud Operations plant of the National Aeronautics and Space Administration, it is prepared for the critical last-minute steadying of a rocket weighing six million pounds and employing 7.5 million pounds of thrust.

The work at Wichita is done for the company's Launch Systems Branch at NASA's Michoud operations, via Boeing's contract with NASA for development, production and test of eight S-1C flight boosters plus two test stages. Components for four additional boosters also are being made by Boeing, to be assembled at the Marshall Space Flight Center, Huntsville, Alabama. Nearly 90 per cent of the tool fabrication and manufacturing of S-1C components is accomplished at the Wichita complex.

Varied techniques and advanced types of equipment are employed by the Wichita fabricators to accomplish the unusual assignment on the forgings. Ultrasonic tests are made on the metal to verify its inner soundness. Grain direction and dimensions are also verified before any machining begins. Most of the intricate milling is done on machines controlled by punched tape.

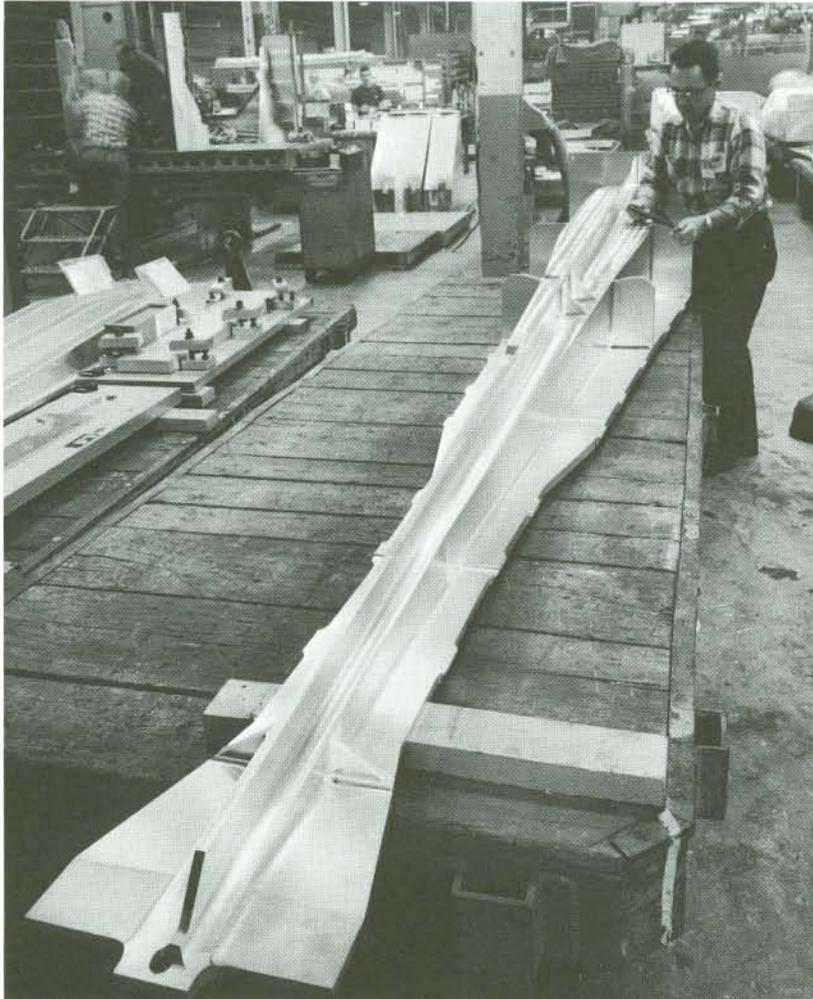
During the milling procedures, careful attention is given to two intervals of heat-treating, to give the 7079 aluminum the tensile properties required. These intervals require special timing; at one point a five-day period of rest is required before the next treatment begins.

A baking process gives the metal a specified amount of artificial aging. Shot peening is used to compress and seal the surface structure of the metal, to help prevent stress corrosion.

As the final steps are reached, a fluorescent penetrant is applied, so that the ever-present quality control inspectors can make sure there are no flaws. Finally, a special chemical coating is used, as a surface protection.

The final result is a finely-machined hold-downer that looks like a part of a huge watch. The multiple flanges, cavities, and attachment holes are precision placed and double checked. The specially tempered and treated surfaces indicate all-around quality. 

*Milled and drilled post also will be heat treated and shot peened.*





*Between-engine mounting of rocket pods leaves room for Hound Dog missiles.*

**New device increases capability of B-52 bomber.**

## ***PODS SHELL OUT ROCKETS***

A PAIR of rocket pods installed under the wings of the B-52 bomber soon will increase its ability to penetrate enemy defenses. Deliveries of the Boeing-designed countermeasures pods are scheduled for B-52H squadrons of the Strategic Air Command.

The pods will be attached by pylons midway between the two engine struts on each wing. This positioning will allow the B-52 to carry two Hound Dog missiles, two wing-tip fuel tanks and two of the rocket pods, all at the same time.

About 13 feet long, the ALE-25 pod will shell out rockets to help the B-52 deal with enemy defenses. The exact nature, speed and range of the rockets cannot be reported,

but they can be described as a genuinely sophisticated addition to the B-52 array of penetration aids.

Each pod weighs about 1,100 pounds loaded, including pylon. Rockets can be launched either by push-button manual control or by an automatic system.

In designing the equipment, Boeing engineers at the Wichita Branch have concentrated on easy system maintenance by building the pod in segments. They also have emphasized safety provisions, in order to avoid activation on the ground and other hazards associated with rocket handling.

Trailer equipment has been designed for fast and efficient transport and installation of the pods on

the airplane. A single electrical plug-in is made when the pylon is attached to the wing.

All parts of the system are being assembled at Wichita. Test firings were made by installing a pod on a half wing and firing the rockets into a special catcher designed by the company. The rockets were aimed through a steel guide tube and stopped by a barrier.

Following the equipping of the B-52Hs, other models may get the new pods.

Nose cones of the pods are dotted with precision-made holes from which the rockets emerge. These openings are filled by protective plugs which loosen at the instant of launch.



Flats with view—Berliners get close-up of 727 putting down on Tempelhof.

**Berlin to Frankfurt is only 38 minutes by Boeing jet—**

## **ONE CIGAR TO FREEDOM**

By WILLIAM L. WORDEN

OVER Frankfurt, cloud layers pressed down, denying the sun, dulling the colors of the yellow and brown airplane climbing through them. The plane headed northeast, leveling off, for once, among the cloud hummocks instead of on top of them; but if the crew would have preferred the proper jet country higher in the bright sky, there was no time to worry about it.

There was Fulda below, and Bad Hersfeld—and then the towns which appeared no different from the air, the neat fields like any others, a train here, an uncrowded road there. But they were different.

In the airplane cockpit, Boeing and Pan American World Airways crewmen, cooperating, checked regular instruments and special navigation aids. This was the corridor above Communism and nobody wanted any mistakes—no altitudes too high, no course deviations, no mistakes whatever.

Twenty minutes, thirty minutes—and now the long glide, the exact turns—forty minutes.

In apartment houses off each wing, faces looked up suddenly from mid-morning coffee, gaped at the yellow and brown plane while passengers gaped at them.

Forty-two minutes: wheels touch runway, thrust reversers push air against air (no need here to bother with brakes) and the plane stops with half a runway still to spare. The plane taxis toward a semi-circular terminal, a waiting crowd, batteries of cameras.

Thus Boeing's 727 came to Berlin, first commercial jet to use famous Tempelhof airport, setting a new flight record for the 269 miles from Frankfurt as it arrived. For a newspaperman asking questions—"How was the flight? What were your impressions?"—a pilot had a simple answer.

"Nothing to it," he said. "It's a one-cigar flight."

Under the four-power agreement

for control of Berlin, one airline from each of the western powers may operate passenger and freight flights from various cities in Western Germany along three corridors, each 20 miles wide, to the Communist-surrounded city. The West German airline, Lufthansa, is specifically ruled out of the Berlin run. Pan American, British European Airways and Air France represent their respective countries, converging on Berlin from such cities as Hamburg, Hanover, Dusseldorf, Bonn, Frankfurt, Nuremberg, Stuttgart and Munich.

At Berlin, three airports are technically available — Gatow, Tegel and Tempelhof. But Gatow is seldom used and Tegel is inconveniently located and short on terminal facilities. A few flights from overseas use it, as does Air France on its internal German services.

Tempelhof is the traditional Berlin terminal and attracts 90 per cent of the passenger traffic—for Pan American alone, a record 8,200

passengers on a single day, almost 2,000,000 a year. Air travel in the corridors is subsidized by the West German government through an unusual arrangement which allows a passenger a refund on his one-way fare to Frankfurt.

But there's been one nagging catch. Although West Germany is served domestically by the 727s of Lufthansa on fast schedules between all other major cities and internationally by a welter of airlines using every sort of modern jet, Berlin still is in the propeller age of flying. Both the size of Tempelhof's runways and the 10,000-foot altitude restriction in the Berlin corridors (Russian and other communist aircraft criss-cross the areas at higher altitudes) have limited jet flights to those few headed for Tegel.

Pan American has depended on DC6B propeller planes to carry its two million passengers per year. Speed and passenger capacities thus have been limited—an hour

and 20 minutes for a flight to Frankfurt; maximum capacity, 84 passengers. The result is a traffic jam of monumental proportions: between 90 and 100 flights a day involving 17 airplanes at times, 11-minute intervals as an average on two runways with 6,100 usable feet each with elevated railroads, factory buildings and apartment houses crowding the airfield on both ends.

This was the situation faced by flight crews of the Boeing-owned 727 demonstration jet on December 2, 1964: could a three-engined passenger jet operate economically at 10,000 feet or less on a 275-mile flight? Could this jet land and take off safely and within reasonable noise limits from Tempelhof's limited spaces? Could it, if need be, do the same things without brakes or with one engine idle?

Hence the 42-minute flight to Berlin, a series of no-brakes, two-engine and downwind takeoffs and landings during four hours' stay at Berlin, a 38-minute flight back to



To Berlin crowds a 727 still is a curiosity.

PAA's Scott Flower flew the 727 on Frankfurt-Berlin record-breaking flights.

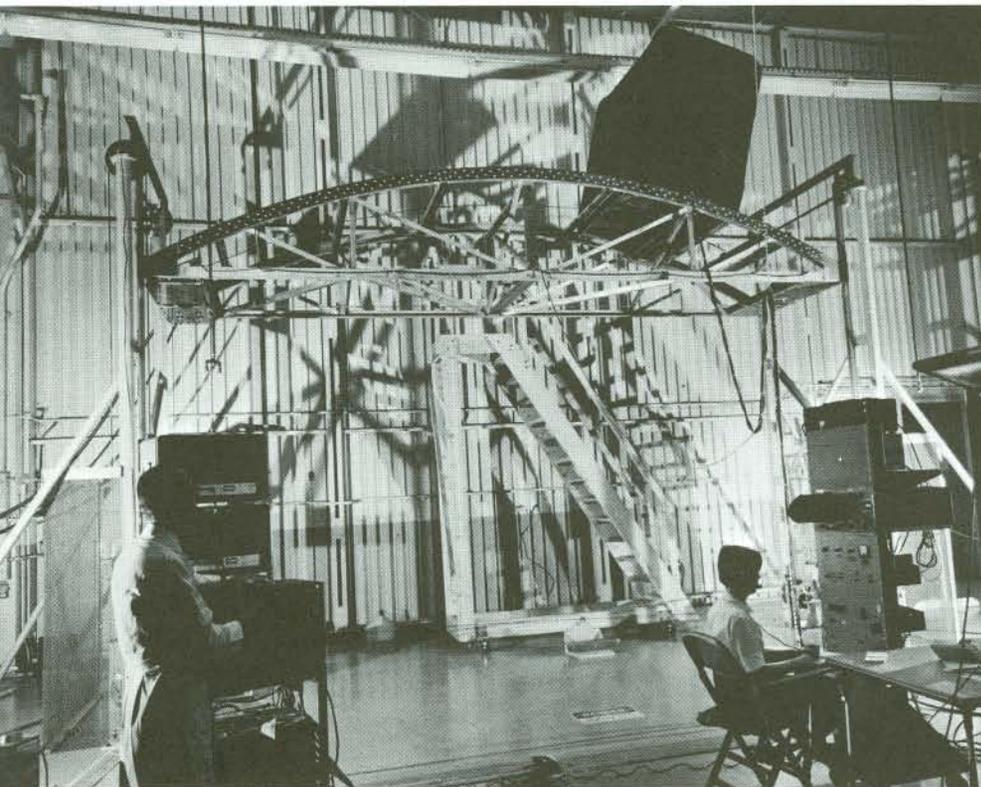


Prop planes have kept corridor open for years; now Boeing jet offers new speed, convenience.

Frankfurt, setting still another record. This particular 727 is the second of more than 100 built to date. It is the same plane which demonstrated its abilities to go where other jets can't by opening LaPaz, Bolivia's 13,358-foot-high airport to jet travel, as well as previously jetless Santa Marta, Colombia; Puerto Vallarta and Acapulco, Mexico. The Berlin demonstrations represented no real strain, adding only a little more geography to this particular 727's 800 hours of test flying.

Tempelhof still has no regularly scheduled jet service and may be without it for some time to come. But now it is only a matter of conferences, agreements—things which can be settled around a table. Boeing's number two 727 proved the rest.

And the faces of the Berliners said something about what the 727 meant to people living on an island of freedom, beside a grim wall.



Operator's cab moves back and forth on arched runway, which at the same time rises and falls on vertical track.



Psychologist Barbara Gonzalez and Dr. Charles Elworth conduct a test.

Light-excluding canopy encloses cab.



## Rock and roll of ship at sea is simulated by

# LAB-LOCKED SEAHORSE

By RAY THOMAS

INSIDE his control station, a sonar operator closely watches the instrument scope and, at the same time, is alert for signal tones coming through his earphones. Suddenly, a tone sounds, followed immediately by another slightly higher in pitch.

"Up Doppler," he says into his microphone. The scope before him, an orange eye in the darkness, now, too, comes to life. A point of light appears at the center and forms a circle which expands swiftly toward the rim. As the arc passes through the upper portion of the scope, a faint surge of light appears.

"Target," reports the operator. "Bearing three-four-zero, range 2,000 yards." While he monitors the equipment, his sonar room is never motionless. It rises, falls and moves in a horizontal arc.

Shipboard? No, but only the water is missing. The operator is working in a ship-motion simulator designed and built for an Office of Naval Research study by The Boeing Company in Seattle, Washington. First of its kind, the equipment simulates the sea so realistically that several test subjects developed advanced cases of *mal de mer*—seasickness.

The engineering psychology group of the Boeing Aero-Space

Division doesn't wish to make anyone ill, but it does want to know if ship motion can affect the performance of the sonar equipment operator. Because sonar is a critical tool in anti-submarine warfare, the operator forms an important link in the chain of information upon which a captain makes his decisions.

The simulator was designed by the technical services group of the Boeing bioastronautics organization and consists of an enclosed operator's station on wheels mounted atop an arched, 20-foot runway. During test runs, the operator's station rolls from side to side over the runway, while, at the same

time, the entire structure rises and falls along a 10-foot vertical track.

These motions simulate the heave and roll of the open ocean. Four signal generators, two for each motion, feed random impulses to hydraulic servo motors which control the equipment. Not even the test conductors know beforehand what pattern of movement the simulator will follow, just as no one at sea knows in advance how the water is going to behave.

Test subjects were chosen from employee volunteers, some of whom did not last too long in the operators' station. Others reported they enjoyed riding the lab-locked sea-horse. Object of the tests, however, was not to see if anyone would become ill, but to determine if ship motion as such over an extended period could affect the judgment and efficiency of the operator.

Only those who did *not* become ill were used as test subjects, according to Dr. Conrad Kraft, head of the Engineering Psychology Unit. If ship motion proves to be a factor affecting judgment and efficiency, Boeing psychologists want to define and measure this factor. The results of these and other tests well could influence future shipboard routines.

Four two-hour test sessions per individual were conducted. To secure comparative data, test subjects stood simulated sonar watches both with the simulator motionless and with it in operation. To further aid in shipboard simulation, the control station was enclosed by a black canopy.

The work performed by the test subjects was controlled from outside by Dr. Charles Elworth, project leader, and Barbara Gonzalez, assistant psychologist. Each 30 seconds, a blip was fed into the equipment or sonar echoes were sent to the operator's earphones. The operator was required to detect the blip, report its range and bearing and to distinguish between the tonal pitches. These responses were punched on cards for later machine analysis and statistical refinement.

The test program concluded in November, and, currently, the data is being processed for a final report to the Navy. 

**Super service is requested from the**

## ***FLYING GAS STATION***

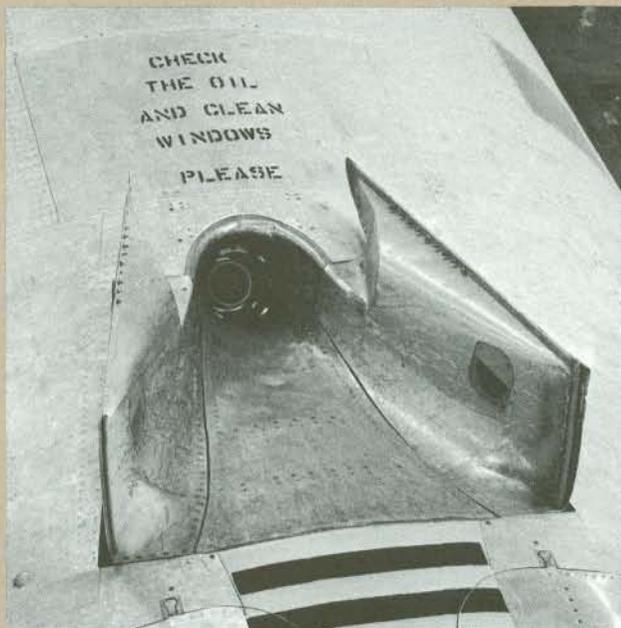
**C**REWMEN of the 92nd Strategic Aerospace wing at Fairchild Air Force Base, Washington, want everything to be trim and shipshape aboard their Boeing B-52 bombers.

They may be overdoing it, however, according to the men who fly Boeing KC-135 aerial tankers and do the inflight refueling for the 92nd. The tanker crews take great pains to maneuver the Flying Boom into smooth hook-ups with the B-52. They deliver the fuel quickly. But if they take an extra look at the

B-52 below, they find that the Stratojet crew still is not happy.

A sign, stenciled on the fuselage just aft of the B-52 filler cap, says "Check the oil and clean windows, please." It's enough to ruin a tanker's day.

Aircraft mechanics at the company's Wichita Branch noticed the sign atop a B-52 when the 92nd brought the airplane back to the home plant for touch-up modification. The sign was meant to be read in flight, but it rated some chuckles on the ground, too. 



*Sign is over fuel receiver on B-52.*

*KC-135 tanker refuels a B-52 in flight.*





*A large part of hybrid computer is in this room.*



*William Quirk stands beside a spacecraft mockup in the Simulation Center.*

**Moon flights are made easy by**

## **HUNTSVILLE'S HYBRID**

By WILLIAM B. SHEIL

**T**HE LARGEST known single hybrid computer system in the world recently became operational at Boeing's \$10-million Simulation Center in Huntsville, Alabama.

"This hybrid gives us the capability of running a complete simulation of a launch vehicle, including a manned spacecraft," says William J. Quirk, the Center's manager. "All the data are stored in the computer's memory sections—such things as amount of fuel carried, weights of all the parts, including the astronauts, and a vast amount of other information.

"From the time the button is pushed to start the first-stage rocket engines, the computer tells us exactly what would happen on the actual flight—speed attained at any given time, fuel consumed, tem-

perature, flight direction, time and place of stage separation, and so on.

"The new hybrid computer can run off a flight like this and give us all the answers in real time—that is, in the same time frame as such data could be produced under real flight conditions. One hundred men working with pencils and paper for 100 years couldn't figure out such complex problems.

"If the simulated flight isn't successful, we can change the input, and get a tremendous amount of information without employing an astronaut or burning a gallon of rocket fuel. Man-in-loop simulation, which incorporates man in the computer system and measures his actions and reactions under varying circumstances, greatly enhances the effectiveness of this method."

The hybrid computer which per-

forms this present-day miracle is a combination of IBM 7094 and 7044 digital computers, three AD analog computers and a 48-channel analog-to-digital and 30-channel digital-to-analog conversion linkage system.

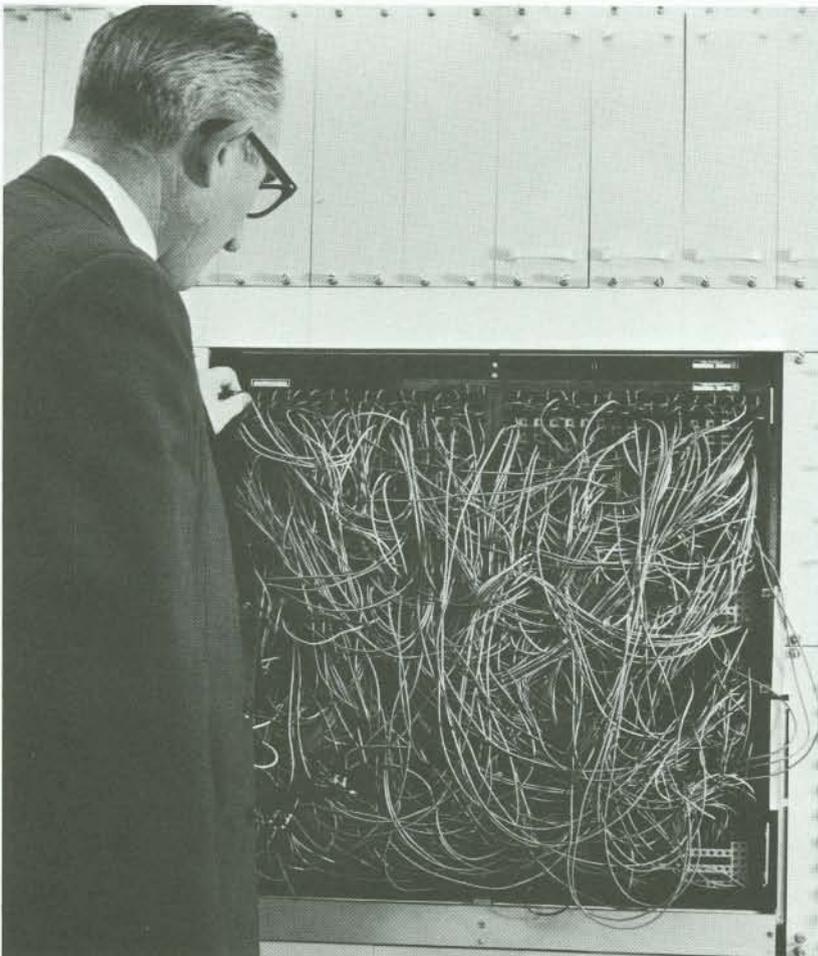
There are three main classes of computers—*analog, digital and hybrid*. An analog computer measures and compares quantities in one operation, but has no memory. A digital computer solves problems by counting precisely and sequentially and has a memory. The hybrid combines the analog and digital to take advantage of the best capabilities of each. Only a computer can calculate swiftly enough to analyze the forces acting on a rocket, keep pace with its progress in space, and recommend adjustments for speed and direction.

The 7094 is supported by the



*Hybrid computer is operated from this console.*

*Interconnecting analog elements are checked.*



7044 to provide precision and repeatability of data required for tasks such as flight trajectory and space environment representation on simulated missions. The 7044 serves as data controller for the information flow between the computers. The AD 256 console is designed to simulate those parameters of a system in which the frequencies are too high to be programmed digitally.

Until the hybrid was developed, it was impossible to attain the precise trajectory simulations in a one-step process. "The hybrid has greatly increased our capability by permitting us to acquire twice as much information in about half the time of the former method," says Quirk.

Two working mockups of manned space capsules are an important part of the facilities at the Simulation Center. Boeing engineers use the mockups in dozens of different situations, interpret the results and use these findings to ensure the highest reliability of the system for man. Without the hybrid, such complicated computation would take years, since the analog alone is not accurate enough, and the digital is not fast enough for such high-speed work. The Simulation Center occupies 25,000 square feet in the Huntsville Industrial Center, and includes an electronics laboratory.

More than 100 of the 130 people working in the center are college graduates and half of those hold advanced degrees, or are working on them at the University of Alabama's Huntsville campus.

Quirk typifies the new breed of mathematician. A graduate of the U. S. Naval Academy, he holds an M.S.E.E. degree from the University of Washington. Prior to joining Boeing, he had served as a professor of electrical engineering at the U. S. Air Force Academy, and as director of research for Comcor, Inc., at Denver, Colorado.

"This hybrid is just another step in man's progress towards learning how to count faster," he says. "Ten years ago, the type of work we are doing today was considered as far away as the moon. Now the hybrid can launch us on a moon mission every day." 

# ADVENTURES IN MANAGEMENT

## THE HORSE WHO HATED BOEING

**T**RAILS fanning out from a riding stable were confusing and the lone horseman was a stranger. In an hour, he was lost and ready to admit it. But he remembered a key fact, dropped the reins on the horse's neck and slapped his rump. Aloud, he said, "I'll just let him go—he'll know the way home."

The horse flicked a thoughtful ear, moved into a purposeful walk. The rider relaxed. Only when the horse crossed a paved road—which the horseman did not remember—was there a moment of surprise.

Thirty seconds later, there was another. The horse turned right, suddenly hunched ancient muscles, raced toward a fence, gracefully sailed over it. His rider pawed for the reins, sawed at the bit—and succeeded only in tripling the number of hoofmarks in the lawn.

Red-faced, the rider stuttered words for the woman on the steps

of the house. He said, "I am sorry . . . I thought . . . horses always go home . . . terribly embarrassing . . ."

But the woman only laughed. "I'm not," she said, "much surprised. I sold that old crow-bait to the stable two weeks ago. He *did* come home."

VETERAN of the law and the military, duck hunter and yachtsman, connoisseur of Japanese winter strawberries and diplomatic punches, Robert J. Murphy, Jr., has spent a lifetime collecting assorted facts—often pertinent to the aero-space business, his third career. Seldom do those facts let him down with such lack of aplomb as a horse's homecoming ways.

More often, they're most useful as Murphy—Boeing vice-president and manager of the company's Washington, D.C., office—moves from White House ceremony to

sales conference to Pentagon briefing, maintaining liaison between the Seattle-based company and its governmental and commercial customers. With a staff of specialists, Murphy advises the company of Washington's needs; keeps government and business experts aware of Boeing capabilities; appraises what is happening in United States or foreign governments today or may happen five years hence.

It's a super-reporter's job and Murphy, born in Summit, New Jersey, prepared for it by attending Wesleyan, Harvard and Rutgers universities, obtaining a bachelor of laws degree in 1933. Until World War II, he sharpened his fact-finding abilities—and his file of disconnected but valuable information—as an attorney and municipal judge in Summit. In the U.S. Air Force from 1942 until 1955, he rose to colonel, earned a Legion of Merit for helping to reconstitute the Japanese post-war aircraft industry—and picked up an appreciation of Japanese food and the ability to sit on his own feet during Japanese business or social occasions. Joining Boeing in 1956, he assisted in various foreign and domestic jet transport sales and, took over his Washington responsibilities in April, 1963.

Describing his successes, one associate says, "Bob starts each day with enthusiasm, and he ends it just as enthusiastic as he started. He keeps better informed than anyone in the office."

Another says, "You pick the spot—Dacca in East Pakistan or Sapporo in Japan or the Left Bank in Paris. Bob not only will know something interesting about it—but five minutes after he gets there, he'll be talking to some old friend."

The facts, for him, make every place home, and the friends make it livable. But there is one negative about which Murphy is positive. "You just," says he, "can't trust a dumb horse." 



**Repair of printed circuits is speeded.**

## **SOLDER SNIFFER**

By WESLEY ROBINSON

**S**OLDERING hair-sized wires to a printed circuit board the size of a ham sandwich is difficult.

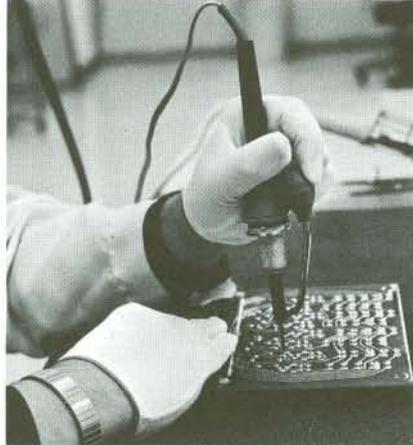
Even more difficult is the job of removing soldered connections from this electronic circuit. A plastic film over the circuit board must be cut through, the part loosened and the pinpoint of solder lifted cleanly from the surface.

This process is known as desoldering. Transistors, capacitors and resistors on Minuteman circuit boards occasionally must be desoldered and replaced.

When the first Minuteman circuit boards were returned to the shop for desoldering, a method was

used which was only partly satisfactory. The circuit board's plastic film was chipped away, a fluxed wire braid was placed over the exposed solder and a heated soldering iron pulled the solder into the braid.

Usually the solder came away cleanly. Sometimes, though, the wire braid was not lifted soon enough and would solder itself tightly to the circuit board.



*Removing a soldered connection from board is done in seven seconds. Device has three different tips.*

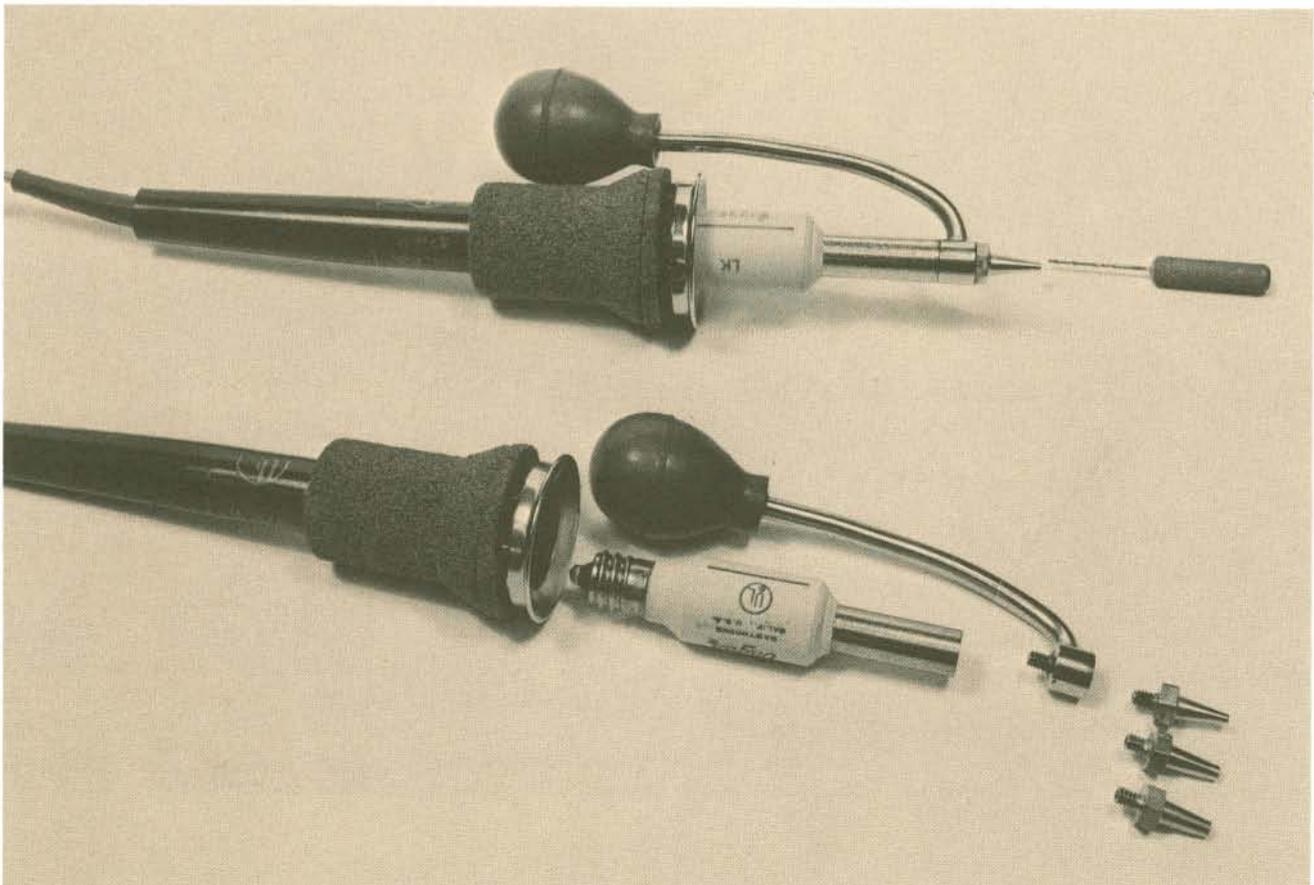
Manufacturing development engineers studied the problem and one of them came up with an ingenious tool called a Solder Sniffer. It works quickly and perfectly every time.

The tool is an adaptation of a standard pencil-type soldering iron. Instead of a straight soldering tip in the iron's heating unit, Boeing placed a small hollow adapter between heater and point, with a short length of stainless steel tubing from the adapter to a small rubber bulb.

Using a special hollow tip, the hot Solder Sniffer burns cleanly through the plastic film, melts the solder and sucks it completely off the board in one simple, seven-second operation.

Capillary action starts the solder flowing into the hot, hollow tip, but suction from the rubber bulb is what actually cleans the melted solder from the circuit board's surface. The Solder Sniffer never plugs up, since a simple squeeze of the bulb expels any solder remaining in the tip.

The tool would be a bargain at several times the low cost of making it. The Solder Sniffer virtually has eliminated ruined circuit boards and saves time as well. 





## How to boost business (and profits)

Take a short-to-medium range route, add Boeing 727 jets. Result: more passengers, more profits.

That's the record of airlines now flying the Boeing 727.

Since entering service, the 727 has elicited more passenger (and pilot) praise than any new airliner in years. It is also operating at load factors well above industry averages.

The 727 is also setting records for

reliability. One new 727, for instance, made 352 on-time departures without a single mechanical delay. The 727's performance is exceeding Boeing's original guarantees by as much as 12%. Its low operating costs and high yield make it, in the words of airline executives, "the most profitable airplane we've ever flown."

Boeing 727s are serving 70 cities on the routes of ten airlines. They have,

since entering service in February of last year, flown 42,375,000 miles, and have carried more than 2¾ million passengers. Already, 231 Boeing 727s have been ordered by these famous airlines: All Nippon, American, Ansett-ANA, BWIA, Eastern, JAL, Lufthansa, National, Northwest, PSA, South African, TAA, TWA and United.

**BOEING 727**