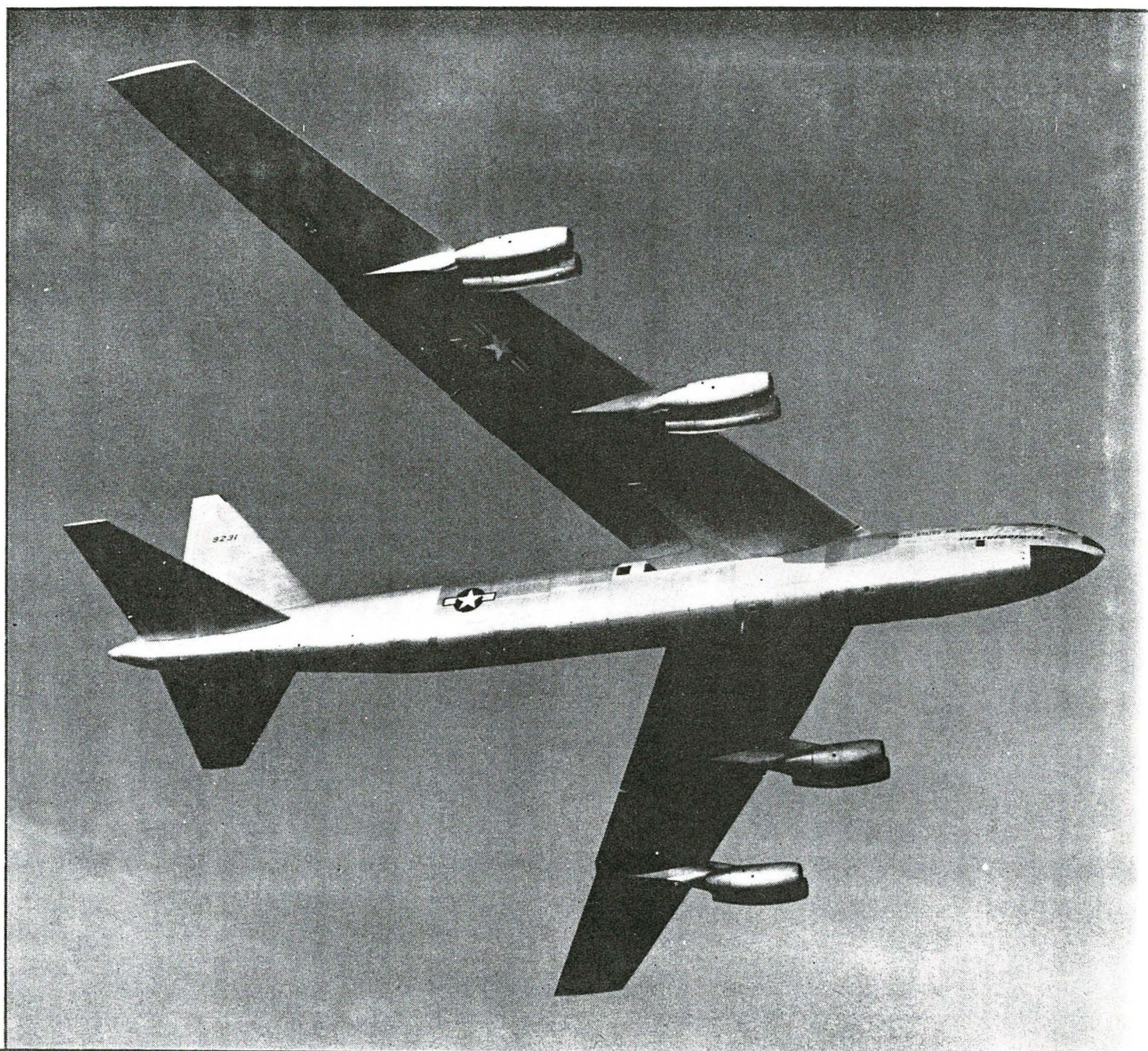


# BOEING B-52

The USAF's successor to the B-36 is the new Boeing B-52 Stratofortress. This huge aircraft has a span of 185 ft. and a length of 153 ft. and is powered by eight Pratt & Whitney J-57 turbojets. Note unique aileron position, between powerplant pods. Details are still secret.



AIRCRAFT Sept/52



taken over by most of the NATO nations themselves.

## Bird Watchers

Bird watchers take note: The DRB recently set up shop in the Jack Miner bird sanctuary at Kingsville, Ontario, where four radar towers were installed to determine the different effects large flocks of ducks or geese have on radar. The experiments were carried on for 30 days and the results have been classified by both Canadian and U.S. authorities.

## HMCS Labrador

Three helicopters are being carried aboard the HMCS Labrador, RCN Arctic patrol ship, which is now taking part in the seaborne supply of Dew Line sites in the eastern Arctic area.

Of the ship's three helicopters two are Bell HTL4's which are being used mostly for ice reconnaissance and ship-to-shore communications. The third, a Piasecki HUP, is being used mainly for the transport of personnel and equipment.

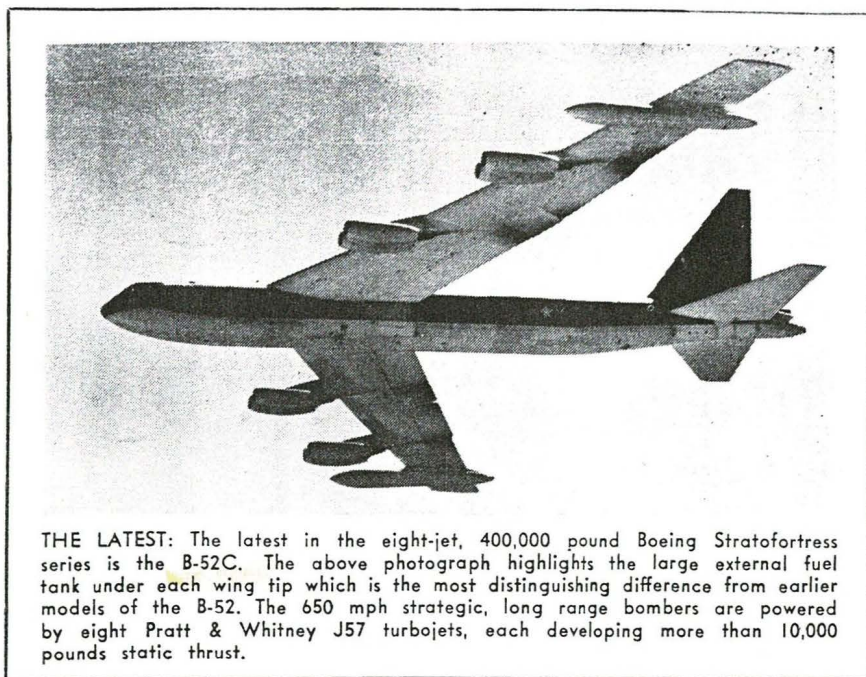
It is expected the Labrador's 1956 activities will be similar to those of last year. These include the exploration and charting of navigable routes to Dew Line sites, survey and selection of landing beaches and the escort of supply convoys to their destinations. In addition, the Labrador is continuing to carry out extensive scientific studies, beginning in the Hudson Strait. She is expected to be in the Arctic for about three months.

## Busy Year

The RCAF Transport Command flew a total of 15,063,710 miles during 1955, according to Minister of National Defence Ralph O. Campney, in a recent report to the House. Broken down into aircraft types the figures show that they flew as follows: Lancaster, 772,570 miles; North Star, 4,642,110 miles; C-119, 2,709,860 miles; Canso, 318,125 miles; Dakota, 1,797,860 miles; Expeditor, 417,615 miles; Sabre, 2,754,450 miles; T-33, 527,900 miles; Otter, 629,600 miles; Sikorsky S-55, 327,860 miles; Sikorsky H-34A, 15,210 miles; Vertol H-21A, 50,720 miles.

## 436 Moves

The RCAF Air Transport Command's 436 Squadron has been moved from Montreal Airport at Dorval, to Toronto's Downsview Airport. The move, carried out last month, was made



THE LATEST: The latest in the eight-jet, 400,000 pound Boeing Stratofortress series is the B-52C. The above photograph highlights the large external fuel tank under each wing tip which is the most distinguishing difference from earlier models of the B-52. The 650 mph strategic, long range bombers are powered by eight Pratt & Whitney J57 turbojets, each developing more than 10,000 pounds static thrust.

necessary by the lack of hangar accommodation at Dorval, following the recent fire which totally destroyed an RCAF hangar.

The squadron, which flies Fairchild Packets, has flown a total of 10,800 hours since its formation in 1953.

The move from Dorval follows the recently completed spring airlift of supplies to the weather stations throughout the Arctic, which was carried out in co-operation with 435 Squadron, stationed at Namao, Alta. To date, 436 Squad. has airlifted a total of 8,600,000 lbs. of freight and mail, as well as 13,000 passengers, not counting the dropping of some 5,500 paratroops during Army operations, all with an accident free record.

The command of the squadron will be taken over this month by Wing Commander J. T. McCutcheon, who will be relieving Squadron Leader R. K. Trumbley.

## Airlift

The 426 Thunderbird Squadron of the RCAF Air Transport Command has been assigned the task of airlifting some 100 service personnel from Dorval to Saigon, Indo China, during the replacement of officers and men on the Canadian Indo China Truce Commission.

The first North Star flight left Dorval on July 6 and was scheduled to arrive at Saigon on July 15, with 25 men and a quantity of freight, making stopovers at Gander, Nfld.; Lajes in the Azores; Gibraltar; Malta; Beirut, Le-

banon; Bahrein in the Persian Gulf; Karachi, Pakistan; and Calcutta, India. This is the third airlift to Saigon with previous exchanges of personnel being made in 1954 and 1955. Five round-trip flights, the last of which will consist of freight only, are scheduled. The next four will leave Dorval on July 27, August 17, September 7 and September 28.

## Australian Visitor

An RCAF North Star holds the honour of being the first aircraft of its type to visit Australia. The North Star visited Australia in June to deliver Ministry of Supply equipment to Edinburgh, South Australia. A stop was also made at Sydney. The North Star left Australia on June 26 for Canada by way of Fiji in the Pacific.

## Men in Motion

Summer is the heavy traffic season for the RCAF's Air Transport Command, which recently announced the completion of another mass airlift. This time the exercise involved the transport of some 500 officers and men of the 1st Field Engineer Regiment, RCE, from Edmonton, Alta., to Camp Gagetown, N.B., for "Exercise Morning Star".

The men travelled by rail to Edmonton from their permanent locations at Camp Chilliwack, B.C. and Victoria, B.C. Here they boarded C-119's of the 435 and 436th Squadrons. Seven aircraft were used in the operation.



## SAGE/ATC Integration

The non-profit Mitre Corp. of the U.S. has started a program known as "Satin" (for SAGE air traffic integration). Presently in the planning stages, the USAF and the FAA are working together on the integration of air defense and air traffic control.

Key to the integration lies in the large capacity AN/FSQ-7A computer which will enable the centres to fulfil their air defense role while at the same time providing en route control for civil and military aircraft moving along the nation's airways. Nine integrated centres are envisaged for the U.S. with a possible tenth for Canada.

## B-52H in Production

Boeing Airplane Co. has received an official go-ahead from the U.S. government to produce an advanced version of the B-52 Stratofortress. The first of the new B-52H models is expected to roll off the line in early 1961.

Having a supersonic air-to-ground missile launching capability, the B-52H is expected to bridge the gap between the manned bombers of today

and the more exotic aircraft now on the drawing boards for future production.

One of the major changes in the new model calls for Pratt & Whitney turbofan engines which will stretch the global bomber's 9000-mile plus unrefuelled range by a good margin. Plans call for the B-52H to be phased into the Boeing assembly lines with the B-52G which is now operational with SAC and which carries two GAM-77 air/ground missiles.

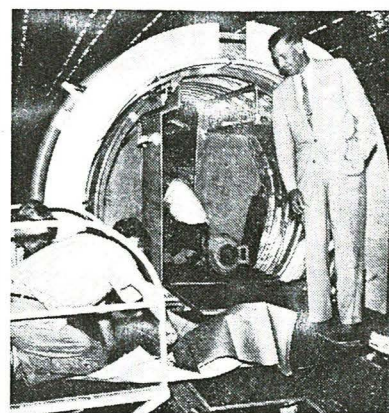
## Letters to the Editor

### Noorduyn Honored by CAI

Sir:

Your editorial "A Debt Unpaid", appearing in your September issue, deplores, with some justification, the lack of Canadian recognition of Mr. Noorduyn's remarkable achievement in the design of the Norseman.

Early this year, the Council of the Canadian Aeronautical Institute decided to make Mr. Noorduyn an Honorary Fellow, the highest honor that the Institute can confer. In accordance with custom, such honors are announced at the Institute's Annual General Meeting, which was held this year in June. Unhappily Mr. Noorduyn died before the Meeting took place; but the announcement was made nevertheless, and Mr. Hammill of Walter Kidde & Company of Canada, an



DoT JETSTAR: Jack Hunter, superintendent of flight operations with the DoT, watches men working on a special mock-up of the JetStar at Lockheed Aircraft's Marietta, Georgia plant. The Department will receive one of the first JetStars to come off production line in 1961.

old friend of Mr. Noorduyn's family, accepted it on their behalf. It was perhaps unfortunate that this Meeting was held in the remote fastnesses of Cape Breton (in connection with another historic event) and consequently this tribute from the aeronautical engineers of Canada did not receive very much publicity.

I mention this, not to suggest that our debt to this brilliant designer has been paid, but to point out that some formal honor has been accorded to him in Canada by those who, I submit, could best appreciate his genius.

H. C. Luttman, Secretary,  
CANADIAN AERONAUTICAL  
INSTITUTE.

Ottawa.

### Limit of Liability

Sir:

... In reply to your editorial "Well, Why Not," Alastair [Paterson] has done his usual excellent job of tearing away the cobwebs that so often surround this particular problem and lead to a totally wrong understanding of it. Although I would not be in favor of any attempt being made to introduce such a limitation into Canadian domestic aircraft operations (because I think it would be an utter waste of time) there might be some merit in just such an attempt in order to get on record a considered opinion by some responsible investigating body to show just why this is not a practical thing.

I say it would be an utter waste of time because there is a readily available and economical alternative to it — adequate insurance. Any argument in favour of a limitation is going to boil down to economic necessity from the operator's standpoint — in other words, he can't afford enough insurance. That is quite wrong, as many operators who do carry adequate insurance well know.

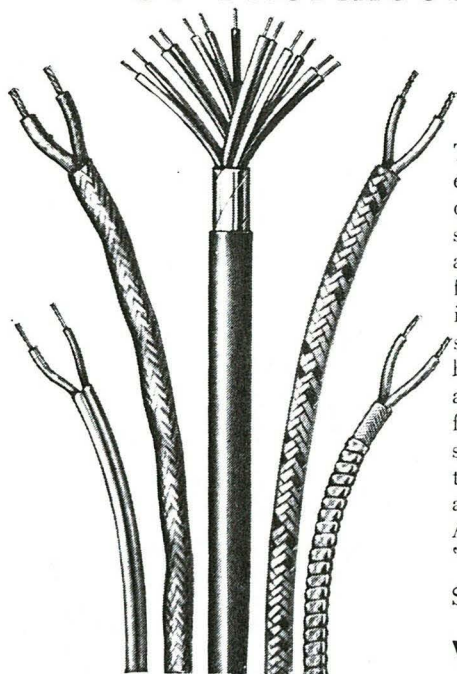
What do I mean by "adequate insurance"? Well, you pick it — \$100,000 per person — \$250,000 per person? — It only requires looking at Court judgments to see what amounts have been awarded individual persons within the last little while. Very, very few exceed \$100,000.

Here's the point: If an operator pays \$100 for his insurance with a \$20,000 limit, he would pay \$114.50 for insurance with a \$100,000 limit or he would pay \$144.50 for insurance with a \$250,000 limit.

I can't see where that is an insurmount-

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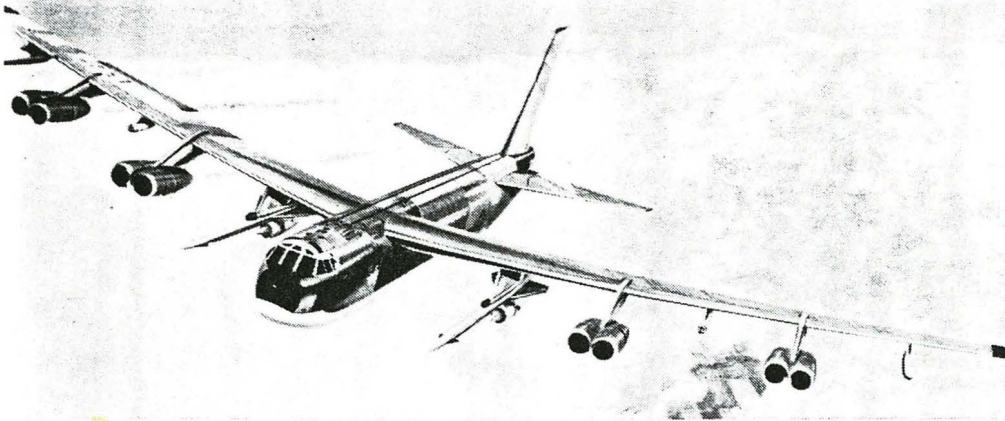
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# The Airborne Services



**LATEST IN BOEING B-52 SERIES** is B-52H, shown in drawing above. Powered by eight P & W TF33 turbofans, the "H" will have a range in excess of the "more than 9000 miles" of the B-52G. Two Hound Dog missiles will be carried. Pods between engines hold rockets for use as penetration aids.

## Defence Budget Cut

The Government has slashed the 1960-61 defence budget by six per cent or nearly \$100 million.

It presented to Parliament Feb. 4 a defence estimate of \$1,596,272,266, a decrease of \$98,921,740 from the current fiscal year which ends March 31. Is is the smallest defence budget since 1951-52.

For the armed forces, the real bad news was the 13 percent chop in estimated expenditures on weapons and equipment. This was a cut of \$44 million to \$280 million.

Cost of maintaining the forces and their present weapons was estimated at \$1,118,353,453, a slight decrease of \$10 million effected through lower expenditures on repair and upkeep of equipment.

Cleanup cost of the Arrow now is estimated at less than \$45 million with \$1.5 million going toward this cost in the 1960-61 budget.

Other amounts contained in the estimates: \$75 million for the CF-104 program; \$37 million for the CL-44; \$22 million for Bomarc-SAGE-radars; \$7 million for the Argus; \$7 million for the Albatross; \$28 million for RCAF electronics, mainly TACAN and UHF; \$12 million for Navy Electronics, mainly sonar; \$1.7 million for naval aircraft.

There is no provision in the estimates for a new RCAF manned interceptor, Army helicopters or the La-crosse ground-to-ground missile.

The total for RCAF aircraft and engines is slashed to \$131,698,000 from \$164,817,000. The amount for Defence Research Board development is cut to \$14,216,000 from \$21,565,000. The total for construction is down to \$102 million from \$124 million.

Totals by services with 1959-60 figures in brackets: Navy, \$271,300,557 (\$287,492,000); Army, \$421,297,000 (\$448,853,000); RCAF, \$767,929,000 \$811,304,000).

## F-106 Darts in Service

By autumn 1960, some 13 USAF squadrons in the North American air defence system (NORAD) will be operating the supersonic F-106 Delta Dart. Six tactical squadrons are now equipped with the long-range all-weather Dart, and seven more will be flying the Convair-built fighter by September.

Next squadron in line for the new equipment is the 5th Fighter Interceptor Squadron at Minot AFB, Minot, North Dakota. The 5th will receive its Darts in March.

## Guessing Game

Speculation has started on possible successors to the RCAF's two top posts those of Chief of the Air Staff and Deputy Commander of North American Air Defence Command, both of which may become vacant this year. The current CAS is Air Marshal Hugh Campbell, who was appointed to the post in September of 1957, the same month in which Air Marshal C. R.

Slemon went to Colorado Springs as NORAD's second in command. Previously, A/M Slemon had been CAS.

Ottawa speculation has it that Air Marshal (Acting) C. R. Dunlap, now with NATO as Deputy Chief of Staff Operations at SHAPE headquarters in Paris, may be appointed to either the CAS's job or that of NORAD Deputy Commander. Another name mentioned in connection with the CAS post is that of Air Vice Marshal John A. Easton, the RCAF's Air Member for Technical Services since 1958.

In earlier sessions of name guessing, the speculators have had A/M Slemon retiring from the service, with A/M Campbell succeeding him at NORAD.

## Air Cadet Ceiling

Although most Air Cadet squadrons in Canada have long lists of boys waiting to join up, the Government has so far refused to increase the ceiling figure of 25,500 cadets. One possible reason that competition is keen is the flying scholarship plan by which cadets are given flying training to private pilot level. Last year, this plan graduated a total of 387 pilots.

Of these, the RCAF sponsored 250 while the remainder were sponsored privately by funds from the Air Cadet League itself. Some \$59,000 of squadron funds was spent in this way, all of it raised by local campaigning.

## Postings & Careers

•Group Captain Leonard A. Costello has been appointed Chaplain General of the Armed Forces (Roman Catholic) in the rank of Air Commodore. He succeeds the Right Reverend Ronald MacLean who retired at the end of last month. For the past 14 years, A/C Costello has been the RCAF's Director of Religious Administration (RC).

•Lt.-Cdr. K. S. Nicolson has been appointed to take command of 870 Squadron of the RCN. Composed of Banshee all-weather fighters, the squadron normally operates from either HMCS Shearwater, or the aircraft carrier HMCS Bonaventure.

•Lt.-Cdr. W. J. Walton has been promoted to the rank of Commander and appointed in command of the RCN's VS 880 Squadron. The squadron is composed of Tracker ASW aircraft and normally operates from HMCS Shearwater or the aircraft carrier HMCS Bonaventure.





**FATE OF SUPERSONIC B-70** strategic bomber is in jeopardy as a result of drastic cuts in U.S. Government funding for the project. USAF states that there is a positive requirement for the 2000 mph weapon system, being developed by North American. Program has been cut back to one prototype.

## Accident Research Lab

The National Research Council is planning a special research drive to reduce aircraft accidents.

A proposal being discussed by the Council and DoT Air Services calls for the establishment of an accident research laboratory by NRC's National Aeronautical Establishment.

The laboratory, to be located at Up-lands, will be equipped to investigate the causes of all types of aircraft accidents. After the cause of an accident has been determined the laboratory will study ways to prevent mishaps of a similar nature in the future.

The laboratory's work will be sufficiently broad to encompass research into accidents believed to have been caused by human error.

F. R. Thurston, NAE director, said the laboratory will not supplant accident research conducted by DoT and the RCAF. Its job would be to conduct research at the request of these two agencies, Canadian air carriers and others.

NAE has been doing accident research for some time. However, when it is asked to make a study, men on other research projects must stop what they're doing. The new laboratory will have its own staff.

Present NAE studies include ways to reduce airport noise and improve

air traffic control and airport lighting. Research has also started on aircraft anti-collision techniques. It is attempting to develop improved aircraft skis and is investigating the use of plastics to make temporary repairs to damaged aircraft floats.

## Snow Goose Flight in '61

Defence Research Board scientists are hoping to fire a new high altitude research rocket known as Snow Goose from the rocket range at Fort Churchill, Man., in 1961.

According to news reports, the Snow Goose is planned by the DRB as a successor to the Black Brant rocket, four of which were fired last September from the northern Manitoba base.

The two rockets will be the same size but whereas the Black Brant was fired to test solid propellants developed by the DRB's establishment at Valcartier, Quebec, the Snow Goose will be used to lift some 150 lbs. of research equipment and instruments into the upper atmosphere.

## New Winnipeg Terminal

Details for the construction of a new \$10 million air terminal building for Winnipeg International Airport, have been announced by Transport Minister George Hees. The building is scheduled for completion by 1964.

The structure will consist of two

integrated units: an administration building for the DoT's operational services such as met', telecom' and air traffic control; and the terminal building proper. Both units will be two storeys high, the control tower rising several storeys above the administration block.

Tenders for the first stages of construction including water, sewerage, excavation and foundation have been invited and excavation will begin as soon as weather permits. Tenders for the structural steel will be called in late winter or spring and the balance of the work should go out to tender before the end of the coming summer.

## Douglas Sells Caravelles

The prospect of Douglas Aircraft Co. building the short-haul DC-9 pure jet airliner has been scuttled by the announcement that Douglas and France's Sud Aviation have reached an agreement covering the U.S. sales and service and possible production of the Caravelle.

Under the agreement, Douglas will provide sales support, customer service and parts support, and customer ground and flight training. In turn, Sud Aviation will have sales rights for the DC-8. News of the agreement preceded by only days the announcement that United Air Lines have ordered 20 Avon-powered Caravelles with an option on 10 more.

## VR Airport Authority

Vancouver's new airport authority will be a five-man body if proposed legislation is approved by the British Columbia legislature now in session.

City council is seeking legislative approval of the authority in case aldermen decide to finance new terminal construction. It is proposed the authority issue its own bonds to raise money for the project.

Vancouver is far behind schedule now with plans for a \$13,500,000 jet-age passenger terminal at the airport.

The present temporary terminal buildings were designed to serve no longer than 1961, when jet travel will be in full swing on the west coast.

But it will be at least four years before the new terminal is completed, and only then, if an immediate start is made on engineering plans. About \$100,000 is needed immediately.

Though taxpayers are not required to approve the city forming an author-



# From the Starting Gate

In a record flight on April 26, 1971 Lt. Cols. Thomas B. Estes, pilot, and Dewain C. Vick, RSO, flew their SR-71 15,000 miles at speeds of more than Mach 3 and at altitudes above 80,000 feet.

For the flight the Air Force Association presented the 1st Strategic Reconnaissance Squadron the David Schilling Award for Flight in 1972. The record flight also earned Estes and Vick the MacKay Trophy and the Harmon International Aviator's Trophy.

On September 1, 1974 Maj. James V. Sullivan and Noel F. Widdifield broke the existing record of four hours, 46 minutes for a transatlantic crossing between New York and London.

Their time was an amazing one hour, 55 minutes.

After remaining in England for eight days and exhibiting the SR-71 during the first international air show at Farnborough, the SR-71 returned to its home base. On its return, another crew—Capt. Harold B. (Buck) Adams and Maj. William C. Machorek—established a speed record where none had existed before: three hours, 47 minutes between London and Los Angeles, a trip that takes the average commercial flyer more than 11 hours to complete on an airliner.

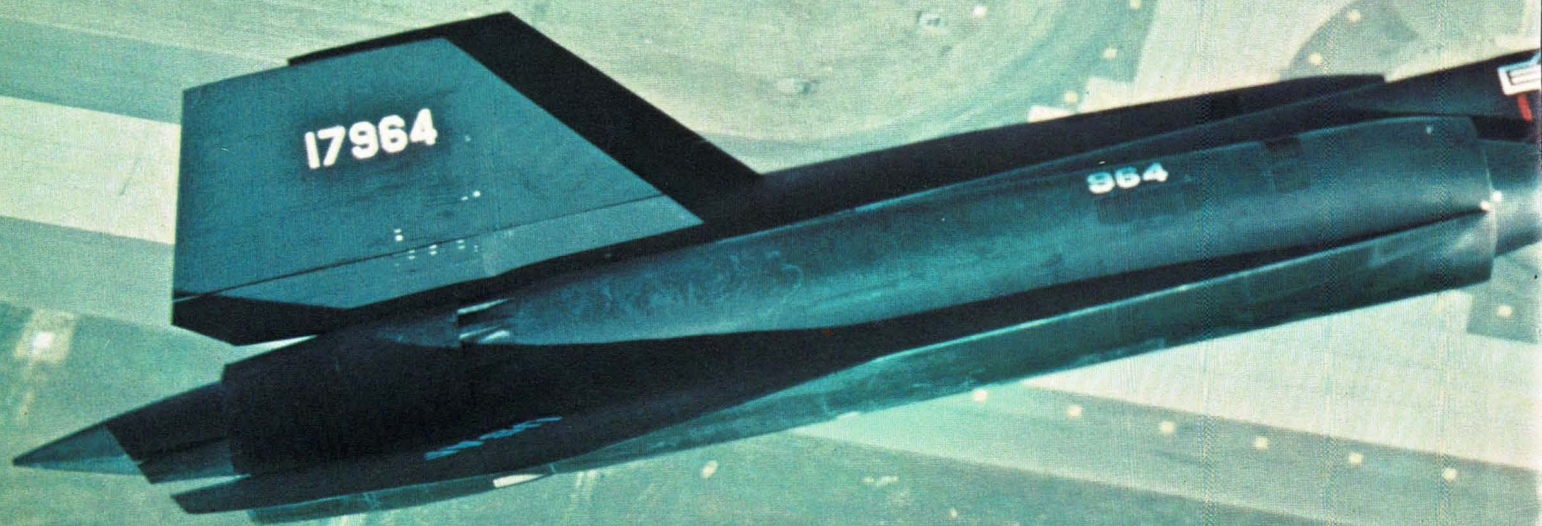
The SR-71 made headlines again on July 27 and 28, 1976 by shattering six world absolute and class speed and altitude records previously held by Soviet MiG-25 and U.S. Air Force YF-12 aircraft.

The first record-setting flight came early in the morning of July 27 when Maj. Adolphus H. Bledsoe, Jr. and John T. Fuller


flew the *Blackbird* at 2,092 miles an hour. The flight set new marks for the world absolute and class records for speed over a closed circuit course. The previous record was 1,853 mph held by a MiG-25 *Foxbat*.

Flying 2,193 mph on July 28, Capt. Eldon W. Joersz and Maj. George T. Morgan set world absolute and class speed records over a 15-25-kilometer straight course. The previous record was held by the YF-12A, prototype of the SR-71.

Capt. Robert C. Helt and Maj. Larry A. Elliott flew to 85,069 feet on July 28 to set world absolute and class altitude records for horizontal flight. That record was also previously held by the YF-12A.







glider-like wings seem short in comparison.

While performing similar missions, each of the two highly specialized aircraft is unique. And both require some of the most exacting, specialized support provided anywhere in the Air Force's inventory of 52 aircraft.

Launching and recovering the exotic *Blackbird*, and its companion ship, the *Dragon Lady*—as the U-2 has been dubbed—is a round-the-clock mission that demands hard work and superior skills from members of the 9th SRW's maintenance and supply units, and from the busiest Physiological Support Division (PSD) in Strategic Air Command.

(Continued on page 26)

Both special and unusual skills are necessary to ready the *Dragon Lady* and the *Blackbird* for action. For no one goes . . .

# Where the High

# Flyers Go

by James A. George  
photos by TSgt. Herman J. Kokojan





**LEFT:** Physiological Support Division technician Sgt. Loreli Maslen tests a helmet during preventive maintenance checks.  
**ABOVE:** PSD technician Sr. Amn. Douglas Snavelly checks operation of the high altitude pressure suit worn by Maj. Warren Pierce.



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effectiveness for the Canadian defence dollar.**

TOP PHOTO: YF-16 launches AIM-7F Sparrow air-to-air missile during recent tests at China Lake, CA.  
(Current USAF requirements for the F-16 do not include radar missile capability, unlike Canada  
and other nations now considering the F-16 as a replacement fighter.)

BOTTOM PHOTO: F-16 takes off at Edwards Air Force Base, CA., demonstrating its load capability  
for 18 MK-82 bombs, missiles and other ordnance.

## **GENERAL DYNAMICS**

Fort Worth, TX 76101



The U-2, for example, is the only aircraft in the free world that uses fallaway, "pogo stick" wheels to help it taxi and take off. It is also the only aircraft in the Air Force that is "chased" by high-speed pickup trucks during its landing phase. Every landing is video-taped for later review by its pilots.

The SR-71, on the other hand, is the only Air Force aircraft that "grows" during its climb to the thin atmosphere above 80,000 feet. Its skin expands to its seals during flight—from six inches to a foot.

Strange as it may seem, both of these high flyers were designed by the same man, Clarence L. (Kelly) Johnson, and built by the Lockheed Aircraft Corporation.

Pilots for the two completely dissimilar aircraft are hand-picked, experienced volunteers who have

undergone intensive preselection screening and flight tests. Capt. Boyer is typical of the U-2 pilots, who often spend long hours completely alone at altitudes that place them physically and emotionally out of touch with their normal ground environment for long hours.

For an hour and a half, he had sat in a reclining chair in the PSD dressing room adjacent to the Beale AFB flight line. But he wasn't just resting; he was prebreathing 100 percent oxygen inside his sealed helmet. The U-2 cockpit is only pressurized to 28,000 feet.

Capt. Boyer had reported to the PSD building much earlier and had received a preflight physical checkup by experienced PSD technicians. Then, after being fed a

high-protein, no-fat steak breakfast prepared by a cook assigned to the unit, he had reported to the dressing room. There, a pair of physiological support technicians and a supervisor had helped him get into his high-altitude pressure suit. He had greeted them in his two-piece long johns, the latest thing in comfort wear for those who live inside pressure suits while prowling the high skies.

The PSD technicians had already inflated Capt. Boyer's suit on a tester and had checked it carefully for possible leaks, tears, or malfunctions. The U-2 pilot sat down on a bench and began the dressing sequence followed meticulously by the technicians.

"Every U-2 and SR-71 aircrew member has two of these suits," explained SMSgt. Manuel H.

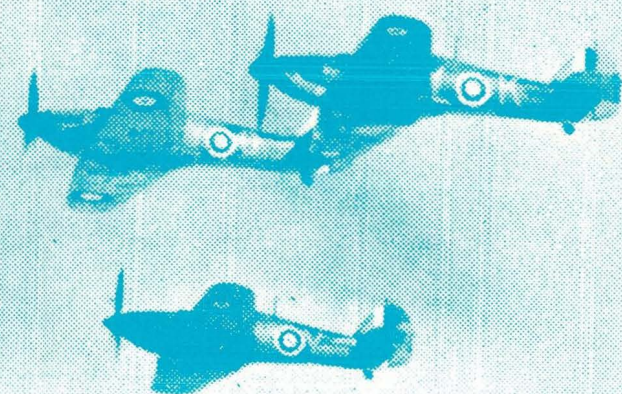




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Gomez, Superintendent of the PSD. "Each suit is fitted exactly for the individual."

Gomez, a veteran of the physiological support and life support systems career fields, spent two years with the U-2 unit at Davis-Monthan AFB, Ariz., before the squadron was moved to Beale AFB and renamed the 99th Strategic Reconnaissance Squadron.

"Our technicians are from two career fields," he explained, "but except for minor variations, both the 911XO (physiological support) and 922XO (life support systems) technicians perform our primary PSD function—getting the high-altitude pilots ready for launch and recovering them when they return."

Lt. Col. Lester E. Hatcher, Chief

of the PSD, explained that the 911XO specialists also operate the unit's altitude chambers, while the 922XO technicians specialize in suit equipment maintenance and repair. "But here," he added, "everyone trains in all phases of both career specialties."

It takes about a year for the technicians to complete all phases of PSD training, although most are ready for launch and recovery operations within two months. "That's our primary mission," Manny Gomez said. "They learn that phase of the training as soon as they report to us."

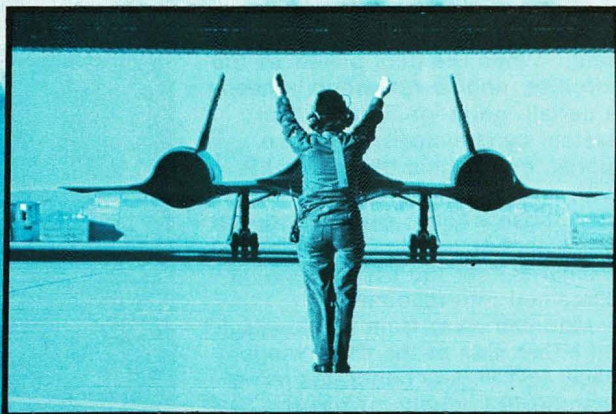
Each pilot is dressed and readied for a flying mission by two technicians and a supervisor, he explained. "In the case of the SR-71, that means two technicians for the pilot and two for the RSO,

with a supervisor closely observing both teams." Like the wing's high-flying pilots and RSOs, the PSD technicians are hand-picked for their jobs.

When Capt. Boyer was ready to leave the gleaming, white stucco building that houses the altitude chambers, flight suit storage section, and suit maintenance and repair branches, he was accompanied by his trio of haberdashers to a waiting PSD van. One of the technicians slid behind the wheel and the four men moved out to the U-2 parking ramp. There was little talk on the way, each caught up in his own thoughts.

No one in the bustling U-2 parking ramp area spoke of the mission ahead, either. Few except Capt. Boyer and his mobile control

**RIGHT:** Capt. Richard Boyer receives final instructions from Maj. William Evans in the PSD van prior to the U-2 mission.  
**BELOW:** A crew chief directs an SR-71 out of the hangar after engine start-up.





officer would have had any inkling of what that mission would be. The comings and goings of the wing's surveillance aircraft are usually like that. Lt. Col. Jerry Sinclair, Commander of the 99th SRS, was on hand to observe preparations.

Capt. Boyer was prepared, having been briefed the night before. His U-2 was being readied for the vitally important mission. Crew chiefs and maintenance specialists swarmed over nearly every inch of the plane to assure its peak condition for the flight.

Capt. Boyer, a veteran U-2 pilot, rested in the van and reviewed his mission charts while Maj. William Evans climbed into the cockpit and performed the final portions of the preflight inspection for him.

"As the mobile control officer and mission monitor," Capt. George M. Crawford, a T-38 pilot assigned to the 9th SRW, explained, "Maj. Evans performs the complete preflight." The mission pilot, he said, remains in the van until the aircraft is ready and it's time to launch the *Dragon Lady*. "It's all but impossible to preflight when you're in that pressure suit," Capt. Crawford added, tapping his pipe bowl against a boot heel for emphasis.

"Maj. Evans just signaled ready," a PSD technician told Capt. Boyer, and the pilot nodded and moved out of the van with his trio of PSD supporters. He climbed the metal ramp up to the cockpit and lowered himself into position. There, the PSD team hooked him into his aircraft oxygen system, the ejection seat apparatus, parachute harness, and other vital systems that would sustain him during his nine-hour flight.

Not until all systems were "go" did they pat him on the shoulder, give him a thumbs-up, and return to the van. They would follow the U-2 as it taxied to the end of the runway, and they would remain nearby until the aircraft climbed out of sight. They would also be on hand when Boyer returned.

At the end of the runway, the long, sleek U-2 paused as the ground crew pulled the pins on the pogo stick wing wheels that had been used to taxi the aircraft.

"The wing starts 'flying' as soon as the aircraft rolls," Maj. Evans explained. "The pogos keep the wings horizontal and as soon as

the U-2's main bicycle gear rotates [leaves the ground], the 100-pound pogos fall away."

"It's a similar operation when the SR-71 returns from a flight and lands," Capt. Crawford interjected. "The pilot pops a landing chute after touchdown and when it's released, a crew follows behind to pick up the chute, its harness package, and the heavy rubber bands that keep the chute properly folded during storage."

Even on the ground, the stove-dark SR-71 presents an awesome picture of pure power. As four physiological support technicians and a PSD supervisor integrated Maj. Peters and his RSO into the *Blackbird's* life support systems, maintenance specialists inspected its fuel cells, seals, nacelles, rudders, and other vital parts.

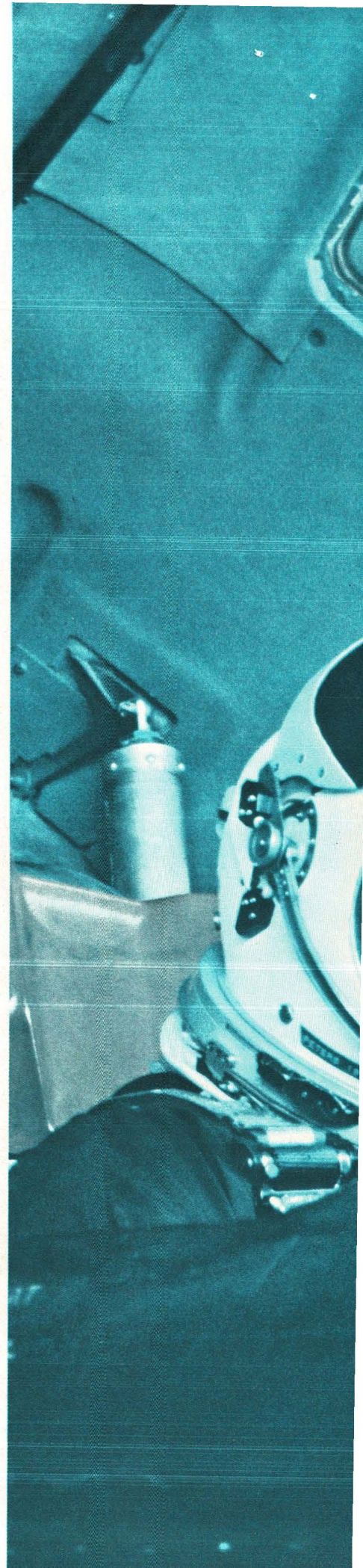
"It carries a wide variety of observation equipment," Capt. Crawford explained. Under normal conditions the SR-71 can fly from Los Angeles to Washington, D.C., a distance of more than 2,000 miles, in just over an hour. "It can also survey 100,000 square miles of the earth's surface during that hour," Capt. Crawford added.

Constructed largely of titanium, which withstands the extreme temperatures and forces of high-Mach flight, the *Blackbird* is 107.4 feet long, 55.6 feet wide, and stands 18.5 feet from the ground to the tips of its slanted, twin vertical stabilizers.

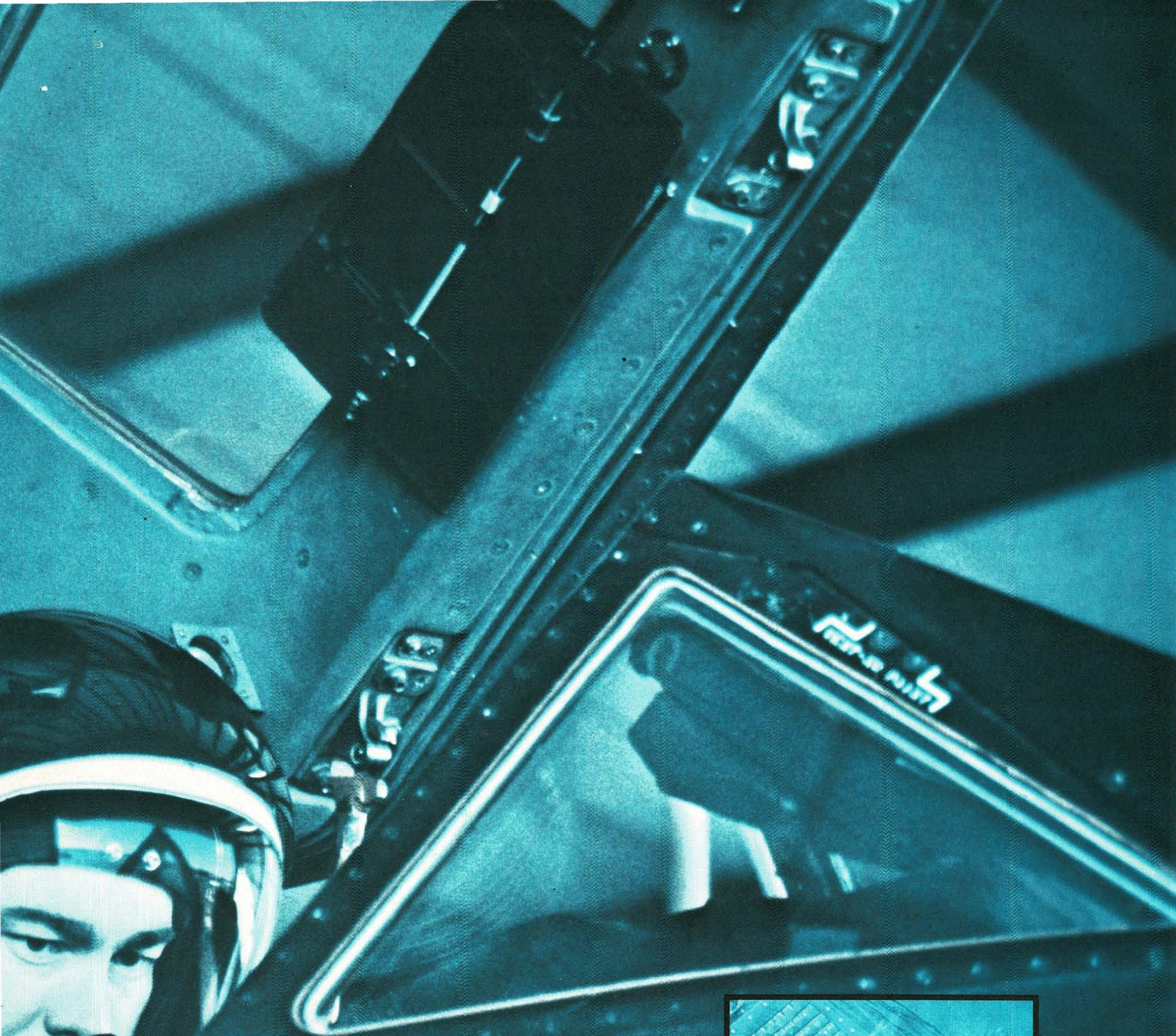
"She's a beauty," said TSgt. Alan Anderson, on hand to provide additional maintenance help if required. He explained that each of the SR-71's two J-58 power plants is started by a pair of start carts powered by Buick engines that turn the turbines in the J-58s.

"But actual ignition is by a chemical process," TSgt. Anderson said. "When the pilot advances the throttles, engine rpm soon exceeds a certain point igniting the fuel system by chemicals." As if on signal, one engine blasted to life with an ear-hammering roar that sent those without ear plugs or ear protectors scurrying for shelter. Moments later the second engine screamed into readiness.

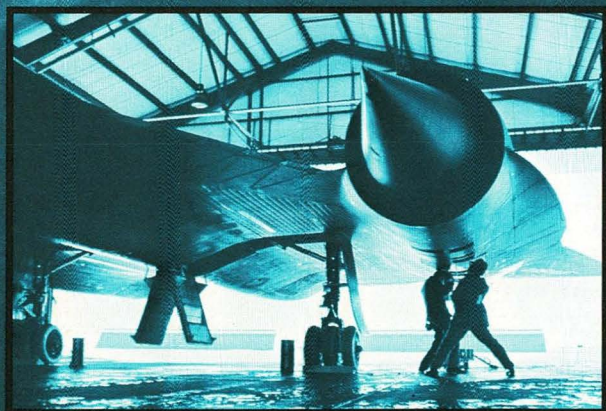
Mounted away from the fuselage on either side of the delta wings, each J-58 engine generates more than 30,000 pounds of thrust.







Maj. David M. Peters prepares for his SR-71 solo flight with a radar systems operator while 9th Strategic Reconnaissance Wing maintenance technicians prepare the *Blackbird* for its mission.





Much of the sleek speedboat-shaped fuselage is occupied by fuel cells, and by space for a variety of photographic and electronic sensors.

With both engines running in the open hangar and the hydraulics systems functioning, the busy crew chief and maintenance assistants quickly began to "clean up" the SR-71 for Maj. Peters' solo flight. They methodically checked circuit breakers, inspected and closed panel access doors, and removed engine start cables and external power equipment.

On the cockpit ladders, PSD technicians pulled the safety pins on the ejection seat systems. Then the crew chief visually checked the drag chute door, closed the canopy, and climbed down to disconnect all remaining forms of

power and communication cables. Within moments the *Blackbird* moved out of the hangar under the crew chief's guidance.

"It's almost a parade," PSD supervisor TSgt. David S. Weir remarked. The SR-71 was preceded by one pickup truck with flashing lights, and followed by another carrying the cockpit access ladder. The PSD van and other vehicles fell into place as the *Blackbird* moved toward its starting gate like an anxious thoroughbred.

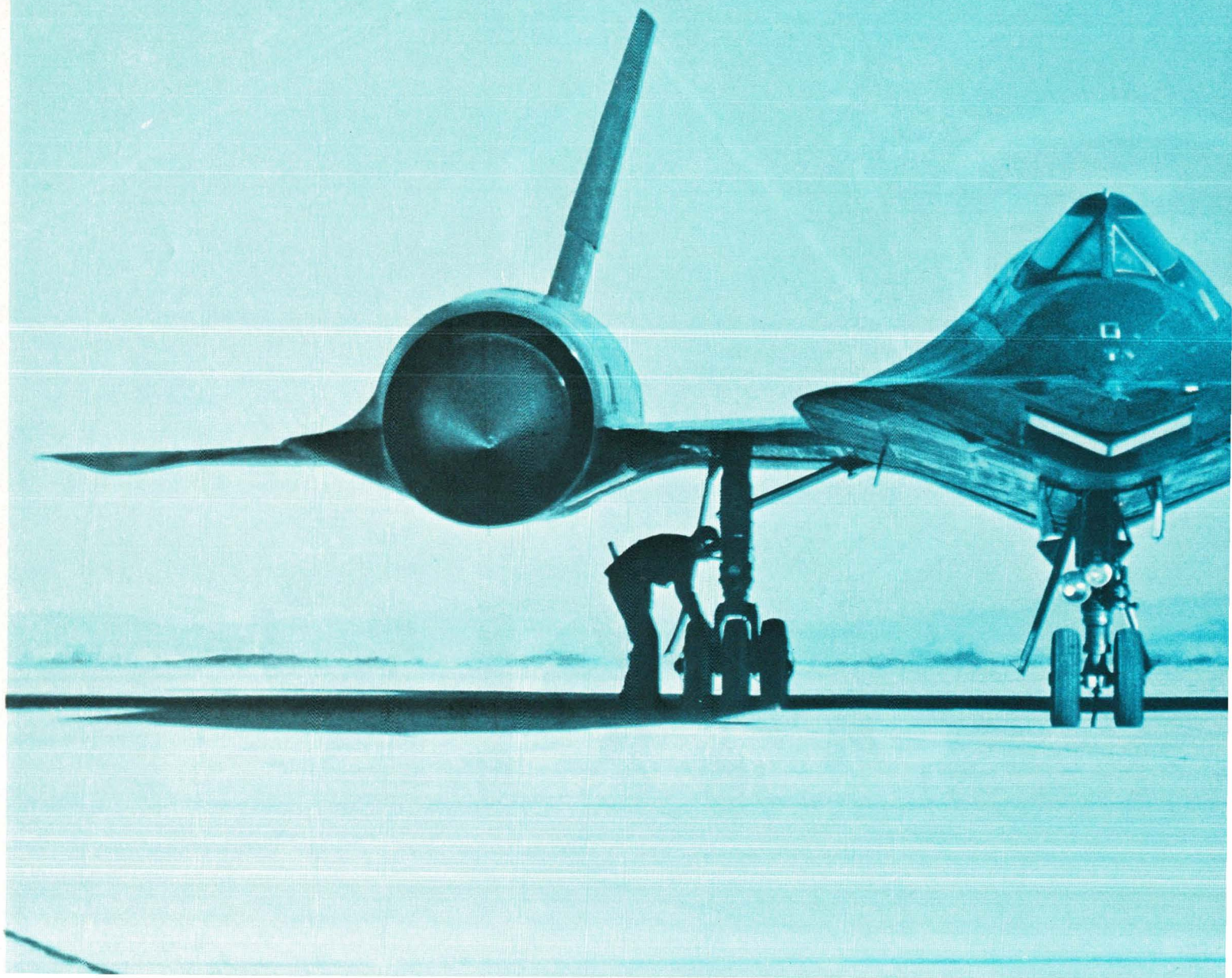
"I can never look at that airplane without being impressed all over again," Capt. Mike Crawford said of the futuristic design of the power-rich SR-71. The faces of every other pilot and 9th SRW maintenance man in the immediate area mirrored his words of praise.

Col. John W. Fenimore, the

wing's Deputy Commander for Operations, expressed a glowing pride in the unit's aircraft, its highly skilled maintenance specialists, the aircrew members, physiological support technicians, and everyone else involved in the operation and support of the wing's unique mission.

"We're constantly sitting on 'go,'" he said. "We may be tasked with high-altitude photographic or air-sampling missions, with either of our two special birds, and on short notice. And our people get little public recognition," he added, "yet this is probably the most fantastic flying organization in the world."

Nobody who comes in close contact with those who fly and support the high flyers would doubt the colonel's comments.

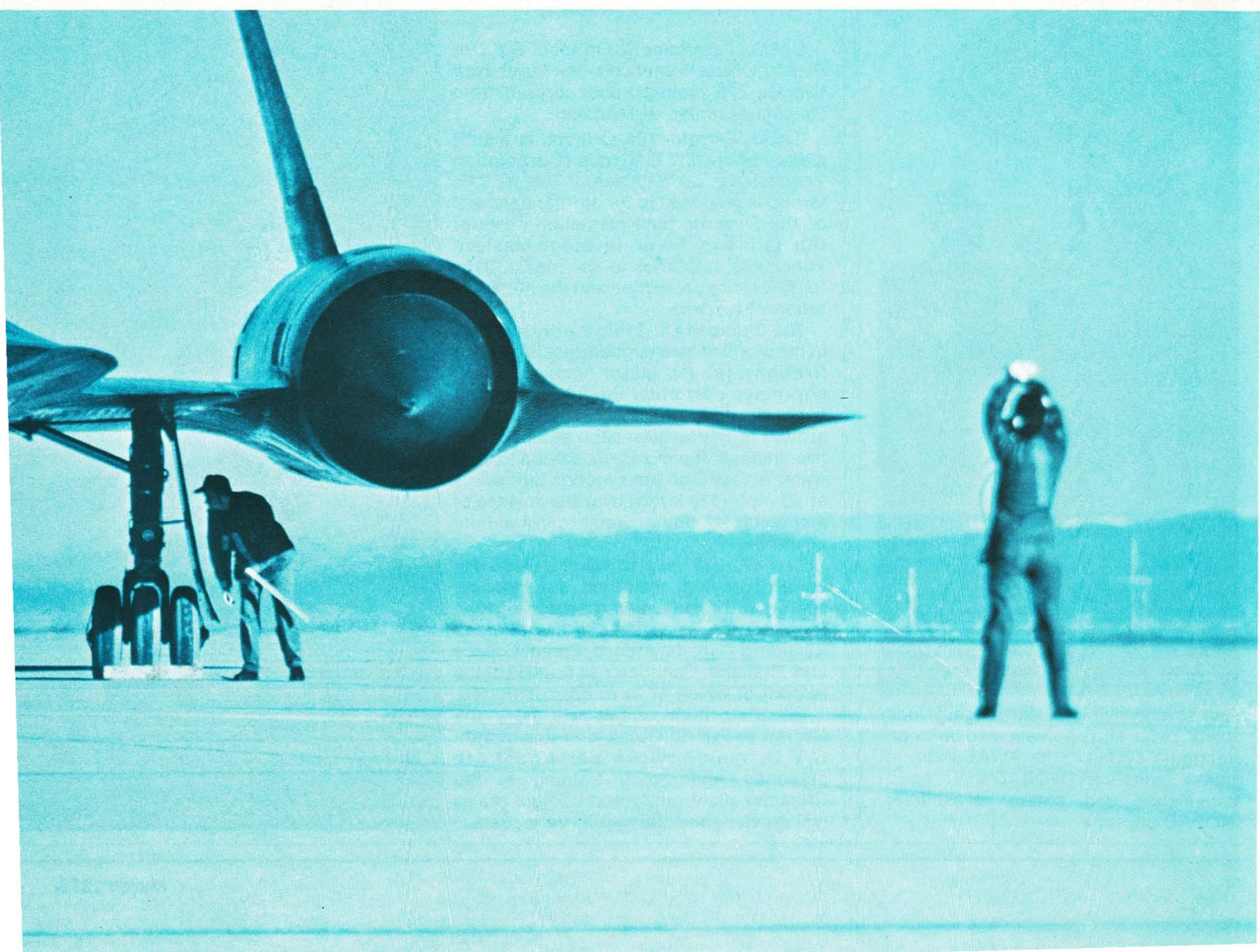






#### NAVY GETS FIRST HORNET

The first McDonnell Douglas F-18A Hornet for the U.S. Navy and Marine Corps arrives at the Naval Air Test Center, Patuxent River, Md. The Navy and Marine Corps intend to procure 811 F-18A Hornets to replace F-4 fighter and A-7 attack aircraft.





## PLANE FACTS



### AWACS ON NORAD ALERT

Adding a new dimension to North American Air defence in 1979 are E-3A Sentry AWACS (Airborne Warning and Control System) aircraft. Canadian Forces Lieutenant General Kenneth E. Lewis, right, deputy commander in chief of NORAD, is briefed on the capabilities of the new airborne system by U.S. Air Force Major General John L. Piotrowski, left, commander of the 552nd AWAC Wing, and Colonel James W. West, commander of the NORAD detachment at Tinker AFB, Okla.



With its high-flying and far-ranging "look-down" radar and sophisticated on-board electronic systems, the AWACS aircraft greatly enhances NORAD's air space surveillance and control capabilities. (NORAD photo)

### FIRST DASH 7 FOR CANADIAN FORCES

The Honorable Barney Danson, Minister of National Defence, today accepted delivery of the first of two de Havilland DASH 7 aircraft for the Canadian Armed Forces. The second aircraft will be delivered in July.

The two aircraft will be flown by the Canadian Forces in West Germany, replacing the CC-109 "Cosmopolitan", a twin-engined turboprop used by Canadian Forces since 1960.

The DASH 7 has been sold to 17 customers in nine countries. Orders and options total 46 aircraft, of which six are already in service.



### VENEZUELAN CORPORATION BUYS CL-215 AIRCRAFT

C.V.G. Ferrominera Orinoco C.A., of Puerto Ordaz, Venezuela has purchased two CL-215 multi-purpose aircraft from Canadair Limited of Montreal.

C.V.G. Ferrominera Orinoco is a subsidiary of the C.V.G. Group (Corporation Venezolana de Guyana). The C.V.G. Group is responsible for the management of the Ouverito pine plantation north of the Orinoco River in south-eastern Venezuela. It intends to use the CL-215s for forest fire protection and the transportation of workers.

The Canadair CL-215 is the only aircraft in the world to be designed specifically for firefighting. Its major technological advantage over other firefighting aircraft is that it does not have to return to an airfield to reload after each attack on the fire. Instead, it picks up its six-ton load of water in less than ten seconds as it skims at 80 mph (130 km/h) over the surface of any suitable body of water in the vicinity of the fire.

The CL-215 is also widely used for aerial spraying, maritime surveillance, search and rescue, and transportation. It is in service in a number of countries including Canada, France, Spain, Greece and Thailand. Canadair has built 65 of the aircraft of which 47 have been exported.

Canadair flight crews will ferry the aircraft to Puerto Ordaz later this month. C.V.G. maintenance personnel are presently undergoing training at the Canadair plant in Montreal. Flight crews will receive their training in Venezuela.





# XB-70 GREATEST OF THEM ALL?

By almost any measure, this hideously beautiful Mach 3 fantasy machine was the most superlative aircraft ever to fly.

By Dave Noland

The only North American XB-70 now in existence sits in front of a large brick building six miles down Route 444 from Wright-Patterson Air Force Base in Dayton, Ohio. It is a souvenir from history, on display as part of the collection of the Air Force Museum. Wide-eyed little boys clamber enthusiastically over its landing gear, camera-toting tourists gawk in amazement at it, and pilots from World War II remark that things have sure changed since the old days.

Indeed they have. For despite the fact that the XB-70 is an obsolete museum piece, it is still the most advanced airplane ever built. Nothing today, in 1972, can match it in terms of size and performance. It has flown at Mach 3.08 (2,033 mph), a speed unmatched by any aircraft in the world except for Kelly Johnson's superspy SR-71 and the Russian MiG-23—both less than a quarter of the size of the XB-70. It has taken off at a gross weight of 538,000 pounds, a figure matched only by the lumbering subsonic 747 and C-5A. And the final superlative, of course, is money. This single 200-ton museum piece, representing an investment of two billion dollars, is worth 10 times its weight in gold.

The XB-70 began in 1955 as an idea in the mind of General Curtis LeMay, then head of the Strategic Air Command and Air Force Chief of Staff. He foresaw a need in the middle 1960s and beyond for a manned, supersonic, long-range bomber to replace the aging B-52 and supplement the proposed ballistic missile force. The Air Force envisaged a fleet of 150 of the superplanes by 1970, at a total cost of

10 billion dollars. Congress authorized funds for the preliminary design and development of the project.

LeMay set down a list of requirements for his proposal. He wanted an unrefueled range of 6,000 miles and the ability to reach 1,100 mph in short bursts. North American and Boeing sweated long hours over this almost impossible combination of range and performance. LeMay apparently wanted to have his cake and eat it, too. LeMay's piece of cake appeared on the drawing board as an ungainly million-pound monster three times larger than any airplane built up to that time. The general took one look at the proposal and rejected it flatly. The engineers slunk back to their drawing boards.

Luckily, at this time, NASA researchers discovered a happy fact of supersonic life—the "compression lift" principle. If the fuselage were properly designed, an aircraft could ride its own shock wave the way a three-point hydroplane rises on its step and skims over the water instead of through it. The engineers calculated a lift bonus of 30 percent. LeMay suddenly had his cake, and with icing. An aircraft was possible that could not only exceed his speed requirement by 1,000 mph, but could cruise the entire mission at that speed instead of merely dashing over the target in a limited burst. The new XB-70 was given the go-ahead, and North American's design was selected.

The technological problems of turning this beautiful aerodynamic dream into reality were staggering. No plane then in Air Force service could fly at Mach 2, much less Mach 3. North

American came up with some revolutionary solutions. They decided the 150,000 pounds of JP-5 fuel could serve double duty as a heat sink to cool the XB-70's skin. (Despite the fact that the air temperature at cruising altitude of 70,000 feet is 60 degrees below zero, friction against that same air heated the skin to over 600 degrees). Calculations showed that the fuel could absorb all frictional heat generated by up to five hours of Mach 3 flight.

Another major technical advance was the three-layer stainless steel honeycomb construction, which made up 70 percent of the aircraft weight. The XB-70 also incorporated movable wing tips that folded down 65 degrees during Mach 3 cruise. Besides adding lateral stability, the folding tips neatly counteracted the delta wing's rearward shift of center of lift with higher speed. These two innovations, never before tried on any aircraft, created weight and drag reductions of nearly ten percent.

By 1959, North American was ready to begin construction of 13 production aircraft. (To save time, the Air Force decided not to build a prototype). They confidently asked for 160 million dollars, and the outcry of rage was deafening when the Defense Department granted only \$75 million. Just no more money available, said the budget people.

The feud between the manned bomber and the missile had flared anew. The old-line Air Force generals adamantly supported the B-70. "You can call back a B-70, but a missile either stays or goes," they said. Bombers had a 40-year tradition of combat effectiveness, but no one had



# Before we start, there's somebody I'd like you to meet.

The history of aviation is a strange mixture of madcap feats and cool technology. They blend in a curious chemistry that makes for great yarns, odd contradictions and epic legends that grow with the telling.

Also, since the entire span of aviation stretches less than three-quarters of a century, the nice thing is that lots of closets, with and without skeletons, are still there for the opening. And both the magnificent men and their flying machines sometimes can still be ferreted out of odd corners of the world for reminiscence, corroboration or a sharp reprimand to the story tellers of aviation.

Were the terrible Gee Bee racers really terrible? New Englander Ed Granville thinks gross distortions of history have been perpetrated on the barrel-bellied airplanes he and his brothers built. But two of the original pilots, Californians Jimmy Doolittle and Jimmy Haizlip, can reply from personal experience.

From opposite ends of the continent, we obtained the blunt comments of all three to throw a little light on one of the intriguing epochs of aviation.

To cast light on this and other great moments in aviation history, and elevate them above the usual dry dossiers of second-hand chronicles, is the idea behind this issue of the *World's Great Aircraft*.

In a sense, we've attempted to apply an editorial brand of X-ray vision into the happenings of flight, to peer past the banal and the obvious. We've done the same with the physiology of two of the most interesting sport aircraft of any period, the Pitts two-holer and the "monstrous" Gee Bee, and provided detail cutaway illustrations of both.

In most cases, it's the human element that adds the color and the drama to our stories about inanimate collections of metal and wood and fabric that fly. For example, imagine chatting with Igor Sikorsky about what it was like to design and then fly the world's first four-engine airplane, way back in 1913. Or dropping in on Curtis Pitts and Jack Conroy to get a slant on the inspiration for the tiny aerobatic marvels, on the one hand, or the unbelievable Super Guppy, on the other. What was going on in Frank Tallman's mind as he led an armada of rebuilt B-25s through the surrealistic episodes of the *Catch-22* filming in Mexico? What motivated three California men to design a trio of the most original racers in years?

We've stirred the cauldron of history and come up with the aircraft heroes and deadbeats that caught our fancy. We've told what it's like to pilot one of the niftiest homebuilts, the Thorp T-18, and the biggest jetliners, the Boeing 747. We've captured the rare Fleetwings amphibian and the suddenly extinct Grumman F3F-2 in flight. And we've explored Mach 3 in the B-70 and Mach nothing in the rickety old Caudron G.3.

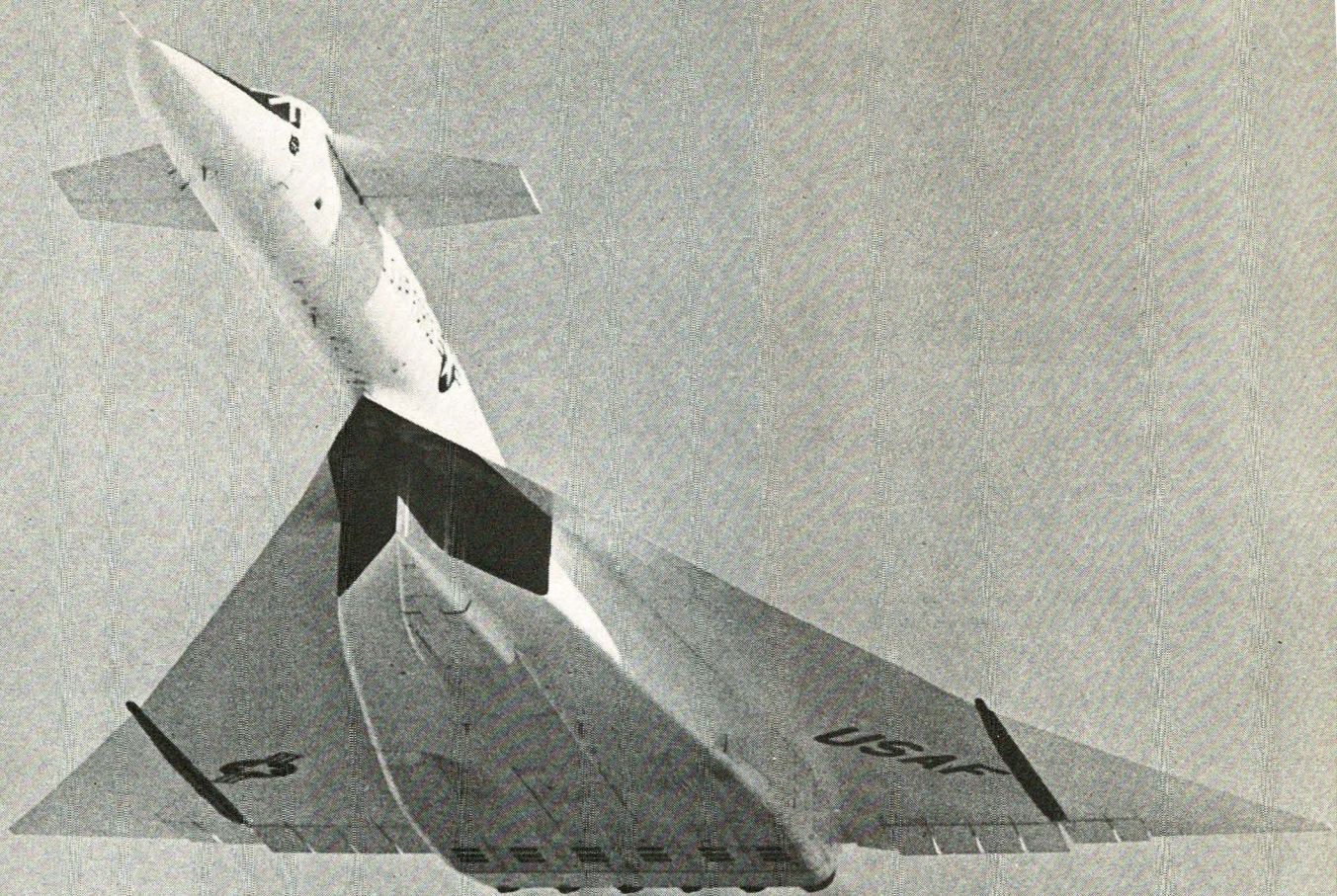
For those who like to fly, or just to sigh, we dedicate this volume of the *World's Great Aircraft*.

Richard B. Weeghman, Editor



Jimmy Doolittle







ever fired a strategic missile in anger.

The Department of Defense, however, still in the shadow of Sputnik, diverted \$85 million to the development of the Minuteman missile. The new plan called for one prototype XB-70 and 20 production models. The first flight target date was set back a year to 1963 and the service date two years to 1967.

Then Robert McNamara and his efficiency experts entered the picture. McNamara took a cold, hard, businesslike look at the B-70 project and decided it would be obsolete before it ever left the ground. It would be vulnerable to missiles, and technical advisors decided that the B-70 simply flew too high and too fast to drop a bomb accurately. McNamara calculated that the cost of developing an operational wing would pay for 2000 Minuteman ICBMs. The B-70 could not deliver enough megatons per dollar, and McNamara ordered the project cancelled. In traditional Defense Department jargon, he explained, "We calculate that the strategic retaliatory forces programmed through 1967 could achieve practically complete destruction of the enemy target system. The addition of a force of 200 B-70s would not appreciably change that result."

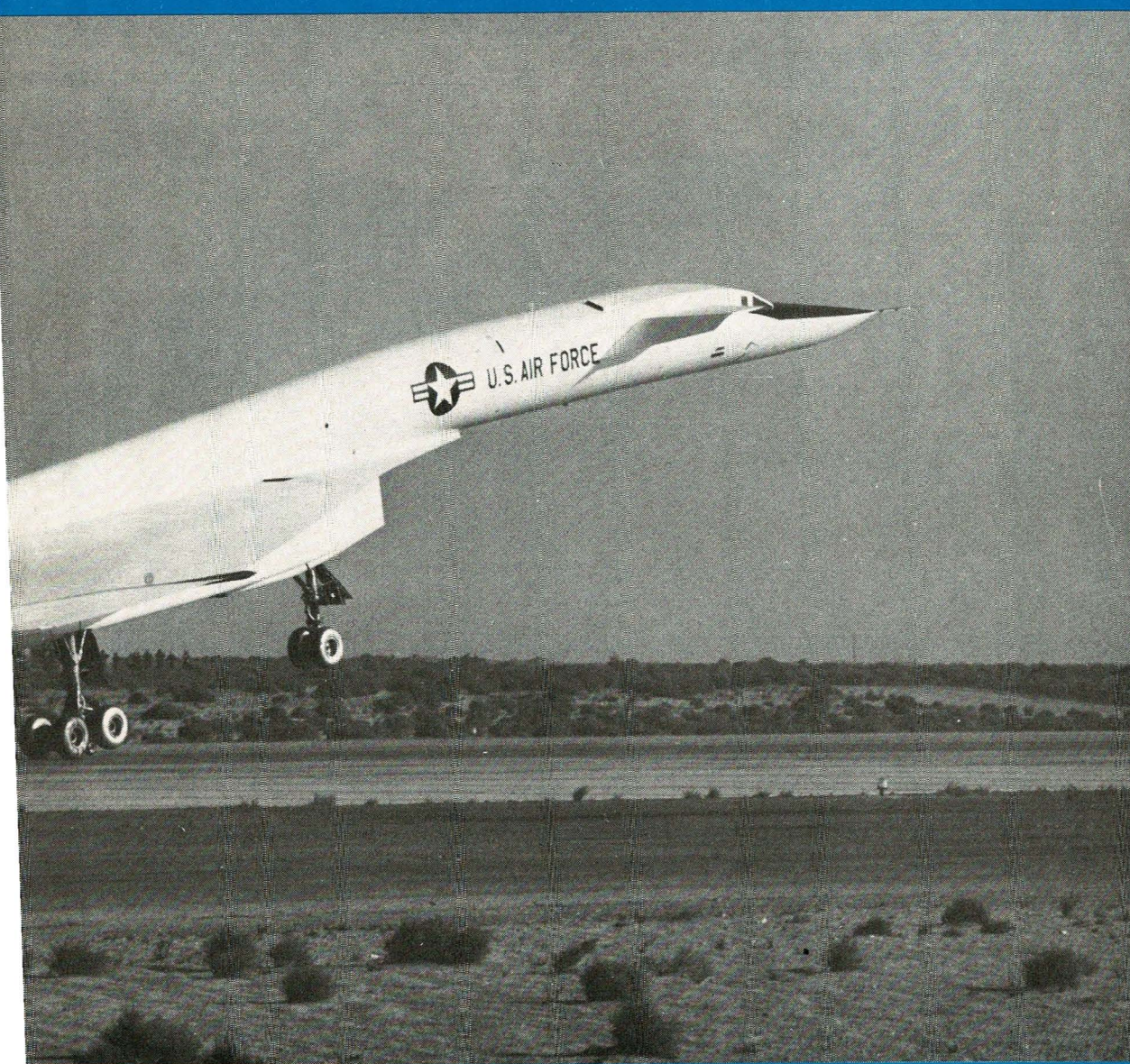
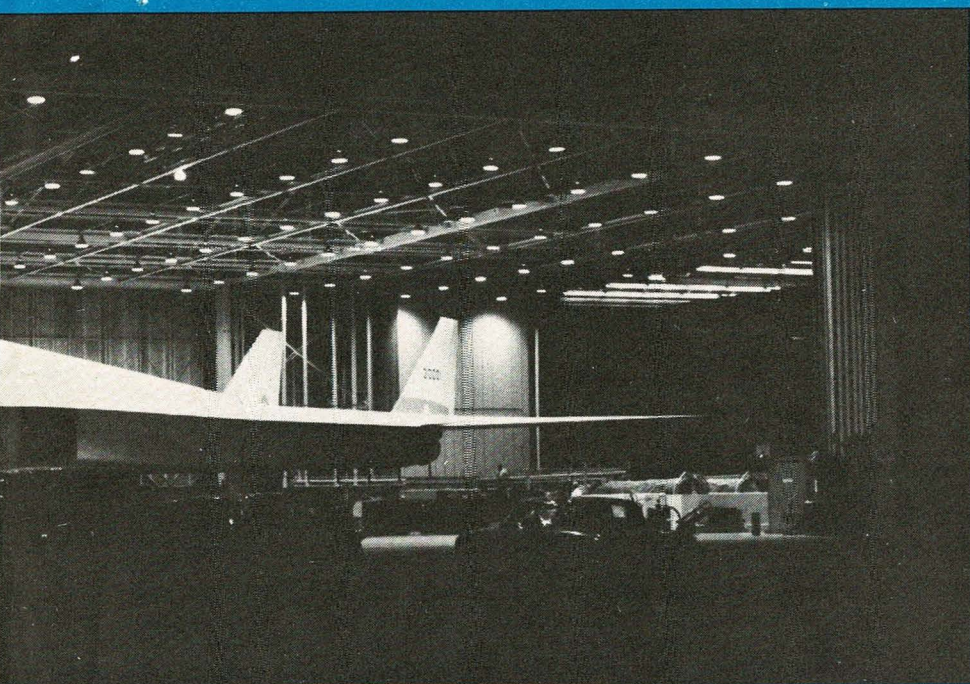
Venerable Congressman Carl Vinson, chairman of the House Armed Services Committee, led the opposition to what he no doubt considered the eggheads and their fancy computer studies. Vinson began what *Newsweek* called "an unprecedented forcing action by Congress." Vinson wrote into the Weapons Appropriation Bill for fiscal 1963 \$500 million for the B-70, three times the amount requested by the Defense Department. And he added a clause to the bill stating that the Air Force was "...directed, ordered, mandated, and required to utilize the full amount" for the B-70.

To avert a head-on Congressional clash, McNamara announced a restudy of the B-70 program just hours before the showdown vote was scheduled. The move apparently was a smokescreen to placate the pro-bomber camp, and also an honorable way out for Vinson, who didn't appear to have rustled up enough votes. McNamara compromised, and

## XB-70

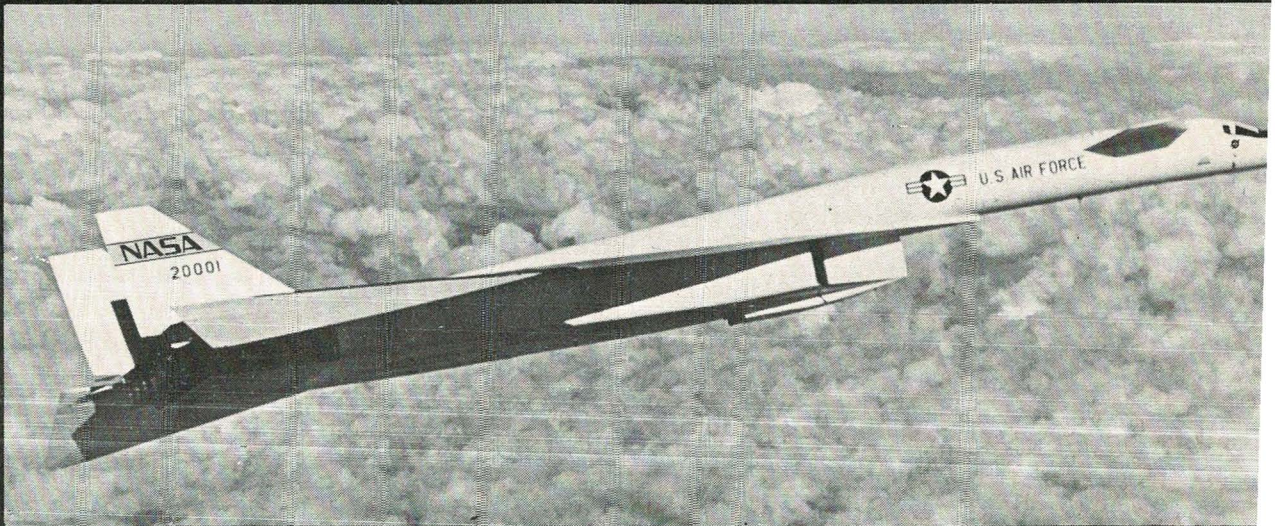
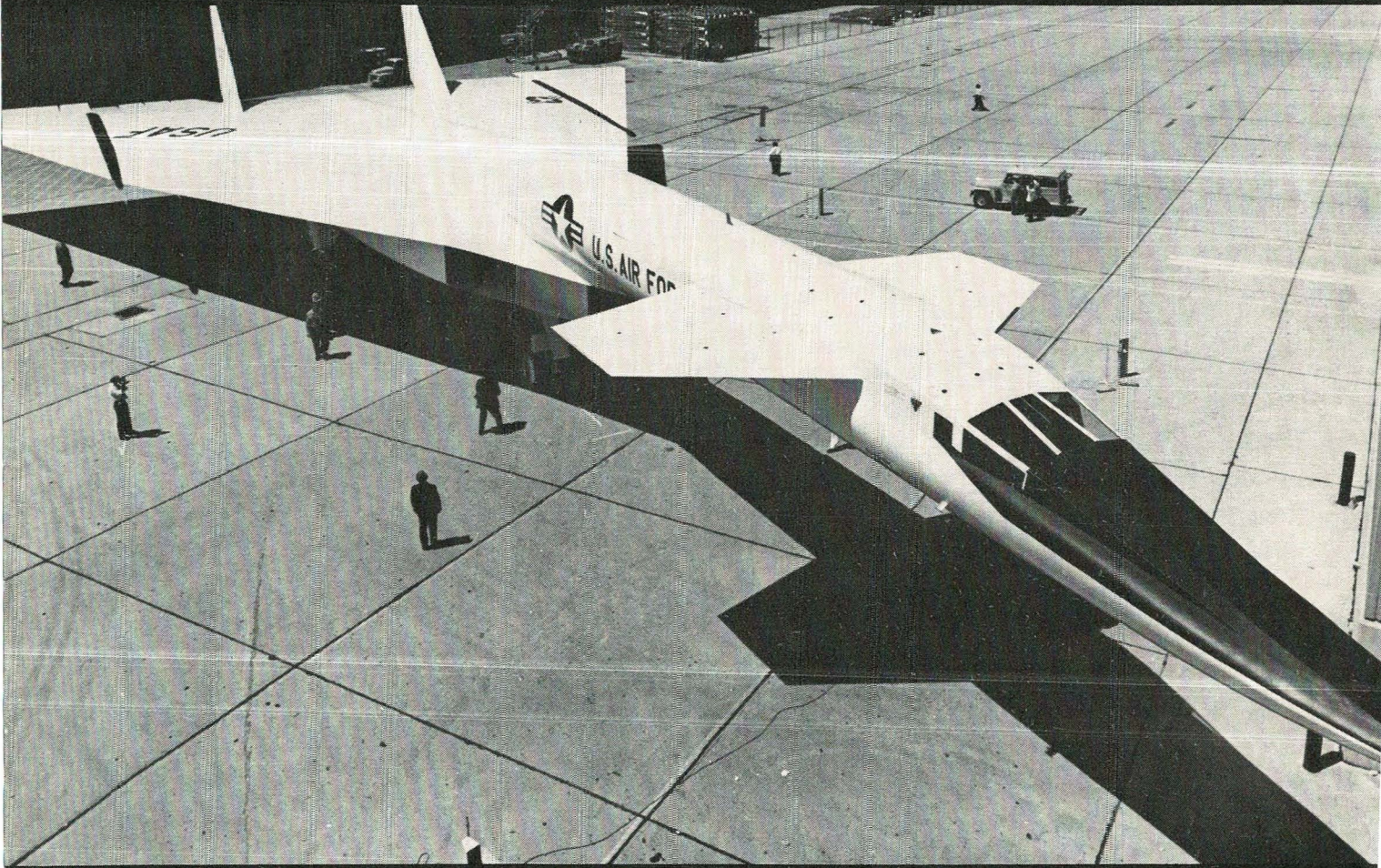
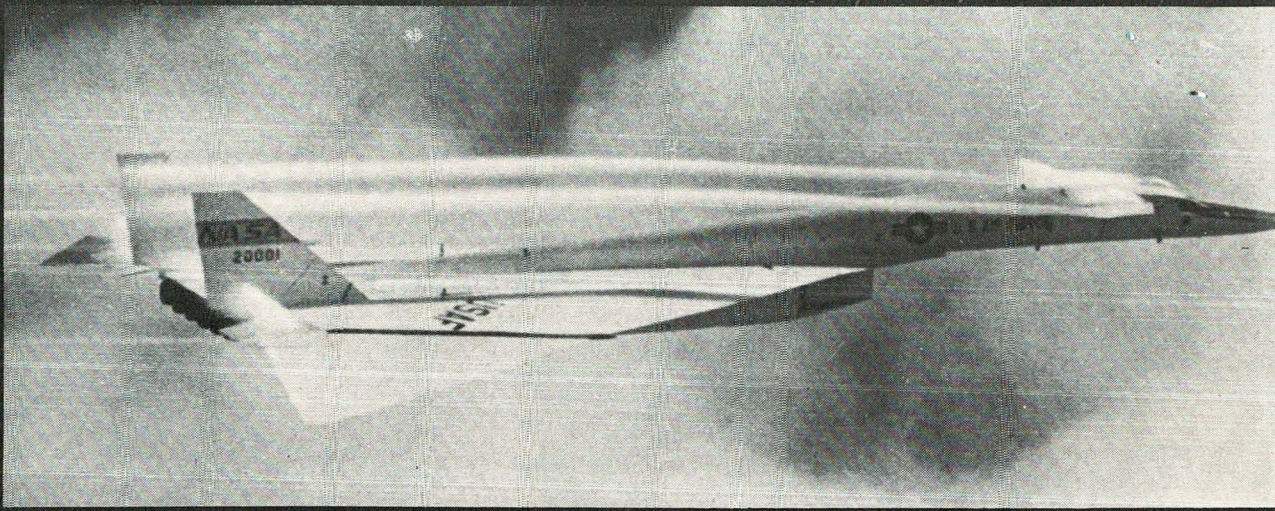




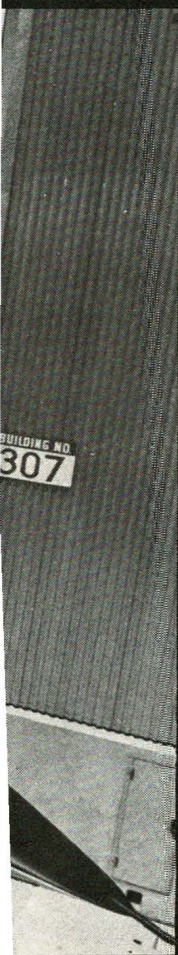




# XB-70







agreed to the construction of two prototypes, with further production hinging on the outcome of the restudy and performance of the prototypes. Vinson agreed, and the House passed the watered-down B-70 bill 403-0.

Both sides claimed victory, but it soon became clear that no production would ever take place. The eggheads and their computers had won. The B-70 was dead as a bomber, but still alive as an experimental plane.

Meanwhile, North American engineers were painfully discovering that not all of their problems were political. Persistent microscopic leaks in the welds around the fuel tanks required an entire year of concentrated effort to find a sealant. (The B-70's fuel was impregnated with nitrogen gas to reduce the danger of explosion, and the nitrogen seeped through the welds). Even after a year's work on the problem, the inner main tank was irreparable, and engineers finally gave up, deciding not to use that particular tank.

In May, 1964, nine years after the beginning of design work and more than two years behind schedule, the first prototype XB-70 was rolled out of its hangar into the Los Angeles sunshine. The glistening white beast was an awesome sight. Its snout hung 25 feet above the ground, almost as high as the tail of a 707. The air intakes for the six jet engines were big enough for a man to walk around in. The nose and cockpit drooped forward of the delta wing, and the canard wings just aft of the cockpit gave the craft the sinister appearance of a hooded cobra.

The XB-70 was called by many engineers and laymen the most esthetically beautiful aircraft ever, but others insisted she was the downright ugliest. One engineer dubbed the XB-70 "Cecil the Seasick Serpent." Another described her as "a banana towing an orange crate." Apparently every aspect of the XB-70 was doomed to controversy.

After five months of careful ground and taxi testing, on September 21, 1964, the XB-70 flew for the first time.

But trouble struck almost immediately after takeoff. A hydraulic failure locked the landing gear in the down position. As Chief Test Pilot Al White struggled to keep the plane flying slowly enough so that the wheels would not be ripped off by air resistance, his number-six engine oversped and had to be shut down. Finally, 25 minutes later, White brought the XB-70 in for a gentle 200-mph touchdown. But again, unexpected trouble hit. The automatic braking system failed, the brakes locked up and two tires blew. Still, White managed to guide her to a safe, skidding stop. The B-70 had flown, but just barely.

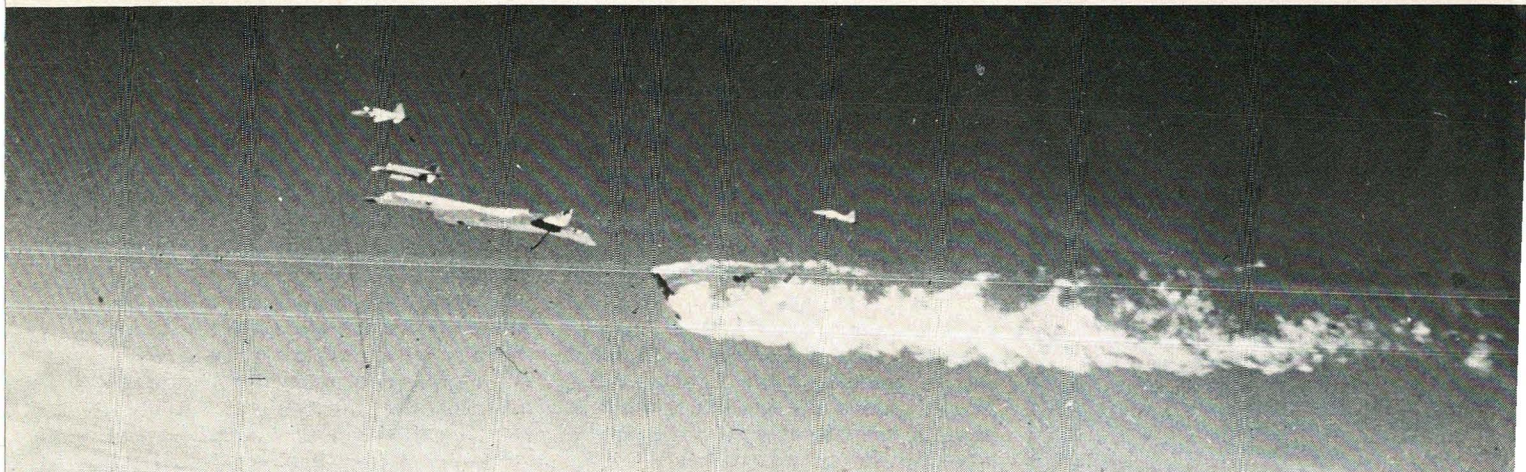
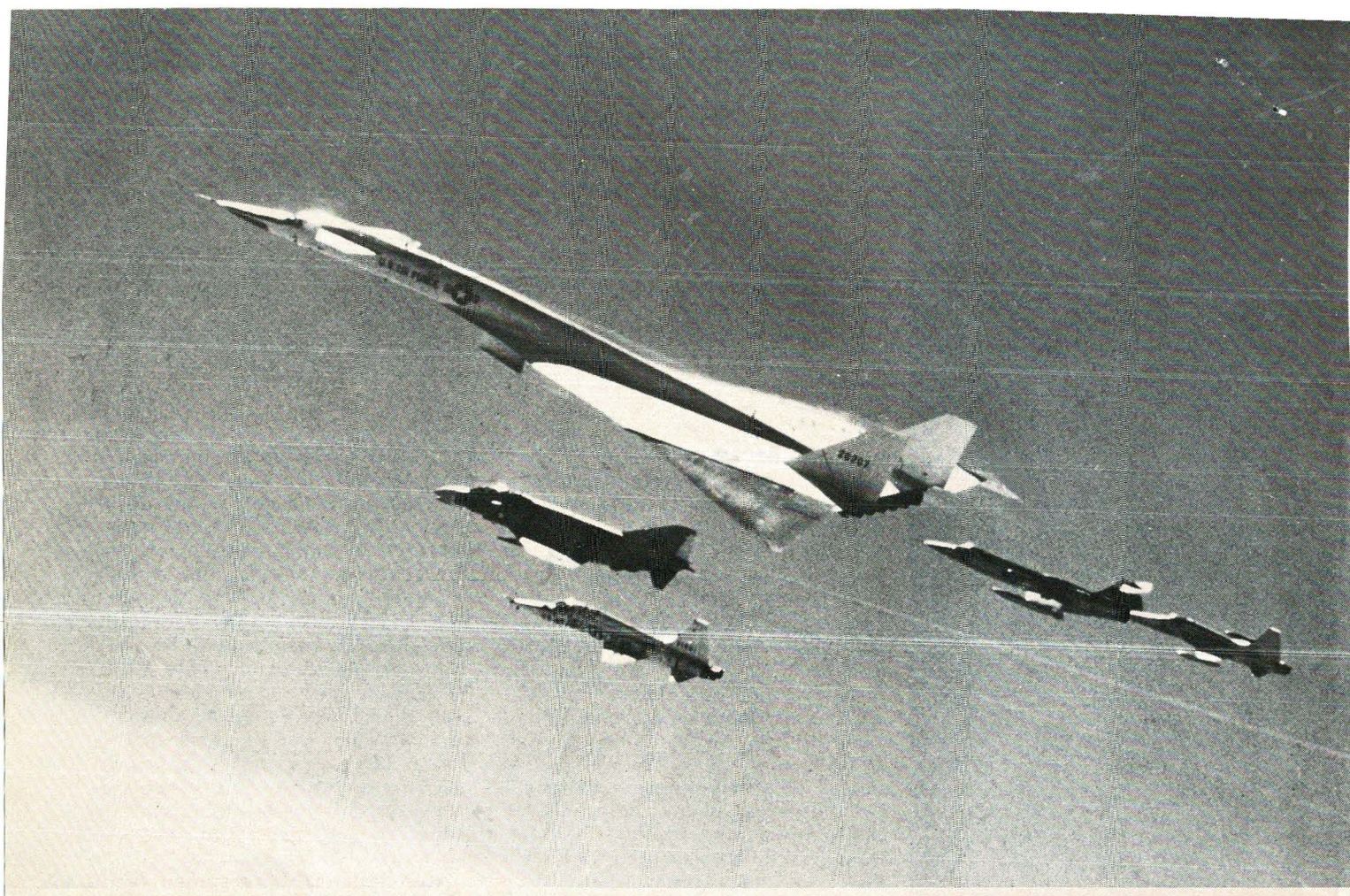
After repairs, she resumed flight testing and surpassed every flight goal set for her. On October 12, the B-70 became the largest plane to fly supersonically. (At that time, she was still the largest plane to fly, period). On March 25, 1965, she passed Mach 2 (1,350 mph) for the first time, and a few months later reached the design maximum speed of Mach 3. Test Pilot White reported that she handled like a dream.

In mid-1965, a second, more advanced prototype joined the first, and the pair made several flights a week. The flights were not without incident, however. On one hop, the number-two aircraft developed a short-circuit in the computer that controlled the hydraulic system. Consequently, the landing gear was stuck in the up position. A belly landing was out of the question because of the B-70's high approach speed and the placement of its engines—all six were underneath the fuselage and would explode on contact with the ground.

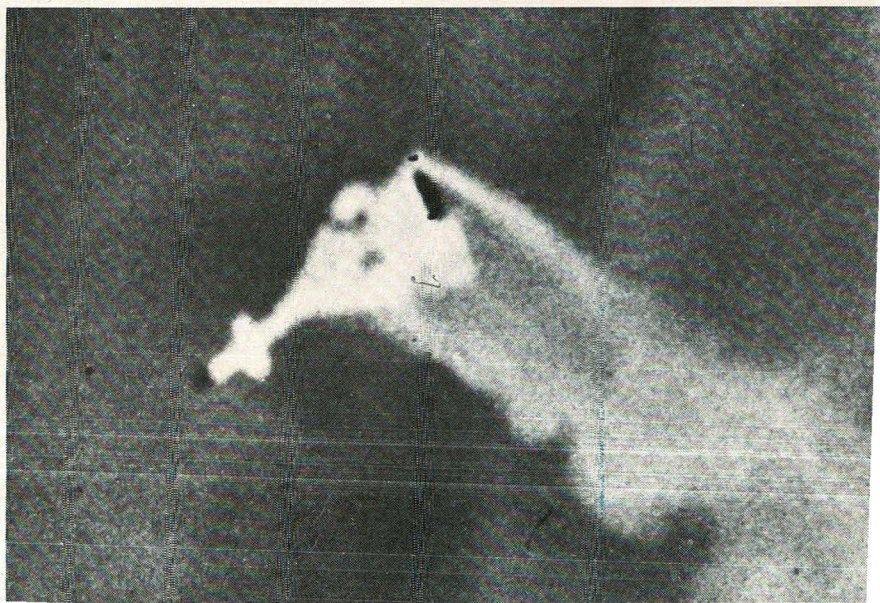
Co-pilot Joseph Cotton, displaying good old-fashioned seat-of-the-pants ingenuity, crawled 100 feet on his belly into the bowels of the aircraft, and located the short. He then repaired it with a paperclip, saving the American taxpayers a billion dollars in the process.

What was it like to fly the B-70 under more normal conditions? Sheer size created some problems. During





**Death of the second XB-70.** During a formation flight to get publicity pictures, Joe Walker's F-104 bumped the right wingtip of the XB-70 and exploded in a ball of flame. The crippled XB-70 kept flying for 16 seconds, then tumbled out of control.





landing, the pilot sat 110 feet forward of the main gear and 40 feet above it. Pilot Cotton commented, "You're sitting way out in front, and at times it seems like you're not really sure what's going on back there."

And of course maneuvering at Mach 2 will be something for prospective Concorde captains to think about. To turn around at that speed requires more than 200 miles. And what happens when an SST approaches a crowded airport? Says Cotton, "You don't stand by at Mach 2 very long. No, sir, you don't stand by."

On June 8, 1966, the B-70 program suffered a stunning, tragic setback. The more advanced number-two aircraft crashed after a midair collision. But the B-70, born amid conflict and controversy, could not even die gracefully. The circumstances surrounding the crash spurred more protests and investigations from the Pentagon.

It seems that General Electric, manufacturer of the XB-70's J-93 engines, had requested a formation flight involving the XB-70, an F-4B, an

F-5, an F-104, and a T-38. All of these craft used GE engines, and the company's public relations people wanted some publicity shots of them in formation. The Air Force agreed.

Major Joseph Walker piloted the F-104, nestled in tight below the right wingtip of the XB-70 for the Learjet camera plane. Walker's speed and altitude records in the X-15 qualified him as perhaps the most experienced and capable test pilot in the world. But somehow, Joe Walker made a mistake. His F-104 apparently slipped into the wake vortex swirling off the XB-70's wing tip. The 104 bumped the tip with its tail, then flipped over on its back and veered into the XB-70's twin tails, shearing one off at the root and damaging the other. "Midair! Midair!" crackled the radios. "Walker ran into him and I think he's done for!" Walker's 104 cartwheeled behind and burst into flames.

Tailless, the massive XB-70 flew straight and level for 16 seconds. As the pilots of the other planes looked on helplessly, the XB-70 pitched abruptly, yawed to the right and flipped over on its back. One para-

chute appeared as the billion-dollar craft tumbled completely out of control. White, after struggling with the clamshell doors of his escape capsule, had finally gotten out.

The XB-70 smashed into the desert, leaving only charred metal to disturb the Mojave landscape. Walker and Major Carl Cross, White's copilot, were dead. It had been Cross's first ride in the XB-70.

The number-one XB-70 was used for further test flying, providing data on sonic booms, engine and airframe performance, turbulence, and other aspects of SST research. On February 4, 1969, the original "Cecil" made its last flight, a cross-country hop from Edwards Air Force Base in California to Wright-Patterson in Ohio. Ironically, the flight was entirely subsonic, to avoid sonic booms over populated areas. The XB-70 made one farewell pass over Wright-Pat, and then, at 2:15 p.m., the most advanced aircraft in the world touched down for the last time. Today, 17 years after its inception, there's still no aircraft anywhere that can approach its size and performance. □











A Vickers Valiant is shown taking off with the assistance of two de Havilland Super Sprite rocket motors, which are contained in jettisonable cannisters.

one engine is not "better" than the other, the airplane designer rather chooses the one which suits him best. (See chart at lower right.)

The Napier Gazelle is the engine developed under MoS contract for the Royal Navy's Westland Wessex (Sikorsky S-58 license) and the twin-engined Bristol 192. Essentially, it is a characteristically Napier axial-flow turbine of low weight and diameter, designed by A. J. Penn to run in any attitude between the vertical and the horizontal. Since frontal area is of little consequence in a helicopter a wide flared air intake casting with a peripheral entry has been used and upon it are mounted all the engine accessories.

This is the first Napier engine to have a stressed combustion air casing instead of a load-carrying tubular structure between compressor and turbine. It is also the first Napier engine to have a common air casing, although six individual flame tubes are still used. Power is extracted from the "boiler" by a free turbine bolted to the top (rear) of the main engine. The efflux is ducted away at ninety degrees by four elbow-shaped pipes. The shaft

of the free turbine drives a planetary reduction gear lying between the exhaust ducts. The free turbine drive is particularly useful in a helicopter because it dispenses with the need for a clutch, since, in the event of engine failure, there is no resistance to auto-rotation of the rotor. Likewise, when the engine is started, the rotor-drive turbine only revolves when there is surplus efflux energy to drive it. Furthermore, a practical balance will occur automatically in flight between the optimum rpm. of both turbines.

Four versions of the Gazelle have so far been announced, the 1,260 shp. NGa1, the 1,650 NGa2, the 1,800 shp. NGa3 and the 2,000 shp. NGa4. The following data are for the NGa1:

height overall, 70 in.; max. diameter, at intake, 33.5 in.; max. rating, 5 mins, 1,260 shp. (residual thrust 260 lb.) at 20,400 compressor rpm., 3,000 output-shaft rpm.; one hour rating 1,100 shp. at 19,800 rpm., continuous 920 shp. at 19,000 rpm.

**All New:** The only completely new turbojet was de Havilland Gyron Junior which, as its name suggests, is scaled down from the Gyron. It embodies the simple low-pressure ratio *plus* afterburner conception of a supersonic engine postulated by Dr. E. S. Boulton. The aim is to get as much air as possible through the engine at high altitude and to make maximum use of the high ram compression at Mach 2 and above. When this is being done turbine temperature limits the compressor ratio and it pays to burn fuel in the jet pipe, where, without rotating parts, much higher temperatures can be withstood—and, of course, the propulsive efficiency of afterburning increases greatly at and above Mach 2. The Gyron is about the same size as the Orpheus and is reputed to give the thrust of a Sapphire—the price of this probably lies in a poor specific fuel consumption in subsonic flight. In use, therefore, the Gyron Junior must reach supersonic speed and maintain it for as much of the flight as possible.

It is a single-shaft engine with what appears to be a six-stage compressor with variable-incidence inlet guide vanes and a two- or three-stage turbine. The engine is almost parallel, with the jet pipe diameter only a little smaller than the air intake. Like the "Senior", the combustion chamber is truly annular and, in this case, it has thirteen spill-flow fuel burners. The air intake casing forms an integral oil tank and there is a de-icing bleed from the rear of the compressor. The turbine casing has two curious external bracing flanges.

Although at first sign it might seem that the Junior is "where we came in",

	Orion	Tyne
Length -----	112.3 in.	100.4 in.
Diameter -----	41.75 in.	40.5 in.
Weight -----	3,150 lb.	2,023 lb.
Pressure ratio -----	10.1	13.1
Airscrew gear ratio -----	11.1:1	15.6:1
T/O Power -----	4,400 shp+1,950 lb. (5,150 chp)	4,220 shp+1,235 lb. (4,695 chp*)
Cruise Power -----	3,500 chp @ 30,000 ft.	2,350 shp+152 lb. (2,553 chp @ 25,000 ft.)
*1961, 5,330 chp; 1963, 5,500 chp.		



with the RAF, and there were several all-Canadian Spitfire squadrons. The famous fighter has often been credited with winning the Battle of Britain and thus making possible victory in the Second World War. First tested in 1936, the Spitfires flew more than a million wartime and postwar sorties in 16 years of operational service.

The Spitfires got their baptism of fire on Oct. 16, 1939, when they took part in the downing of three German bombers attacking British shipping. They took a heavy toll of Nazi aircraft during Hitler's all-out air offensive against Britain in 1940. During the following years of combat, the Spits underwent many changes to keep pace with new enemy weapons and tactics. Their speed was increased from 360 mph. to 450, and their armament from eight Browning machine guns to four 20-mm cannons. At the end of the war, the then highest speed by any aircraft was accurately measured at Farnborough when a Spitfire reached 620 mph. in a dive during research flights.

## Carrier Commissioned

HMCS Bonaventure, the Royal Canadian Navy's first Canadian-owned aircraft carrier, was commissioned at Belfast, Northern Ireland on January 17.

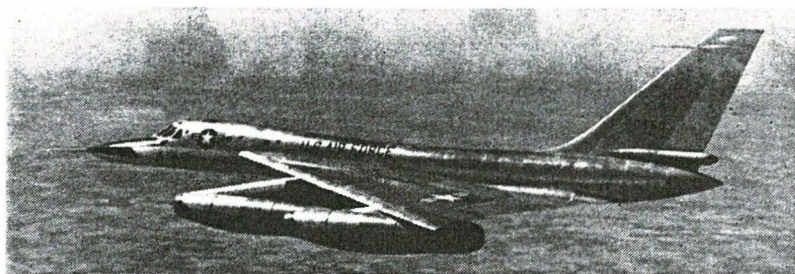
## Britannias for ATC

The RCAF's Air Transport Command is definitely to get a version of the Bristol Britannia to replace the out-dated North Stars presently in use. Long-standing rumors have now hardened into fact and Canadair has been given the go-ahead to start preliminary work on a transport version of its CL-28 MR Britannia. This will be known as the CL-44. It will probably be two years before the first one is ready for acceptance flights.

## Swedish Dragon

The Saab J-35 double-delta supersonic jet fighter has gone into quantity production for the Swedish Air Force, with deliveries scheduled within the next few years.

The SAF, which has designated this highly advanced aircraft the J-35 Draken (Dragon), has been working with Saab designers for seven years on the project. In the three Saab J-35 prototypes, the Swedish Air Force has found the answer to its requirements, laid down in 1949, for a fighter which could intercept enemy bombers in the



**THE HUSTLER:** The USAF Convair B-58 Hustler, the U.S.'s first supersonic bomber, is photographed in flight. The Hustler is designed to operate at altitudes above 50,000 feet, is powered by four General Electric J-79 turbojet engines with afterburners. The aircraft is 95 feet long, has a wingspan of 55 feet, and carries a crew of three. It has the ability to carry a wide variety of external pods filled with offensive or defensive weapons at supersonic dash speeds over the target area. It has out-run an F-100 chase airplane, with less than full power.



transonic speed range.

The unusual configuration of the Saab-35 came about as an answer to the problem of reducing air drag and getting sufficient volume in the aircraft for equipment, fuel and armament.

## Radar Helicopter

The USN's new Sikorsky HR2S-1W radar helicopter is now undergoing initial flight tests. The Navy is evaluating it as a new method of extending a fleet unit's early-warning coverage beyond that of shipboard search radar.

In most cases, the helicopter radar could detect a low-flying enemy aircraft more than twice as far away as could a shipboard radar set. The helicopter can be carried on an escort carrier or other Navy vessel large enough for a landing platform, with a fleet unit at sea beyond the coverage area of land-based Navy radar picket planes or blimps. It can be sent up as needed, to hover over the ships or to fly out beyond them for added radar coverage.

The radar, designed and built by General Electric, is described as the most powerful airborne search radar in production today. It is widely used by the U.S. Navy in anti-submarine work, and in airborne early-warning

airplanes and blimps. It is also being used by the U.S. Air Force in its comparable radar picket airplanes.

## Atomic Bomber

The U.S. Air Force, apparently confident of success in building an atomic powered bomber, has started organizing a complete weapons system for the operation of such aircraft. The same secrecy which has surrounded the nuclear propulsion project for devising an atomic airplane engine also cloaks the new weapons program.

Atomic-powered bombers will impose operational requirements and make possibly strategy entirely different from those for present aircraft weapons systems. Available information indicates that the USAF already has let contracts for development of some of the equipment needed. A nuclear-powered aircraft could stay in the air far beyond the endurance of any one crew. The longest routine training periods for heavy bomber crews now are about 48 hours. An atomic-engined aircraft might be able to fly for weeks.

Towards this goal, the U.S. Atomic Energy Commission recently completed a big nuclear aircraft propulsion test facility, including a runway as well as static test equipment, in Idaho.



## Canadian Air History

Aeronautical items of historical significance to aviation in Canada are being sought for possible use in connection with the documentary film which the National Film Board is planning to produce to commemorate the 50th Anniversary of Canadian Flight.

The Film Board would like to locate film clips depicting aviation events which took place in Canada in the early days of aviation, particularly in the period following World War I and during the early thirties, though movies and stills from any other period might be useful as well. The Board is also seeking parts and components of old aircraft, especially those with a historical connotation.

Readers who have or know the location of any such films or aircraft parts or components are asked to communicate with: The Editor, *Aircraft Magazine*, 341 Church St., Toronto 2, Ont. Do not forward any material to either this address or the National Film Board; information only as to its whereabouts is being sought at this time.

## Added Insurance

The Great American Insurance Company and the Great American Indemnity Company have become members of the Canadian Aircraft Insurance Group. Through membership in CAIG, these companies will participate in the writing of aircraft hull insurance and aircraft liability insurance respectively.

The Canadian head office of the Great American Companies is in Toronto with branches in Quebec, Montreal, Ottawa, London, Sudbury, Winnipeg and Vancouver. The Canadian Aircraft Insurance Group is managed by Canadian Aviation Insurance Managers Ltd., in Montreal.

## Turbine Ops Panel

A new turbine operations panel to co-ordinate the joint effort of the world's airlines to develop the most efficient flight procedures and requirements for the new generation of turbojet and turboprop aircraft has been created by IATA's Technical Commit-

tee. The group will consist of seven experts from American, British, Canadian, Dutch and French airlines.

Concentrating on the actual flying problems of turbine-powered aircraft, the IATA panel will determine how they will differ from those aircraft now in use, and establish guiding principles for holding patterns, rates of descent, cruising speeds and altitudes, ground handling and other aspects of actual operations. Their assignment is the logical further step in the international airlines' joint attack on jet problems which began with a worldwide symposium six years ago. Subsequent studies of problems of fuel, infrastructure, communications, weather forecasting and other problems will now be synthesized by the new group.

J. T. Dymont, who was chairman of the IATA jet symposium in 1950 and has since headed its jet fuels study, will be chairman of the new turbine operations panel. The results of the panel's work will be circulated to airlines to assist their own planning and will be submitted as well to ICAO's jet operations panel, in which governments are studying requirements for runways, ground and navigational aids.

## O-Ring Distributor

Pneumatic Industrial Equipment Co. Ltd., 2432 Kingston Road, Toronto 13, has been appointed distributor for Parker O-rings and related molded rubber products. The appointment was announced by Parker Appliance Co.,

Cleveland, Ohio. The new distributor will maintain stock for prompt servicing of needs throughout the Southern Ontario area. Technical assistance will be available to the Canadian distributor by the Parker Co.

## Morocco in ICAO

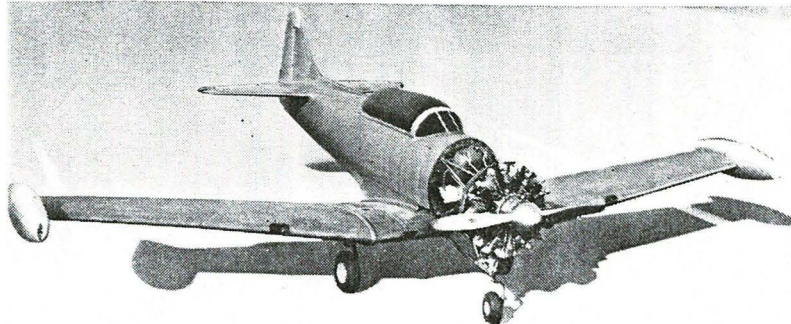
Morocco has become the 70th member state of the International Civil Aviation Organization. December 13, 1956 was the effective date.

## B-58 Hustler

According to reports, the new Convair B-58 Hustler medium bomber is able to out-fly the USAF's fastest operational jet fighter. In tests at Edwards Air Force Base, Calif., the Hustler is said to have "run away" from the North American F-100 Super Sabre equipped with afterburner. The F-100 is advertised as having a top speed of nearly 900 mph. with the afterburner cut-in.

The B-58 is destined to replace the Boeing B-47's now in USAF squadron service. Powered by four General Electric J-79 engines rated at 15,000 pounds thrust each, the Hustler is almost twice as powerful as the B-47 which has a top speed of over 600 mph. The Hustler is believed to be the only bomber in the world capable of exceeding the speed of sound in level flight.

Designed and built by Convair, the Hustler is capable of flying non-stop to any point in the world with mid-air refueling. With a nuclear payload, the B-58 could demolish installations in the most remote sections of Russia,



**HARVARD NEW LOOK:** An extensive conversion for the famous T-6 (RCAF Harvard), training airplane, increasing its performance, and adding to its safety features, has been developed by Erle L. Bacon Corp., Santa Monica, Calif. Called the "Super 6", conversion has been developed for sale primarily to foreign air forces. Features include: tricycle landing gear; modernized power package with jet stacks and augmentor cooling; one-piece canopy; single disk brakes, tip tanks.



# THE AIRBORNE SERVICES

## 65 Grand Pilots

It costs about \$65,000 to train a pilot qualified to fly jet aircraft in the RCAF, the House of Commons was informed recently in answer to a question from a member.

## Increased Strength

The authorized manpower ceilings for two of the three Armed Services have recently been altered by boosting the limit for the RCAF, while scaling down the Army. The Navy is not affected, nor is the authorized combined strength of the three services, which is pegged at 120,000.

The old ceilings were 50,000 for the Army, 48,000 for the RCAF, and 20,000 for the RCN. It is considered permissible to exceed these individual ser-

vice ceiling figures up to three per cent, though a closer check is kept on the combined strength.

## Moving Plans

At least three major RCAF establishments are involved in moving plans that are either now under way or projected for the near future.

No. 3 All-Weather OTU, based at North Bay, Ont., since its formation a few years ago, is soon to move to a new location in Western Canada, RCAF Station Cold Lake, Alberta, centre of operations for the RCAF's big new firing range which straddles the inter-provincial border between Northern Alberta and Northern Saskatchewan.

A complete shift of all transport

Comets, now grounded), but will not affect 408 Photo Squadron.

RCAF Station Rockcliffe will continue to be the base of flying operations for Central Experimental & Proving Establishment, and the headquarters flight of aircraft that is maintained to allow AFHQ officers to maintain their flying skills. Rockcliffe is also the location of Air Material Command HQ.

At Edmonton, all RCAF flying operations are gradually being shifted from Edmonton Municipal Airport to RCAF Station Namao. So far, the cold weather detachment of Central Experimental & Proving Establishment has made the move as has the communications & rescue squadron. Still to go are 435 Transport Squadron and 418 Auxiliary Squadron. These cannot be moved until the new cantilever hangar at Namao is completed. This has been delayed somewhat by such difficulties as a strike at the plant of the structural steel supplier in Winnipeg.

## RCN T-33's

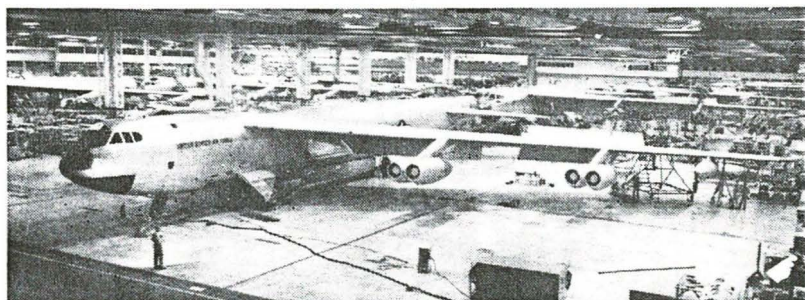
Early this year, four T-33AN Silver Stars were delivered to HMCS Shearwater, the RCN's Naval Air Station near Dartmouth, N.S. This marks the first time the RCN has operated jet aircraft.

The T-33's are being used to train pilots in jet aircraft operation preparatory to deliveries being made of the McDonnell F2H-3 Banshees which the RCN has on order from the USN. Deliveries of the latter are being delayed until such time as the Magnificent's replacement, the HMCS Bonaventure, is nearly ready for commissioning. It is understood that the Banshees will be machines that have seen service with the USN, but will have been factory-rebuilt just prior to delivery to the RCN.

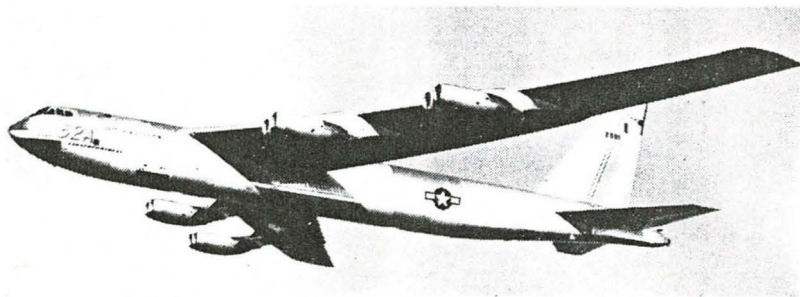
## RCAF Neptunes

The first of the new Neptune aircraft being obtained for RCAF maritime squadrons are expected to arrive in Canada this month.

The first several aircraft were handed over to the RCAF early this month at the Burbank, Calif. plant of Lockheed Aircraft Corporation. They are remaining there for a brief period, while RCAF air and ground crews complete their operation, servicing and maintenance training on them. Aircrew and ground technical personnel have been undergoing intensive ground training for some time at the Lockheed



**MASSIVE RETALIATION:** Shown in flight below is the first production model of the Boeing Stratofortress, the B-52A, while above is shown Stratofortress final assembly line at Seattle, Washington. Completed machine at end of line has vertical tail folded in order to clear factory door top when airplane is rolled out. Powered by eight P & W J-57's of over 10,000 lbs., th. each, this bomber has a span of 185 ft., length of 156 ft., tail height of 48 ft., and a gross weight of more than 350,000 lbs. Speed is over 600 mph.; range, more than 6,000 miles.



vice ceiling figures up to three per cent, though a closer check is kept on the combined strength.

The new authorized strengths are 49,000 for the Army, 51,000 for the RCAF, and 20,000 for the Navy.

The actual strengths as of December 31, 1954, were 49,447 for the Army, 48,750 for the Air Force, and 18,806 for the Navy.

The decision to boost the Air Force

flying operations from RCAF Station Rockcliffe to RCAF Station Uplands is to be completed this fall. Originally it had been intended to make the move this spring, but delays in the construction of a new Air Force hangar at Uplands now make this impossible. The move will involve 412 Transport Squadron, which operates a miscellany of aircraft ranging in size up to the Canadair C-5 (and including the two





## The Airborne Services

### Muscle Building

Not since the heyday of the BCATP has the RCAF had it so good. In truth, since the end of World War II, the only major new equipment that the Air Force had received were some 85 Vampires. And, now, with unnerving suddenness, this Force, as well as the Army and the Navy, was being swamped with goodies . . . new "used" airplanes, as well as new "new" airplanes, more pilots, more navigators, and best of all, more money.

All these things were not revealed at once, but rather in a series of announcements by Defence Minister Brooke

Claxton, who was obviously mighty pleased with himself at having the foresight to do what everybody had been telling him to do for these past several years. Some highlights of Mr. Claxton's revelations:

- The Armed Forces are now on active service . . . in other words they are on a war footing.

- Parliament has okayed the spending of an additional \$142,200,200 for defence during the fiscal year ending March 31, 1951. This is besides the \$409,257,821 that had been okayed earlier in the year. It should be understood that in the case of the latter figure, this is not the actual amount

of money that will be paid out during the current fiscal year, but rather the value of the orders which the Department of National Defence may place. Payment will take place over a period of years. The former amount is for actual cash outlay during the current fiscal year. The RCAF's share of this extra money is to be \$58,492,837.

- The RCAF's establishment has been increased from 18,278 by 40% to a total of 24,950. The planned intake for aircrew is 150 every six weeks and it is also hoped to get 450 groundcrew per month. Respective figures under the old program were 40 and 100.

- The number of planned interceptor squadrons is to be increased threefold (to 15). It is also proposed to build the squadrons up to full fighting strength of aircraft and personnel, rather than at half or two-thirds fighting strength.

- Squadrons of Lancasters are being or have been converted to maritime operations and will be built up to full fighting strength.

- No. 426 Squadron has had its establishment increased from eight to twelve North Stars. The medium range transport squadrons are each receiving an additional six Dakotas.

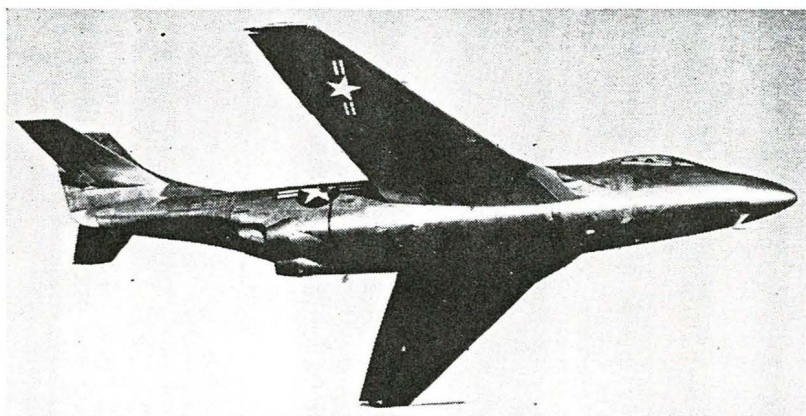
- A further transport squadron is, Mr. Claxton hopes, to be equipped with American aircraft. (See below).

- The possibility of building a new type of transport aircraft in Canada is being explored . . . Mr. Claxton thought something like the Fairchild C-119 would be the ticket. Building of such a transport in Canada depends on whether or not North Atlantic Treaty nations could use some (gratis, if need be) . . . otherwise there would not be sufficient numbers required by Canada to make an economic production run.

- Training facilities are being increased to provide for the training of 100 aircrew for the North Atlantic Treaty nations (France, Belgium, the Netherlands, Norway, and Italy).

- Some 300 F-86A aircraft, as well as an unspecified number of CF-100s (probably 150) are to be purchased over the next few years. From USAF stores have been bought 100 Mustangs, which will help build up the interceptor squadrons until new Canadian-built jet fighters are available.

- The City of Vancouver (442) auxiliary squadron is to receive more aircraft, either Vampires or Mustangs.



TEAM MATES: The McDonnell XF-88 is still in the process of evaluation by the USAF, so cannot yet be classed as an operational type. Few details are yet available except that it has been designed as a penetration fighter. The lower picture shows the latest model Stratojet, the B-47A, which is now in series production, this first of the new aircraft having come off the production lines this spring. Powered by six GE J-47 turbojets, the B-47A has a maximum gross take-off weight of more than 185,000 lbs., and can carry more than 20,000 lbs. of bombs. One of the two prototypes of this aircraft flew across the U.S. (Moses Lake, Wash., to Andrews AFB, Maryland) in 3 hours 46 minutes at an average speed of 607.8 mph.







**FIRST DOUGLAS DC-8:** Photo shows the first DC-8 at the mid-point of the final assembly line, the aircraft being rolled out only to be turned around for the last half of the assembly process. Yet to be installed are the wing leading and trailing edges; fin and rudder completed; engine pods installed, and basic furnishings completed. Production model deliveries are scheduled for May, 1959.

healthy increase, rising 401 from 2,145 to 2,546. Other categories were as follows (with 1956 totals in parentheses): Senior commercial, 422 (380); airline transport, 946 (831); glider, 278 (246).

Other types of personnel licences: air navigator, 98 (77); air traffic controllers, 530 (416); flight engineers, 38 (33); aircraft maintenance engineers, 1,875 (1,747).

The number of licenced airports also continued on the upgrade, with 547 being registered at the end of September, 1957 as compared to 519 a year previous.

## Photo Aid for ATC

The difficulties of permanently recording and projecting information presented on a cathode ray tube have been solved by a rapid processing photographic projector produced by the U.K.'s Kelvin & Hughes Ltd.

Designed initially in conjunction with the Ministry of Supply, the equipment is now being sold in quantity to the U.S. There it is being used to investigate and to help solve some Air Traffic Control radar problems, to record data from high speed computers, and is also employed in several other capacities for recording cathode ray tube information.

Three of the projectors have been installed by the CAA at its Technical Development Centre, Indianapolis. There the equipment is projecting air traffic information from cathode ray tubes fed by two radar systems geographically spaced 50 miles apart. A photographic record is made of the

tube face, this then is developed by the equipment and projected onto a large screen. The processing cycle can take as little as 6 seconds and the film can then be kept indefinitely.

## High Temp Grease

The development of a new class of greases for high temperature, high speed application in missiles and supersonic airplanes, has been announced by Shell Oil Co. of Canada Ltd.

The new lubricants, called Shell ETR (extreme temperature range) Greases, withstand temperatures up to 600°F and protect metal parts running at speeds up to 30,000 rpm. The lubricants contain an organic vat dye that serves as a thickener to improve heat stability and gelling efficiency.

Shell said company scientists began research on high temperature lubrication some years ago, when it became apparent that the highest quality soap base and petroleum oil greases would be inadequate for the operating conditions met in extremely high speed flight.

The new lubricant class includes two members: ETR Grease B, and Grease D. Canadian enquiries regarding the new lubricant should be directed to the Shell Oil Co. of Canada Ltd.

## New USAF Bomber

The United States' most advanced intercontinental bomber, being developed by North American Aviation, has been designated the B-70. The aircraft is the project formerly known as WS-110A and will be capable of speeds in excess of 2,000 mph at altitudes

above 70,000 feet.

Under the Weapon System Manager concept, the Los Angeles aircraft firm is responsible for the development of the entire system required to put a bomb on the target. After an intensive two-year-design competition, it was announced last December that North American had won the contract upon the unanimous recommendation of the USAF's Strategic Air Command, Air Materiel Command, and Air Research & Development Command.

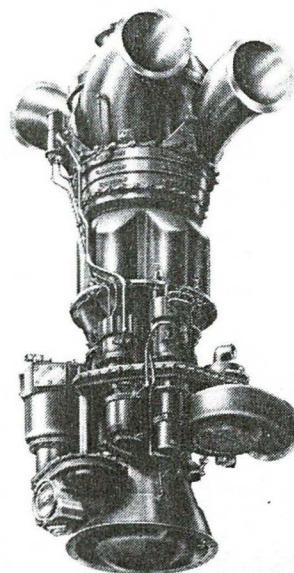
## New Flying Club

The Schefferville Flying Club, Schefferville, P.Q., a member of the RCFCA, has been recently organized. Holding a Class 6 license, the club is operating with one Aeronca Champ, one Cessna 140, one Fleet 80, and one Seabee. Secretary of the new club is Jean Blouin, P. Eng.

## Radar Rescue

The DoT's new Decca MR-75 Short Range Surveillance Radar installation at Toronto's Malton Airport proved its worth as an aid to aircraft operations when it recently was the means of directing a USAF aircraft to a safe landing after fire broke out in flight.

The aircraft, a transport carrying Major-General D. F. Callaghan of the U.S. Army to Ottawa, had passed

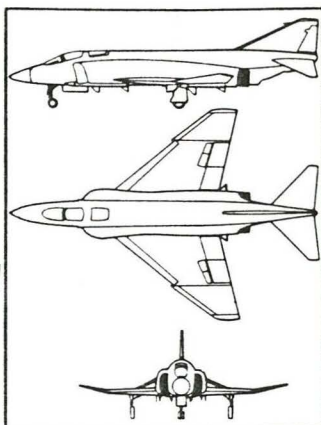


**NAPIER GAZELLE JUNIOR:** New free turbine engine by D. Napier & Sons, available both for helicopter application and as a propeller turbine. Initial rating is 920 shp, but this will be increased to 1,070 shp during development.

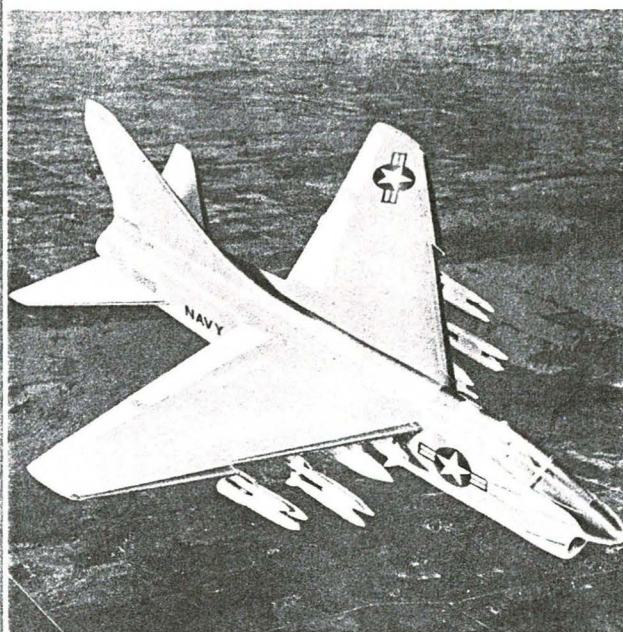
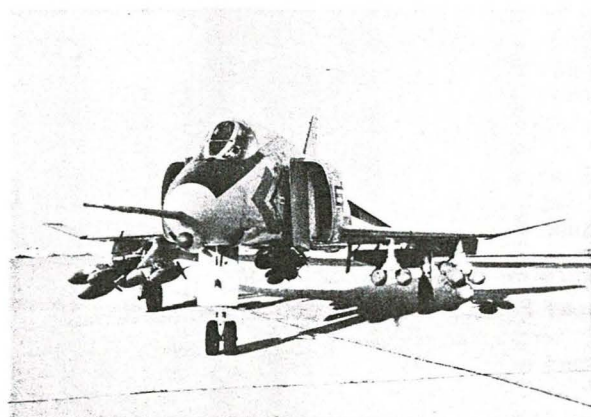
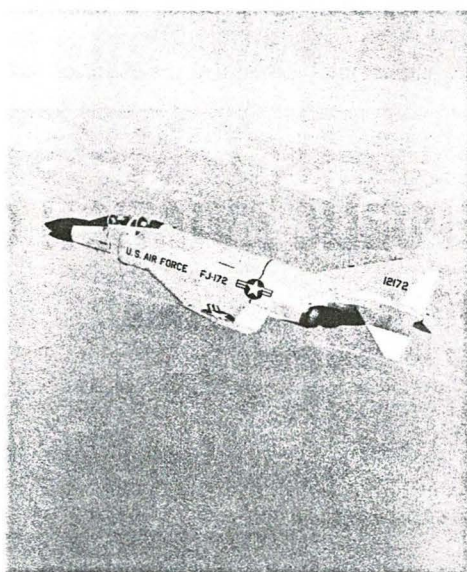


# McDONNELL AIRCRAFT CORP.

## *F-4 Phantom II*



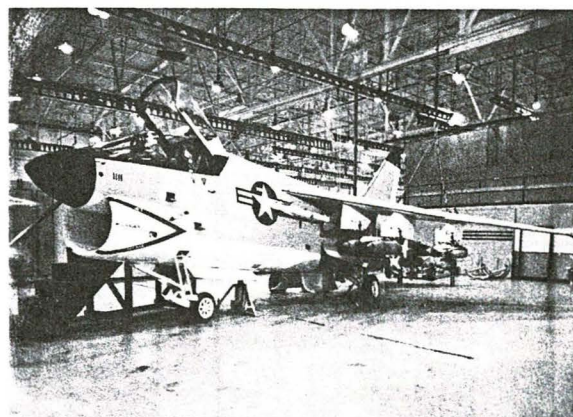
THIS bi-service fighter-bomber has a maximum speed of 1,650 plus mph and a range, with maximum fuel load, of 2,000-plus miles. Powerplant is two General Electric J/79-08 engines with afterburners, producing a combined thrust of 34,000 lbs. Wing area is 530 sq. ft. and the Phantom II has wing boundary layer control. This fighter-bomber can carry a bomb load greater than the B-17 used in World War II.



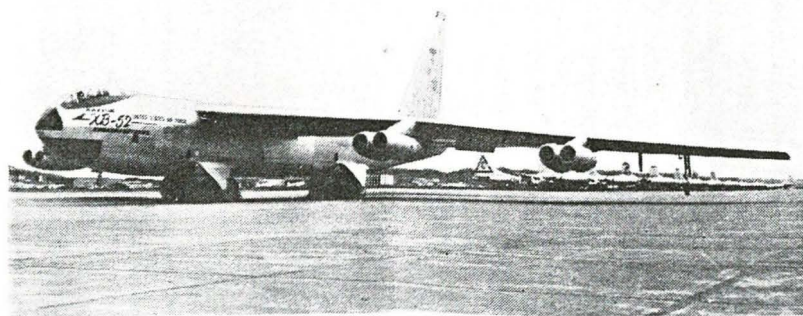
# LING-TEMCO-VOUGHT CORP.

## *A-7A*

LTV's light attack bomber (formerly known as VAL) will fly in the fall of 1965 and is being produced for the US Navy. It is designed to carry a heavy load of armament with emphasis on close air support and limited war operations. Powered by a Pratt & Whitney TF-30 engine similar to that being used in the F-111A, the A-7A incorporates many features of the F-8 crusader series. It is subsonic, with fixed wings, shorter fuselage and less sweep-back to the wings. Ailerons will be outboard of the wing foil.







**STRATOFORTRESS:** The new Boeing XB-52 is the USAF's newest heavy bomber and the first to be all-jet-powered. It is fitted with eight Pratt & Whitney J-57 turbo-jets, thought to develop about 10,000 lbs. st. th. each. Few details have been released but the aircraft obviously has sharply swept wings, dual tandem undercarriage with outrigger wheels near the wing tips. In the same class as the Stratofortress is the Convair XB-60 a jet-powered, swept wing development of the B-36.

sumably the Vampire would be even less successful, since one of the prime attributes that have been necessary to outfight the MiG 15 to date is that of speed. Both British types are somewhat slower than either the Russian aircraft or the USAF's F-86.

It is possible that the RCAF squadrons based in the U.K. may continue to form the vanguard of British air defences for some time. While the British have at least two fighter types that would be the match of any comparable aircraft at a comparable stage of development (the Supermarine Swift and the Hawker Hunter), both are far from mass production. Even if production were properly organized within the next few months, it would be at least two years before RAF fighter squadrons were completely re-equipped.

Actually, the RAF will be making use of Canadair-built F-86 aircraft before it gets any number of British-made aircraft.

## Stocking the Larder

Last month saw the beginning of the annual air re-supply operations to the joint Canada/U.S. weather stations in the Arctic. These stations are operated on a year-round basis by the DoT and the U.S. Weather Bureau, and are manned by equal numbers of personnel from each country . . . these personnel being changed once a year.

Flights are being made to weather stations at Mould Bay, on Prince Patrick Island, Isachsen on Ellef Ringnes Island, and to Alert and Eureka, both on Ellesmere Island.

RCAF commitments are being handled by two North Stars of 426

Thunderbird Squadron, Dorval, P.Q., operation under Air Transport Command. These RCAF aircraft, working out of Resolute Bay on Cornwallis Island, are engaged in flying hundreds of tons of mail, food, equipment, and personnel to the stations.

USAF commitments are being handled by four C-54s from Northeast Air Command, with headquarters at Pepperrell AFB, Saint Johns, Newfoundland. NEAC is responsible for the resupply of two weather stations—Alert and Eureka. Using six crews of seven men each, the C-54s will fly more than 230,000 pounds of cargo to the two stations.

The weather reporting program from these Arctic stations includes surface observations several times daily as well as upper air conditions to heights of 60,000 to 70,000 feet. Basic meteorological data obtained from the stations is of fundamental importance in the development of the science of meteorology and is of assistance to research meteorologists in their attempts to solve the innumerable problems of weather movements.

## Expansion at Centralia

The current expansion and modernization program under way at RCAF Station Centralia, Ontario, will cost an additional \$2,000,000 as a result of further new construction planned. This brings the cost of the program to an estimated \$6,000,000. The Station is one of the largest operated by the Air Force, being the centre of operations for No. 1 Flying Training School. Its airport averages something like 1,200 aircraft movements a day . . . making it the busiest airport on the continent.

**WHEREVER YOU GO  
WHATEVER YOU FLY**



**THERE IS  
ARC EQUIPMENT  
TO MEET YOUR  
OPERATIONAL NEEDS**

## VHF COMMUNICATION and LF NAVIGATION SYSTEMS

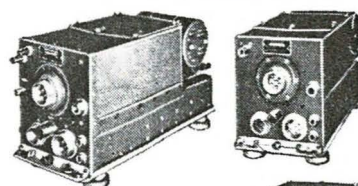
### THE ARC TYPE 11A

Meets your basic navigation and communication needs. Provides for VHF transmission, LF range reception and rotatable loop navigation.

### THE ARC TYPE 17

Adds two-way VHF communication. System includes tunable VHF receiver and a five-channel, crystal controlled VHF transmitter. As many as four of these transmitters may be installed providing up to 20 channels.

### THE ARC TYPE 12



Gives you the combined advantages of the type 11A and the Type 17 systems. You get two-way VHF communication and LF range reception, as well as rotatable loop navigation.

Ask about ARC Type 15C Omni-range equipment and ARC's 10-channel Type F11 Isolation Amplifier. Write for all the details.

All units of these systems are type certified by the CAA. Installations for both single and multi-engine planes are made only by authorized agencies.



**AIRCRAFT RADIO CORPORATION**

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## New Wind Tunnel

Another wind tunnel has been added to Canada's growing facilities for aerodynamic research. The existence of the latest tunnel was revealed in an address given recently in Toronto by Dr. Gordon Patterson, director of the University of Toronto's Institute of Aerophysics.

The new tunnel is located in the Institute of Aerophysics, at Downsview Airport near Toronto. Dr. Patterson described it as a "hypersonic air tunnel" and said that it was one of the three most powerful this side of the Iron Curtain. It is said to be capable of providing air velocities up to Mach 10, and is to be used to study blast effect as well as high speed aerodynamics.

## Change of Name

Godfrey Engineering Company Limited has been announced as the new name for Sir George Godfrey & Partners (Canada) Limited, 480 Metropolitan Boulevard, Lachine, P.Q. The company designs and manufactures aircraft pressurization and cooling equipment, aircraft ground servicing equipment, industrial blowers, and vacuum pumps, and other specialty engineering work. There has been no change of management or policy, and the present affiliation is being maintained with the parent company in England.

## Accident Board

The establishment of an up-to-date accident investigation board by the DoT has been requested by the Canadian Air Line Pilots Association as a result of a resolution passed at the recent annual meeting of the Association. The CALPA also asked for extended and improved navigation and landing aids.

## License Fees

The DoT is now charging two dollars for the initial issue or replacement of any personnel licenses.

## Slippery Business

The USAF is once again conducting its SOIAS (Sliding on Ice & Snow) project from a base at Kenora, Ontario. The project is a continuation of work started in the Kenora area last year

and involves the carrying out of ski landing and take-off trials with a variety of experimental and standard skis fitted to a Northrop Raider, a Douglas C-47, and three Ryan Navions.

Acting as suppliers and consultants to the USAF project once again is Ontario Central Airlines.

## Aviation Imports

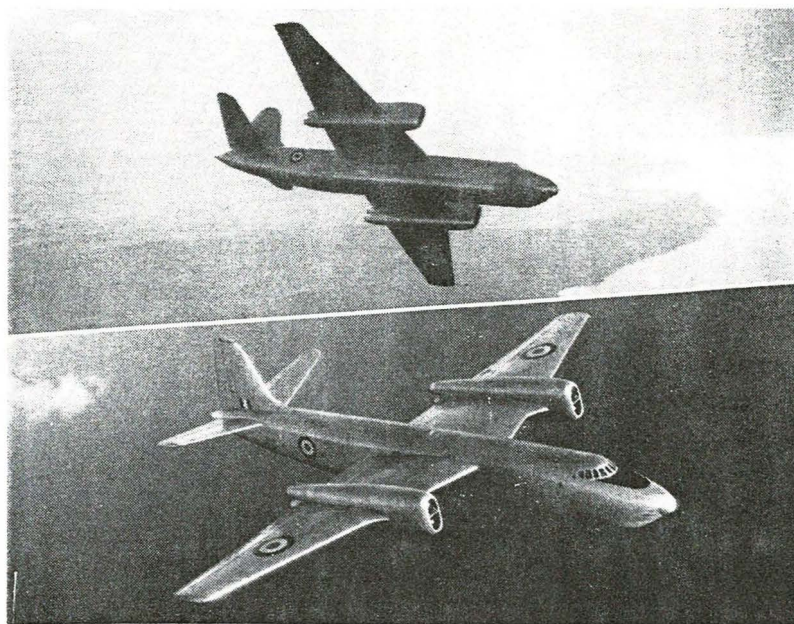
During the four-month period ending September 30, 1951, there were 27 aircraft weighing not more than 1,500 pounds brought into Canada, 2 from the U.K. and 25 from the U.S. The British machines were valued at \$11,131 and the American at \$64,062. There were 10 machines in the 1,501-

from Mexico valued at \$10,550.

Aircraft parts valued at \$809,646 were brought in from the U.K., \$9,278,802 from the U.S., \$5,874 from Australia, and \$199,228 from Sweden.

From the U.K. came 11 engines valued at \$13,976, all in the up to 200 hp. bracket; in this class also were 56 engines from the U.S. with a value of \$57,002. In the 201-500 hp. category were 12 engines with a value of \$56,505 from the U.K., and 6 engines valued at \$4,057 from the U.S. The U.S. supplied 53 engines value at \$186,528 in the 501-1,000 hp. class, and 104 engines valued at \$3,337,402 in the over 1,000 hp. class. In the latter bracket also were 26 engines value at \$566,356 from the U.K. and 2 valued at \$17,000 from Egypt.

From the U.K. came 11 engines parts valued at \$1,286,814; from the



ABOVE AND BELOW: The Short S.A./4 heavy bomber is, with the exception of its rather unusual engine installation, a quite conventional aircraft. According to Short Bros., whose product has already been compared unfavorably with the Vickers Valiant, the S.A./4 was designed to an Air Ministry specification which called for a heavy bomber without such modern innovations as sweepback, buried engines, etc. The aircraft is powered with four Rolls-Royce Avons.

3,000 pound class brought in from the U.S., and these had a value of \$24,019. In the 3,001-7,500 pound category there was only one machine imported, this also from the U.S., and valued at \$5,830. A total of 28 machines in the over 7,500 pound class were brought in, 25 of these being from the U.S. and having a value of \$1,898,775. In this same category was one aircraft from the U.K. valued at \$35,000, one from Egypt valued at \$20,485, and one

U.S., \$859,165; from Australia, \$1,934.

Aviation gasoline totalling 246,797 gallons valued at \$68,509 was imported from Alaska, compared with 25,988,293 gallons worth \$4,933,191 from the U.S.

## B.C. Aviation Council

Captain B. J. Gadsden of Victoria was chosen president for 1951-52 of the B.C. Aviation Council at its recent annual meeting. Other officers chosen



## Exercise Air Show

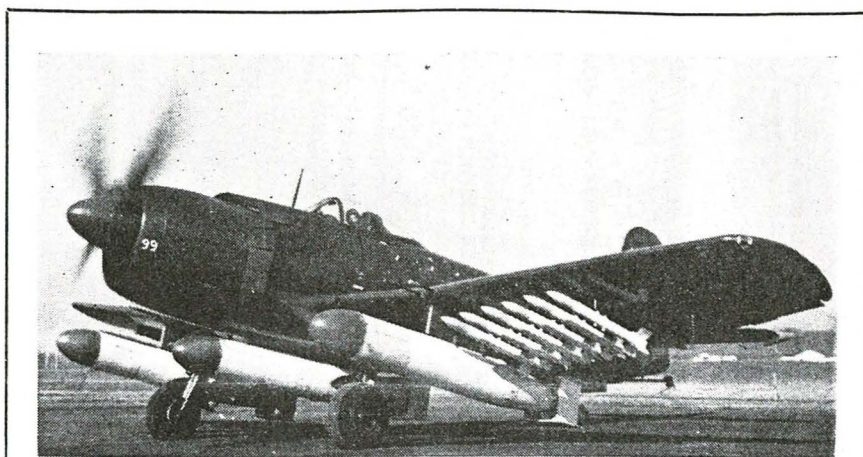
Edmonton is a city which probably has more right to that much abused term "crossroads of the air world" than most. However, while most cities are content to draw a map of the world with themselves as the focal point and then forget the whole business, Edmonton is going ahead and planning something which may well give it a unique spot in the Canadian aeronautical picture.

Edmonton is planning an air show — not the stereotyped kind that Canadians are getting accustomed to seeing every summer, but a real effort with rings on its fingers and bells on its toes. At least that's the way the news reports make it sound.

The show was first mooted last summer by the Edmonton Chamber of Commerce aviation committee. Since then the idea has snowballed and everybody is getting into the act with both hands and feet. A committee comprising representatives of the RCAF, the Chamber, the Jaycees, the city, the airport management, and the service clubs, has been set up and is working on initial organization details.

### As Goes Cleveland

Officials of the Cleveland and Miami air shows have been contacted and the reports obtained from them will be used partly as a basis for planning. One problem at present facing the committee is whether or not to hold the show during Edmonton Exhibition week. It has been suggested that though the show is to be sponsored by the Chamber of Commerce for the first year, if it proves successful it might be taken over by the Exhibition management and made a regular part of the Ex. itself.



**BEAST OF BURDEN:** The Martin AM-1 Mauler, the USN's latest carrier-based, dive-torpedo bomber, carries a payload of more than 9,000 pounds—three full-size torpedoes, 12 five-inch rockets, and four 20 mm cannon. As pictured, the all-up weight of the AM-1 is 25,520 lbs. Maximum possible all-up weight is over 29,000 lbs.; maximum payload is over six tons. Power is by a 3,000 hp Pratt & Whitney Wasp Major. Approximately 100 Maulers have been delivered to the USN.

Secretary Don McKay of the Chamber of Commerce makes no bones about his group's reasons for sponsoring the show: "... solely for publicity and promotion for the city of Edmonton. It is quite conceivable that, with the excellent facilities available here, the Edmonton show could become a major attraction in the dominion."

## Personal Planes

Personal airplanes numbering 5,415 were shipped by American firms during the first eight months of 1948. A breakdown by companies is as follows: Aeronca, 421; Beech, 540; Bellanca, 25; Cessna, 1,196; Ercoupe, 127; Fairchild (F-24) 71; Luscombe, 521; Piper, 1,258; Republic Seabee, 17; Navion, 359; Stinson, 686; Taylorcraft 67; Swift 125, 198.

## More Pictures

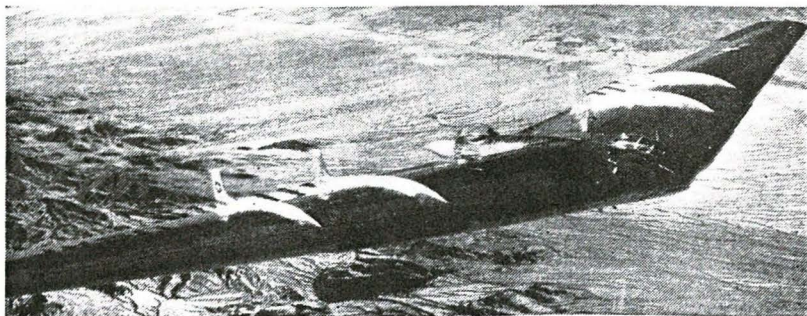
A continuing expansion of the use of aerial surveys in Canada was fore-

cast by D. N. Kendall, managing director of the Photographic Survey Corporation of Toronto, when he addressed an international gathering of civil and military air survey authorities at the annual convention of the American Society of Photogrammetry in Washington, D.C. In his address, Mr. Kendall also explained some of the difficulties which must be overcome by Canadian operators.

Pointing out that the Canadian north offered an almost limitless market for topographical and geophysical surveys, he stated that "survey begets survey, meaning that as small maps become available, plus the reconnaissance mapping of resources, the country opens up and the demand for large scale development maps is created."

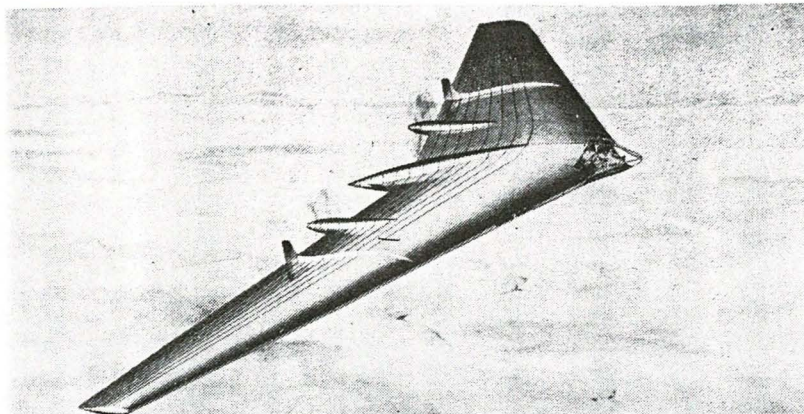
Insufficient ground control and geodetic survey information was one of the major problems in Canadian aerial mapping and photogrammetry. A speeding up of geodetic survey through the use of the helicopter to transport surveyors quickly to points difficult to reach on the ground. Other factors which complicated flying operations in Canada were the lack of airfields, high fuel costs in remote areas, short flying season for photography, the necessity of carrying heavy emergency equipment in aircraft over uninhabited territory, and communication and personnel problems arising out of operating from remote bases. For this reason it cost more per square mile to photograph and map Canada than other more densely populated countries.

PSC sponsored a display at the convention. The Corporation was also represented by W. H. Godfrey, Hunt



**ON THE WING:** One of the first Northrop Flying Wings to be converted to jet propulsion is shown in full flight over California. Designated the YB-49 by the USAF, the aircraft has an all-up weight of 213,000 lbs. and an empty weight of 88,100 pounds. Performance data is restricted, but acceleration is said to be so fast that it is necessary to throttle back immediately after take-off so that the gear-down speed will not be exceeded before the gear can be retracted.





**GLOBE GIRDLER:** This is how Northrop thinks its flying wing would look if it were completely fitted with boundary layer control slots. Northrop claims that so equipped a flying wing such as the YB-49 could fly around the world non-stop. More about Northrop's theories on boundary layer control may be found in News Roundup.

rent unrestricted production engines and is consequently now available for commercial use.

•The Grobet File Company of America, Inc., has appointed the Industrial Steel & Supply Company, 878 Notre Dame West, Montreal, as Canadian representative.

•The Smithsonian Institution of Washington, D.C., has installed a permanent display featuring Goodyear's

crosswind landing gear.

•The CAA has issued a proposed regulation which would standardize the cockpit arrangements of all U.S. transport category aircraft on the drawing boards at the time the regulation is adopted.

•Magnesium alloy canopy frames for prototype models of the Temco TE-1A military type trainer are now being experimentally stretch formed

on a Hufford stretch-press at Texas Engineering and Mfg., Co., Inc., in Dallas, Texas.

•A Stratocoach version of the Boeing Stratocruiser, offering coach class accommodations for 99 to 103 air travelers, has been announced.

•British aircraft exports for the first four months of 1949 had a value of approximately \$45,058,000. Goal of British aircraft constructors for all of 1949 is exports valued at \$141,400,000. In June it appeared that Britain had orders covering the purchase of over 1,000 aircraft of all types.

•A six-jet Northrop Flying Wing is to be built to serve as a flying test bed for the XT-37-1 Turbodyne engine, developed by the Turbodyne Corporation at Hawthorne, California. The Turbodyne will be mounted slightly to the left of the centre of the airplane and will drive a large contra-rotating propeller. The airplane will be designated the EB-35-B.

•Pretoria Light Aircraft Company has completed plans to build under license two types of Piper personal planes in South Africa.

...THERE HE WAS, STANDING IN THE DOOR, SAYING...

# "What's 'One-stop' service?"

WELL WE KNEW, BY LOOKING AT HIM, THAT HE COULDN'T READ SO WE SHOWED HIM WITH PICTURES...

...HE WASN'T AS DUMB AS WE THOUGHT.

## AIRCRAFT OVERHAUL & REPAIRS, LTD.

\* LAC A LA TORTUE, P.Q. • THE FINEST LAND AND SEAPLANE BASE IN EASTERN CANADA • TELEPHONE GRAND'MERE 2259 AT NIGHT 2409



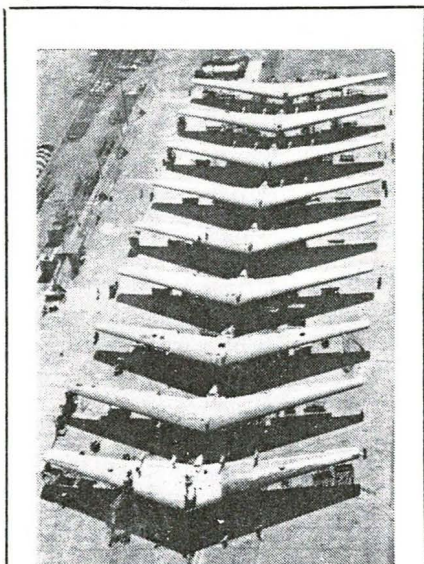
in that the Ambulance (a Norseman) had to pick up a youth who had been accidentally shot and who had to be rushed to hospital. The lighting of the field by the cars was pre-arranged by the doctor who had requested the plane.

There was no moon and the cars were so located to shine their headlights down the field from the direction in which the landing was being made. The flare was dropped over the centre of the field just prior to landing. The aircraft, a skiplane, had a clear landing run of about half a mile, there were no obstructions in the vicinity and the snow was about 8 to 10 inches deep with a smooth surface. Pilot Malcom says that conditions were ideal.

## Profits Soon?

Scheduled air carriers in Canada showed a loss of \$54,406 for the first ten months of 1948, according to figures recently released by the Dominion Bureau of Statistics. This looks quite impressive when compared with the loss of \$2,152,643 which had the ledgers dripping with red ink during the same period in 1947.

Figures for October, 1948, last month for which details are available, show that scheduled carriers earned \$2,550,631 during the month, compared with \$2,011,525 in the corresponding month of 1947. Operating expenses for the month totalled \$2,629,626, giving an operating loss of \$78,995. The



FROM SCREW TO SQUIRT: Nine Northrop Flying Wings are shown lined up before being converted to jet-propelled RB-49's. Those in picture are driven by pusher propellers. Only four conventional aircraft could be stored in same space.

DIMENSIONAL SPECIFICATIONS  
190 CU. IN. CLASS

**AIRBORNE HOT ROD:** The rules for the 1949, 190 cubic inch class of racing airplanes are now available. This is a race that is rapidly growing in popularity and calls for the use of engines which have a cubic displacement of not more than 190 cubic inches. . . Minimum allowable wing area is 66 sq. ft. Full rules are obtainable from the Contest Board, National Aeronautic Association, 1025 Connecticut Ave., N.W., Washington 6, D.C. Canadian entries are permitted but must have U.S. built engine.

loss in October of 1947 was \$150,582, when operating expenses were \$2,162,107.

Non scheduled carriers had revenues of \$513,918, compared with \$539,376 the previous October. Operating costs rose from \$475,126 to \$535,476.

## AITA Membership

Air Industries and Transport Association membership totalled 122 on January 14. This was made up of 62 operator members, 43 associate members 7 associate manufacturers, and 10 manufacturers.

## Customer Service

A tour of eight South American countries by Cheston Newhall, vice-president and general manager of The Babb Company (Canada) Ltd., Montreal, was started on February 1. While on his trip Mr. Newhall will visit 15 air lines to which Babb sold aircraft during 1948.

He will serve as a technical consultant on the trip advising Babb customers on maintenance, procurement, and operating problems, to help them use their equipment at top efficiency. A statement from Mr. Newhall says that it is the policy of his company to follow through on sales in this manner.

## TCA Pilot Pay Up

Increases in pay will be coming to 300 captains and first officers of TCA with the conclusion of an agreement between the air line and the Canadian Air Line Pilots Association, bargaining agents. Major bone of contention was the salary of about 170 first officers,

and the discussions resulted in pay raises for these amounting to about \$30 per month.

Hereafter, pay for first officers will range from \$200 to \$400 a month, as against a former starting wage of \$300 a month. The lower minimum was agreed upon because it is expected that future first officers will be comparatively inexperienced. The present batch of starboard sidlers is composed mainly of erstwhile RCAF pilots.

Captains' pay will run from \$450 to \$750 a month on domestic service. A new classification, that of reserve captain, will be made up of captains who sometimes fill in as first officers and are first in line for captains' position in the event of a vacancy. The personnel in this group will receive captains' pay when acting in that category. The new agreement ends an 18 months dispute. The raises are retroactive.

## Briefly

- Britain is said to be trying to buy 150 to 180 Boeing B-29 Superforts. Negotiations were thought to be under way last month and at the same time RAF personnel were training on USAF B-29's based in England.

- The Mach number officially recorded during the deHavilland 108 sonic dive was 1.04, representing a speed of 688.48 mph at 35,332 feet.

- A Gloster Beryl-Meteor recently climbed to 40,000 feet in 7 minutes 31 seconds. It had reached 30,000 feet in 3 minutes 43 seconds. The standard Meteor takes 8 minutes to do 30,000 and 17 minutes to do 40,000.





# News Roundup

## Look Out

The widely publicized accident in which a Cessna 140 collided with a Pan American Airways Constellation over Long Island, N.Y., in January of this year, is the subject of an accident investigation report released last month by the CAA.

As is well known, the pilot and passenger of the Cessna were both killed, and while there were no injuries to the passengers or crew of the Constellation, the aircraft itself was extensively damaged, though it was able to land safely.

At the time of the accident there were no clouds below 15,000 feet and visibility at 3,500 feet, at which altitude the collision occurred, was five miles or better. The Constellation was climbing to its approved cruising altitude of 17,000 feet at an indicated air speed of 175 mph and on a heading of 95°, during which time the Cessna was flying a heading of approximately 40° at an air speed of 108 mph and at an altitude of 3,500 feet.

The two airplanes converged at an angle of 58° and collided at an altitude of 3,500 feet over Long Island, on a Red Airway. During the period of time that the airplanes were converging at an angle of 58°, the Cessna maintained a constant relative bearing from the Constellation of 38° and the Constellation maintained a constant bearing from the Cessna of 84°. Neither the pilots in the Constellation, nor the pilot in the Cessna observed the other until immediately before impact, though each aircraft could have been seen from the other. When the pilots of the Constellation did see the Cessna, it was within the wing span of the transport to the right and slightly above the cockpit. The Constellation's control column was pushed sharply forward, but it was too late.

The Report says: "The Civil Air Regulations applicable at the time of this accident required an aircraft which was overtaking another, or converging on another from the left, to give way. The same regulations also require an aircraft in level flight when 3,000 feet or more above the surface in a control area to fly at an even or odd thousand

foot altitude as specified by the Administrator. In this particular case the Administrator had specified an odd thousand foot altitude. In addition to these specific regulations, the pilots in the safe operation of both aircraft were required to remain vigilant for the presence of other aircraft in their immediate vicinity.

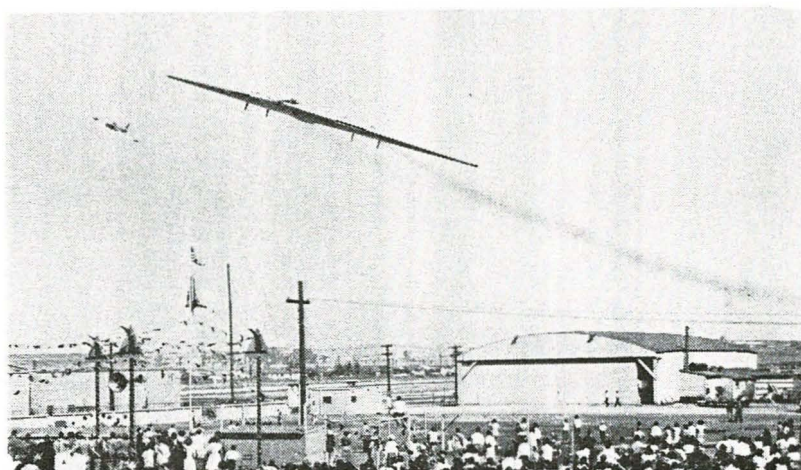
"It appears clear that the pilots in the Constellation were required not only to see the Cessna, but to avoid it. It also appears clear that the pilot in the Cessna was required to remain alert for the presence of other aircraft in his vicinity, especially in view of the fact that he was crossing an air-

## ICAO Story

The International Civil Aviation Organization, which has its headquarters in Montreal, has issued a small, two-color booklet which explains in clear and brief style what ICAO is, how it began, and so on. It is worthwhile reading because it contains worthwhile information on a worthwhile organization.

Commenting on ICAO's future, the booklet concludes by quoting Dr. Edward Werner, president of the ICAO council: "ICAO is an association of national governments which have recognized the need for working together for the good of civil aviation and for the healthy development of international relationships.

"No one nation, acting within its own territory and with its own resources, could make its civil aviation



**RAZOR'S EDGE:** Striking across the sky, the USAF's Northrop Flying Wing YB-49 bomber shows its stuff for the spectators who attended the recent tenth anniversary celebrations of Northrop Aircraft, Inc. Slightly to the left of the YB-49 is a Lockheed F-80. The trail of black smoke evident seems to be typical of most American turbo-jet engines. The Flying Wing has a speed in excess of 500 miles per hour and grosses over 100 tons. Northrop is also producing the C-125 Raider for the USAF. This is the aircraft that Canadair is licensed to build for world markets.

way in an area where heavy traffic could be expected. Furthermore, since the accident occurred at 3,500 feet in a control area at a time when the Cessna was observed in level flight, it appears that the Cessna was not being flown at proper altitude.

"Therefore, it must be concluded that the failure of the pilots in both aircraft to remain in an area where heavy concentrations of traffic could be expected, resulted in this mid-air collision."

as safe, reliable, economical or useful as it could be if that nation worked together with its neighbors. Recognition of this need for constant co-operation has brought into ICAO membership two-thirds of the world, nations which operate more than ninety per cent of international air lines. The same recognition will, I believe, convince the remaining states that they cannot long forgo the benefits of membership."



copter for postal services. In many areas airmail could be delivered one day earlier. For Arctic use it has many important functions, such as ice patrols ahead of ships and, landing on islands which are fringed by pack-ice until very late in the season. However, one use of immediate importance, and upon which I would like to conclude, is in connection with geophysics.

We are increasingly dependent upon geophysics for exploration purposes. The airborne magnetometer is now a familiar instrument, but the next year or two will see increasing use of aircraft in connection with radio-activity, gravity, electromagnetic and even seismic surveys. In these developments the helicopter is at least as important as the conventional aircraft. Most of them depend upon flying low, or even landing briefly; others require low flight speeds; in certain cases topography precludes the use of aircraft other than helicopters.

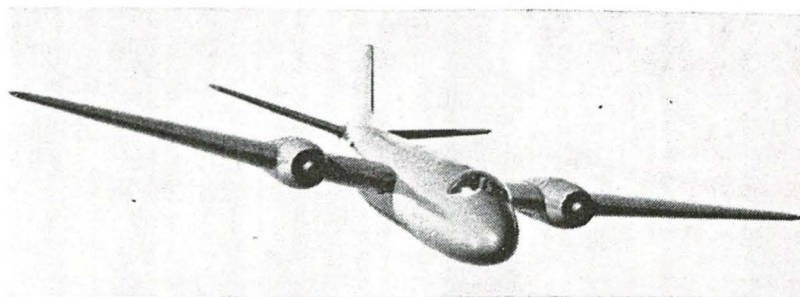
To take two practical examples, in

### THE PICTURES

PAGE 9: The upper photograph shows a Hiller "360" helicopter flying hands off, giving some indication of what may be expected of helicopters in the future. The lower picture shows a Bell 47D being used by the Ontario Hydro-Electric Power Commission for power line patrol.

very mountainous areas (such as B.C.) it is clearly impossible to fly at a constant height of, say, 300' above the ground in a fixed-wing aircraft. Yet with a helicopter this is quite feasible. Again in Northern Alberta, where the oil search is now moving, roads hardly exist, and usable lakes for float aircraft are not common. Much of the country consists of innumerable small muskegs. Naturally in such country exploration is most difficult and conventional aircraft are largely unusable. Here the helicopter, summer and winter, would provide a wonderful tool. It could move geologists in and out of the area. An airborne seismic crew could be set up based on four helicopters. Only one helicopter is needed for a gravity party. There are still technical difficulties, but it is perhaps sufficient to say that they have been, or can be overcome, and I therefore venture to predict that we shall see a major use made of helicopters on behalf of the oil industry in the West, as the exploration program moves to the North.\*

\*Three helicopters, brought in from the U.S.A., were actually used in Alberta in 1949.



## The Canberra

Although deftness and gracefulness are not usually associated with bomber aircraft, an exception to this may be found in the English Electric Company's Canberra B. Mk. 1, a machine that shows full promise of having all the versatility of a Mosquito, despite its greater size and weight. Observers at last year's SBAC Show were fascinated by the fighter-like manoeuvrability of this medium class bomber.

This is due in large part to the power that is available from the Canberra's two Rolls-Royce Avons, which turn out about 6,500 pounds of thrust each. It is also due to the light wing loading, comparatively low aspect ratio, smooth construction, and a modest thickness chord ratio.

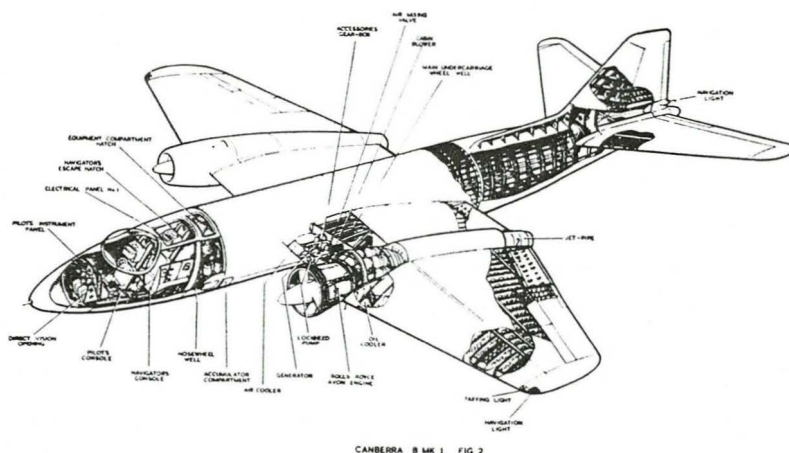
The Canberra is the first jet-bomber designed and manufactured in Great Britain (and it is now in quantity production for the RAF). It is a twin-engined, mid-wing monoplane intended to rely for defence on the highest possible performance and altitude. It is so clean in conception that nowhere are the contours broken by any bulges (i.e.

gun blisters), even the use of external airdrops having been largely avoided. The intersections of the wings with the fuselage and nacelles were achieved without the addition of fillets. The bomb doors are fitted with rollers which slide on curved tracks so that they retract well into the fuselage to reduce drag.

The plan shape of the wing is fairly conventional, the use of sweep back having been found not to be necessary at the Mach numbers which could be attained when carrying a useful military load with the power likely to be available from two engines within the life of the aircraft.

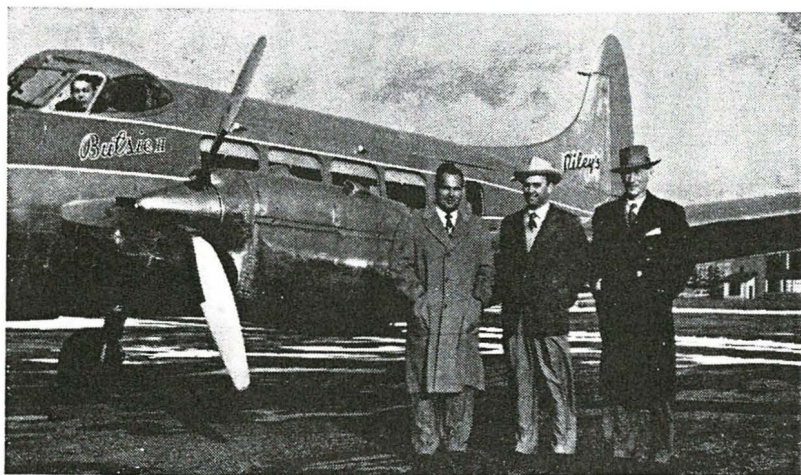
A crew of two, pilot and navigator, is carried in a pressurized cabin at the forward extremity of the fuselage. The pilot's station is enclosed by a shallow canopy of transparent plastic, and the navigator is located behind the pilot.

Span is 64 ft.; length, 65 ft. 6 ins.; height is 15 ft. 7 ins.; The Mosquito had a span of 54 ft. 2 in.; a length of 41 ft. 2 in.



CANBERRA B MK 1 FIG 2





**NATURALIZED DOVE:** First de Havilland Dove to be certified in the U.S. is shown above. The aircraft was delivered at Toronto during December bearing registration N 4550N. Shown in front of Dove, L. to R. are: Jack Riley of Riley Aircraft Corporation, Shreveport, Louisiana, first Dove distributor to be appointed by de Havilland in the U.S.; Thane Minor, sales manager & demonstration pilot, Riley Aircraft; Sandy A. F. MacDonald, sales manager for de Havilland Aircraft of Canada. The aircraft shown is an executive model.

pay the transportation costs to and from the conference, and supply aircraft and gasoline for any or all air work involved. Participants would be expected to pay their own accommodation and personal living expenses. August has been put forth as the best month for the courses, which would be nine days in duration. The lecturers will possibly include personnel from the RCAF and from the major air lines.

## First Arrivals

The first group of RAF aircrew trainees scheduled to earn their wings at RCAF flying schools during 1951 arrived by air at Dorval P.Q., on January 13. The initial party consists of 28 pilot trainees, and arrived aboard an RAF Handley Page Hastings transport. The group immediately

proceeded to RCAF Station, London, Ontario, for a two week pre-flight course before going to Gimli, Manitoba.

The trainees form the first contingent of 200 RAF aircrew, including both pilots and navigators, to be trained in Canada during 1951.

It was further announced recently by Defence Minister Brooke Claxton that Canada was offering the North Atlantic Treaty Organization the chance to increase substantially their training in Canada. Mr. Claxton added that he considered this "one of the most important ways in which our special facilities and experience can be made available to assist other countries in meeting the need they all feel." The increase referred to would be in addition to the 200 RAF and 100 Continental trainees previously mentioned.

## Third Party Risk

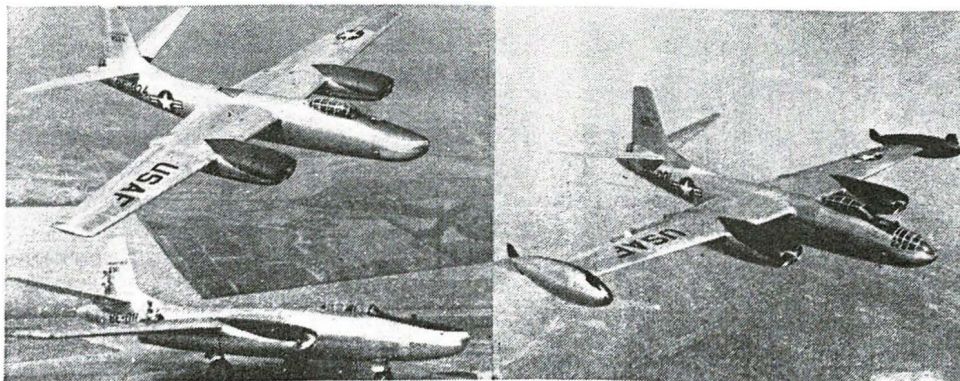
The protection which must be afforded innocent third parties on the surface against the risks of air navigation is being studied by ICAO's Legal Committee, now meeting in Mexico City. Legal experts from more than 25 countries are attempting to finalize a new draft convention on damage caused by aircraft to third parties on the surface with a view to having the convention adopted in 1951.

The main problems to be solved before a final draft of the convention is prepared include such matters as the definition of the term "operator"; the system of liability; the jurisdiction of courts to adjudicate claims, arising under the convention, and to grant execution, where required, of the judgments rendered in the courts of contracting states and the insurance requirements to be included in the convention. In addition, the Committee is also considering aspects of the problem of aerial collisions which relate to the draft convention.

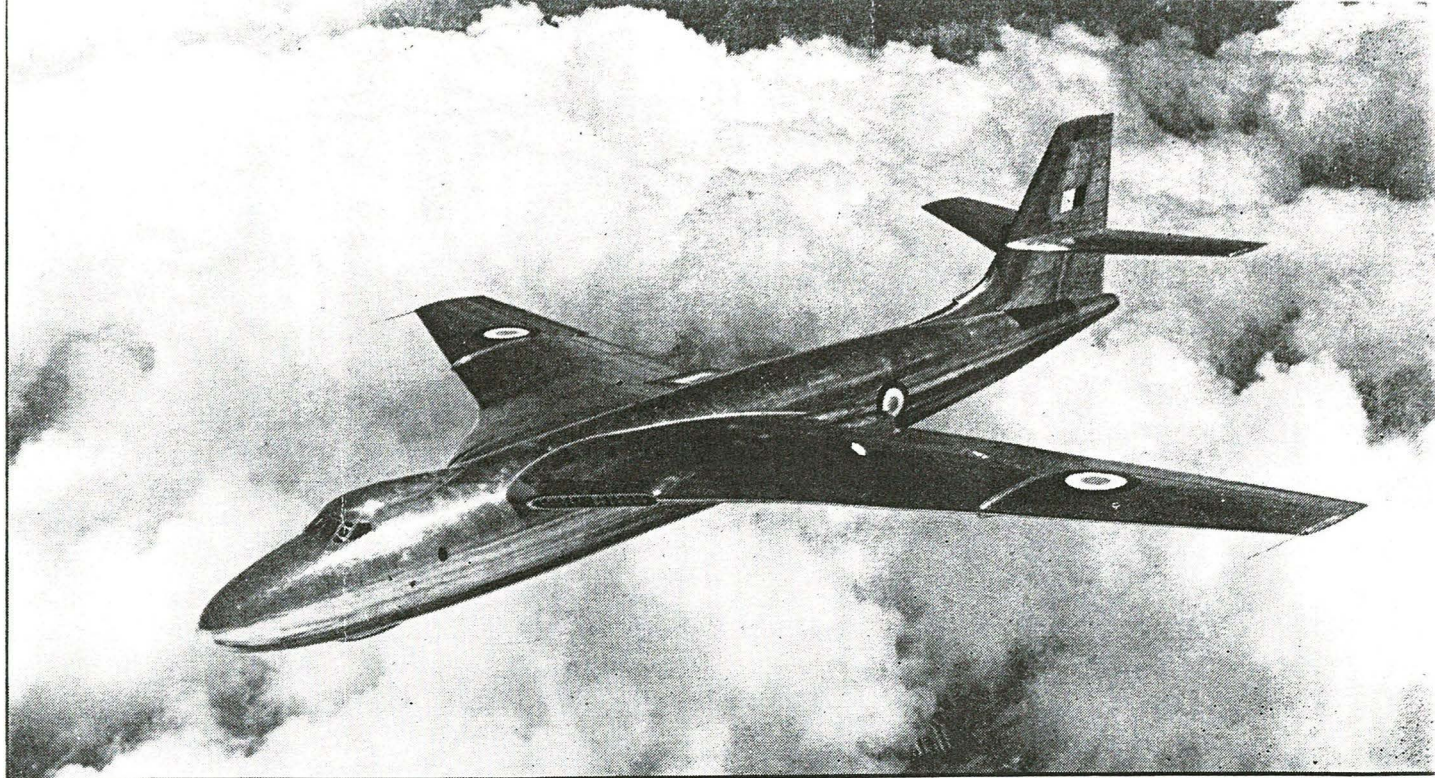
The present draft provides for limited liability of the operator except when his conduct is such that it would be against the public interest to limit liability. However, it has been argued that, if unlimited liability should apply to all cases of negligence, the practical importance of a system of limited liability would be extremely small. Therefore, a special group of circumstances has been introduced to cover cases where the person suffering damage is able to prove negligence, or another wrongful act, on the part of the operator, which cannot be classified as intentional; in such circumstances, the liability would be three times the usual amount of limited liability.

## SPECIAL MISSIONS:

The latest version of the North American Tornado is the RB-45C, a photo-reconnaissance bomber, shown at left. At right is B-45C with wingtip tanks. The YB-45C is fitted with five camera stations and is powered by four GE J-47As. Aircraft is said to be in the 550 mph class. With a maximum gross t/o weight of 110,000 lbs., it has a service ceiling of over 40,000 feet.







# Farnborough Afterthoughts

By JAMES HAY STEVENS

**F**ARNBOROUGH is over once again: all the frantic preparation is past until next year; the excitement of the first morning with the white tents, the office staff unaccustomedly wielding their feather dusters on the stands and the ground crew their polishing cloths on the aircraft; the hurried greeting of old friends whom one will not see for another year—all this is finished and one is left wondering how to sum up the Twelfth SBAC Display. Certainly there were not so many new types as some other years, but what was to be seen after the veil of security had been (reluctantly) lifted was of the very first quality.

Despite this excessive security, there was an amusing lapse that is worth

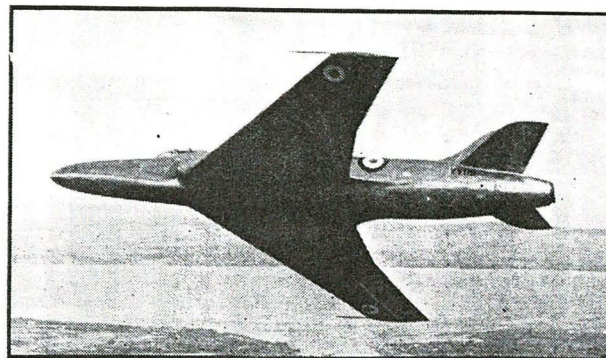
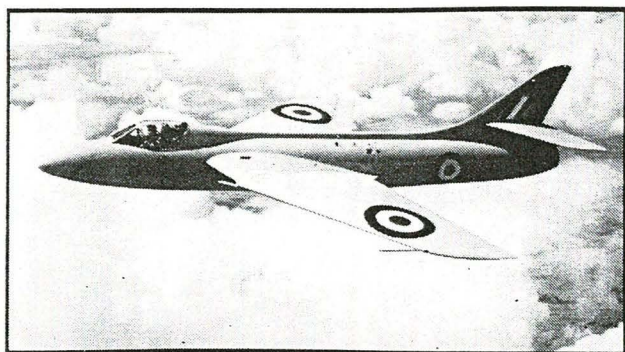
recording. For some years we have had had to be content with a few handouts about the "flexible deck" (MAT) which was being developed for the Royal Navy. No photographs could be published and nothing said, yet when I arrived at Farnborough, there beside the runway was the whole equipment—an area of heavy rubber ballonets with a wooden ramp, pressure gauges and inflating equipment. Then, early on Wednesday morning, before most of the guests had arrived, a Sea Vampire came in with its arrester hook down and landed on the flexible deck with its wheels up, stopping in a cloud of dust in a very short distance. Apparently there was an arrester cable in use, but one was not allowed a close-up

after the demonstration. The idea of the flexible deck is to provide an emergency landing area on which wheelless aeroplanes can be put down safely at 100 mph or so. If this were used in conjunction with catapults for take-off and convenient handling trolleys, all the weight and complication of the undercarriage on fighters could be avoided—with a consequent increase in performance or endurance.

## the static display

**T**HE SHADOW of security prevented most companies from showing their latest work in the Static Exhibition. Napier, however, were a happy exception. It was generally known in the Industry that they had

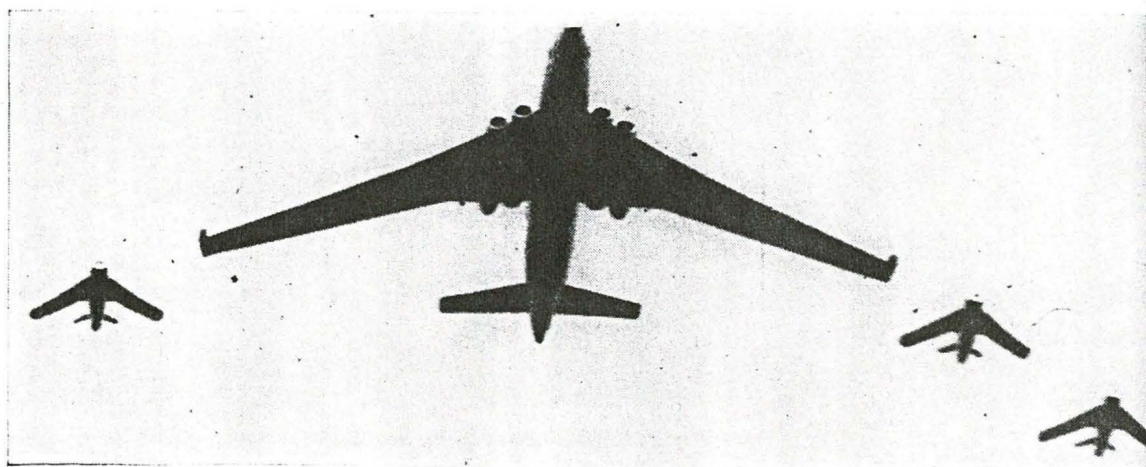
TOP IS THE VICKERS VALIANT; BELOW, LEFT, THE HAWKER P.1067; RIGHT, THE SUPERMARINE 535





USSR

## ILYUSHIN IL-38 (BISON)



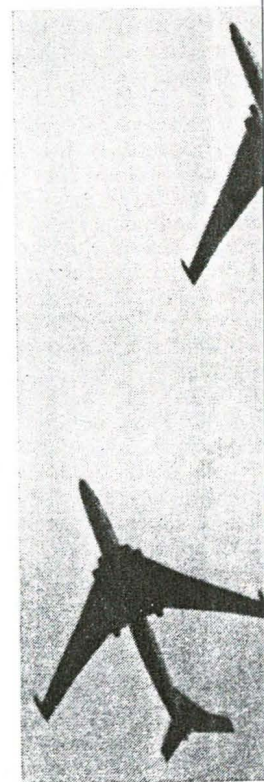
Long-range heavy bomber

**B**elieved to have been designed by Sergei Ilyushin, one of the two best-known Russian bomber pioneers, this machine is the Soviet Union's counterpart of the American B-52 Stratofortress. It is the U.S.S.R.'s major aeronautical advance flaunted in the face of the West since the appearance of the Mig-15. Known by the N.A.T.O. code-name as Bison, or Type 37, this advanced machine was publicly displayed on May 1, 1954, during the year's May Day fly-past over Moscow, and is believed to have flown for the first time late in 1953. IL-38 is a tentative designation as employed in the West, but it has been established on good authority that the TsAGI design number of this bomber is Type 428. The appellation "Molot," meaning a "heavy hammer," has also been mentioned in reference to this strategic nuclear weapons carrier. Currently it is one of two long-range thermonuclear bomb carriers which form the backbone of the Soviet Union's strategic air command — the Aviat'sia Dalnyevoye Deystviya — the other aircraft being a Tupolev four-turboprop design referred to as the Bear in the Allied designating system.

Although not endowed with the same great range as the Bear, the return-trip reach of the latter being of the order of 10,000 miles, the IL-38 is capable of reaching New York after a six-hour flight from one of the Arctic Circle bases, dropping its load of atomic or hydrogen bombs and/or missiles, and returning to its base — all at speeds approaching that of sound. The only American bomber with similar performance capabilities is the B-52, utilizing eight turbojet powerplants, as compared to four employed by the Bison. The four large axial-flow units which propel the Bison are partially buried in the thick wing roots close to the fuselage center line, thereby eliminating any powerful asymmetric forces in the event of a failure of one or both engines in one of the wings. At the time of the Bison's appearance in the sky over the Red Square, its powerplants were superior to any operational turbojets in the Western air forces, as evinced by the fact that only four of these by-pass turbines were sufficient to provide the Soviet bomber with performance figures matching those of the eight-jet Stratofortress of the U.S.A.F. Strategic Air Command.

The airframe of the Ilyushin is a conventionally subsonic design, featuring high-aspect ratio wings at an angle of approximately 34 degrees at mid-span. The inboard sections, this being some 34 degrees at mid-span, are accomplished by a cycle landing gear, the main gear retract into the fuselage just between the exhaust pipes. Outriggers in small, straight tip fairings act as stabilizers of braking parachutes in the event of a bomber down during landing.

In the best Soviet Air Force bomber, the Bison is heavily armed for interceptors. Reports suggest that fire cannons are installed, but radar-equipped tail turrets are mounted in pairs on dorsal and





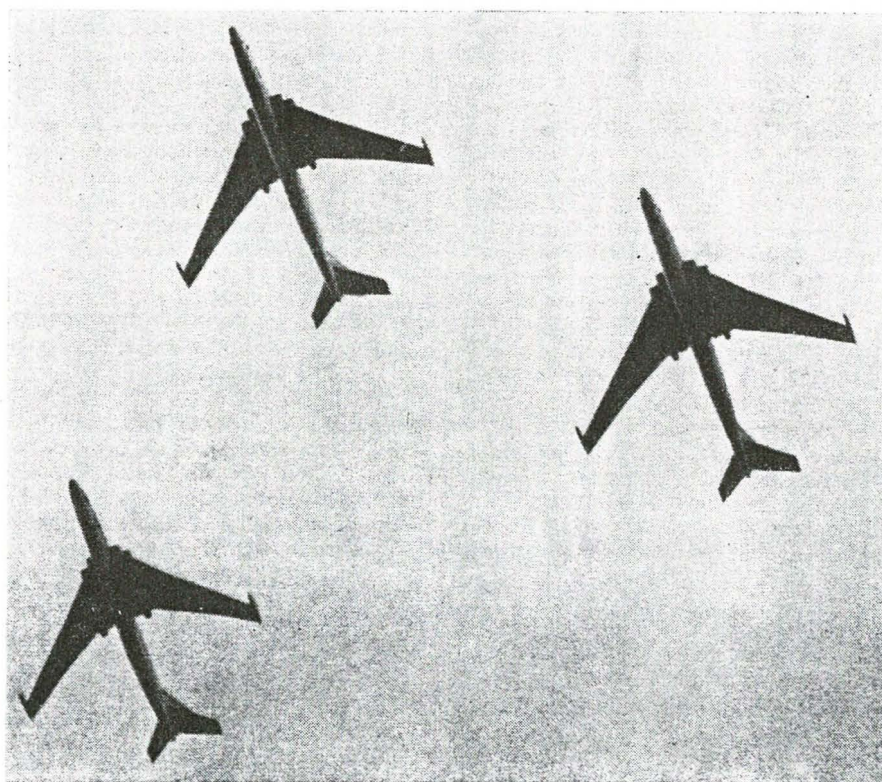
The airframe of the Ilyushin-38 is a basically conventional subsonic structure, featuring high-aspect ratio wings swept back at an angle of approximately 40 degrees at the inboard sections, this being reduced to some 34 degrees at mid-span. Takeoffs and landings are accomplished by means of bicycle landing gear, the members of which retract into the fuselage just under the air intakes of the inboard engines and mid-way between the exhaust pipes and the empennage. Outriggers in small, streamlined wing-tip fairings act as stabilizers. A triple cluster of braking parachutes is used to slow the bomber down during landings.

In the best Soviet Air Force tradition, the Bison is heavily armed for defense against interceptors. Reports suggest that 10 rapid-fire cannon are installed, two in a manned but radar-equipped tail turret, plus eight mounted in pairs on dorsal and ventral fuse-

lage surfaces, in front and rear sections. Sighting blisters and radar bulges, which can be discerned on the available photographs, indicate that armament positions are remotely controlled.

Representing what is probably the final product of the Soviet Union's piloted bomber design, one of the last stages prior to the advent of the Intercontinental Ballistic Missile, this aircraft is currently in full production and in squadron service in numbers estimated by various experts at flying 175 machines.

**TECHNICAL DATA** — Maximum speed: App. 630 mph. Range: Maximum 7000 miles. Ceiling: App. 57,000 ft. Weight: Loaded 352,750 lbs. Engines: Four 20,500-lb. thrust turbojets. Armament: App. ten 23-mm. automatic cannon plus bombload of app. 20,000 lbs. Wingspan: App. 170 ft. Length: App. 150 ft. ■



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USSR

## ILYUSHIN IL-28 (BEAGLE)

Noteworthy because it was the first Soviet bomber with jet powerplants to enter production and service, the IL-28 is today the most numerous jet bombing aircraft on an operational level with the forces of the Warsaw Pact nations. In terms of performance, it is somewhere in between the American B-45 Tornado and the B-54. Designed soon after the close of World War II by the famous Russian bomber constructor, Sergei Ilyushin, and intended to replace the piston-engined Petlyakov PE-2 and Tupolev Tu-2 light bombers, the IL-28 effected its maiden flight sometime late in 1948, with first service machines being delivered to the Soviet Air Force in 1949-50. Presently the IL-28, with its several derivatives, forms the mainstay of the light bomber and ground-attack squadrons of the Soviet, Czechoslovak, Polish and Red Chinese air forces, as well as that of Egypt.

There has been some speculation as to the turbojets employed in the IL-28. It has now been established on good authority that they are VK-1 centrifugal modifications of the Rolls-Royce Nene. A number of versions of the basic IL-28 design are currently in service with several air forces, and despite the plane's age, their designations are still largely a controversial subject. The code-name "Beagle" (previously "Butcher") is used for this bomber in the West, with a swept-wing progressive development, reportedly with a top speed of 621 mph, known as "Blowlamp." The latter machine was initially demonstrated at the Kubinka airfield in June, 1956. It is known that the standard bomber version has been modified to serve as a heavy ground-attack aircraft ("shturmovik") with the addition of heavier fixed nose armament. An all-weather fighter with radar in the nose has also been reported, while a conversion trainer, designated IL-28U ("U" for "uchebniy" or "instruction") has a second cockpit ahead and below the normal pilot's cockpit and excludes the underfuselage radar system.

A slightly modified conversion of the

IL-28 is known under the designation IL-20. Used by the U.S.S.R.'s government airline, Aeroflot, for delivering high-priority cargoes and for gaining jet operating know-how, this development is externally similar to the bomber version, even the nose gun ports not being faired in.

The IL-28's design is a composite of straight wings with no taper on the leading edge and all-swept fixed tail surfaces. Its shoulder-positioned wing of moderate aspect ratio, with mass balances, inset hinges, and de-icing air outlets at the tips, is mounted far back on the circular-section fuselage, with two square-section engine nacelles installed far forward under the wing and housing hinged landing lights. Defensive armament consists of two tail-mounted cannon in a pressurized turret controlled by the tail gunner, who, contrary to the accepted Western practice, has no ranging radar at his disposal. Entry is effected through a ventral hatchway covered by a door which is also used as a blast shield for bail-outs and as a tail bumper. Another pair of fixed offensive cannon is installed in the nose. The crew members are equipped with emergency oxygen in their personal parachute packs, with emergency ejection seats for the pilot and the navigator only.

In wide service with many air forces and in production, under license, in Czechoslovakia, approximately 45 of these light attack bombers were sent to Egypt prior to the Middle East military collision in the fall of 1956. Training was effected at the Egyptian Air Academy at Bilbeis, but the aircraft were not used effectively in the Suez operation. Some were destroyed by Anglo-French bombing raids, while others took refuge in Syria and Saudi Arabia.

**TECHNICAL DATA** — Maximum speed: 600 mph. Range: 2000 miles. Ceiling: App. 45,000 ft. Weight: Loaded app. 45,000 lbs. Engines: Two 6000-lb. thrust Klimov VK-1 turbojets. Armament: Four 23-mm automatic cannon plus bombload. Wingspan: 68 ft. Length: 62 ft. ■



Three-seat light bomber

## MIKOYAN & G

The original Western conception of the MiG-19 differed extensively from the one which bears that Soviet Air Force designation. Formulated from conflicting and questionable photographic information, and notably of German origin, it depicted a single-engine fighter with horizontal wings mounted in a "T" position about a relatively large-area vertical fuselage. This misconception, based on a general scarcity of data in an era of the equipment of the Soviet Air Force, dissolved in 1955 with the appearance of approximately 50 advanced fighters, dubbed Farmers in the NATO code, and the subsequent identification of that aircraft as the MiG-19. Reports in the spring of 1957 stated that numbers of MiG-19s were delivered to replace the serious aircraft lost by that country during the Suez operation.

Designed by a team headed by Mikoyan and Mikhail Gurevich, the MiG-19's first operational appearance bears a strong family resemblance to its known predecessors, the MiG-15 and MiG-17, which it is a direct progressive development. Similarly to its subsonic predecessor, it is destined to form the mainstay of day fighter squadrons having the same status early in 1955 and is in the process of replacing the MiG-17 in the first-line squadrons. Logically, as well as performance-wise, its external appearance, the Farmer, is the counterpart of the U. S. Air Force's American F-100 Super Sabre, compared to the F-86 Sabre.

In appearance the Farmer is a blend of the Super Sabre, the Chance Vought F8U Crusader, and the French Super Mystère. The 61 wings, however, have a high sweep and the supersonic intercept capability, the accepted standards of the modern fighter design in utilizing jet engines, slim axial-flow turbojets in





USSR

## TUPOLEV TU-16 (BADGER)

Long-range medium bomber

During the 1954 annual May Day parade in Moscow, a formation of nine of the new twin-jet medium bombers streaked over the Red Square, revealing an advanced subsonic design, previously unknown outside the Soviet Union. It can be assumed that the type made its initial flight not much earlier than late 1951 or early 1952, and it is known that the high-speed bomber is currently in wide service with the Soviet Air Force squadrons, although not in quantities as large as its American counterpart, the Boeing B-47 Stratojet. It has attained a more advanced production status than its larger stablemate, the Type 37, having reached a comparable stage to that of the British Valiant four-jet bombing aircraft.

The designation of this bomber was for a long time after its unveiling a subject for speculation, but it has now been definitely established that its military designation is Tu-16, with the letters standing for A. N. Tupolev, the best-known Russian aircraft designer specializing in bombing machines. The design is also known as Type 228 by the TsAGI (Tsentralniy Aero-Gidrodinamicheskiy Institut) or Central Aero-Hydrodynamic Institute, which is the Soviet Union's equivalent of the N.A.C.A. In the West, it is referred to by its N.A.T.O. code-name of Badger, or Type 39. It falls roughly in the same category (performance-wise) as the six-jet American B-47, and Great Britain's four-engined bombers, i.e. the Valiant, the Vulcan, and the Victor. In view of the fact that this Tupolev design utilizes only two turbojets, as compared to six and four for its Western contemporaries, it can be concluded that the Soviet aircraft industry is well advanced in the field of turbine powerplants. The two engines, designed by Mikulin, are of the very large axial-flow type, approximately 40 feet long and 6 feet in diameter. Attached to the fuselage sides, these turbo-

jets have air intakes and jet exhaust pipes canted outwards.

Its long sleek fuselage, similar in concept to that of the Type 37 "Bison," has glazed visual-bombing position. Manually-controlled twin rapid-fire cannon are installed in a manned turret at the tail end, accommodating the last of three crew members. Additional guns, primarily of the radar-controlled variety, are placed in front dorsal and rear ventral positions. A large radome under the forward fuselage houses radar-bombing and navigation systems, and a "stepped" cabin features excellent visibility for the pilots.

The wing leading edge has compound sweepback angle, being some 42 degrees on the inboard sections, decreasing to about 35 degrees on the outboard panels, mean sweep being approximately 37 degrees. This system prevents the thicker wing roots from reducing the aircraft's critical Mach number. Main members of the Badger's tricycle landing gear retract into large streamlined fairings extending from the wing trailing edge, which may also act as housings for ATO rocket units to boost take-off and climb power. The tail surfaces are also swept, and the modern bomber is known to be capable of aerial refueling, a property which gives it an almost infinite range. Without aerial refueling, it can strike with nuclear weapons at all important targets in Europe and Asia.

A commercial airline development of the Tu-16, known as the Tu-104, is referred to under separate heading.

**TECHNICAL DATA** — Maximum speed: 620 mph. Range: Normal app. 4500 miles. Ceiling: App. 50,000 ft. Weight: App. loaded 160,000 lbs. Engines: Two 17,000 thrust Mikulin turbojets. Armament: App. six 23-mm. automatic cannon plus a 10,000 lb. bomb load. Wingspan: App. 110 ft. Length: App. 115 ft. ■

YAKOVLEV

Popularly known under the clature code designation twin-engine design is currently in service with all-weather interceptor squadrons of the defense system, the PVO (Proti Oborona). Reports by authorities have indicated that in 1957 numbers of these fighters received by the Egyptian Air Force, reality by Alexander Yakovlev, most celebrated Russian aircraft designer, this aircraft is thought to have been received in 1953, and to have attained service in 1955. Its mission, that of high-flying bombers at considerable altitudes, is comparable to those of the Scorpion, Canada's CF-100, and the Gloster Javelin. But most of its French counterpart, the Mirage, with which it shares a degree of design flexibility, both aircraft having been adapted to meet military requirements.

The original Yak-25, of the type observed by Western representatives at the Tushino air display near Moscow, is an exceptionally large round-nosed aircraft in accordance with its 24-hour duties. Known provisionally as the Yak-25A, this machine employs a fuselage with tandem dual engine gear, known as the "bicycle" crew, consisting of a pilot and a navigator, is seated in tandem under a partial bubble-type cockpit. The back horizontal tail surface is mounted rather high on the fuselage. Forward-firing armament consists of a pair of 37-mm. cannon, which are very heavy-duty for use in a fighter. An alternative system may comprise a launch system for unguided fin-stabilized rockets and guided missiles not as yet built in the Soviet aerial arsenal.

Two-seat all-weather fighter



## YAKOVLEV YAK-25 (FLASHLIGHT)

Popularly known under the Allied nomenclature code designation Flashlight, this twin-engine design is currently in widespread service with all-weather and night interceptor squadrons of the Soviet air defense system, the PVO (Protivovozdushnaya Oborona). Reports by authoritative informants have indicated that in the Spring of 1957 numbers of these fighters were received by the Egyptian Air Force. Made a reality by Alexander Yakovlev, one of the most celebrated Russian aircraft designers, this aircraft is thought to have flown early in 1953, and to have attained squadron service in 1955. Its mission, that of intercepting high-flying bombers at considerable ranges, is comparable to those of the American Scorpion, Canada's CF-100, and the British Gloster Javelin. But most of all it resembles its French counterpart, the Ouet S.O.4050 Vautour, with which it shares a similar degree of design flexibility, both basic configurations having been adapted to fulfill multiple military requirements.

The original Yak-25, of the type initially observed by Western representatives at the Tushino air display near Moscow, employs an exceptionally large rounded radome, in accordance with its 24-hour interceptor duties. Known provisionally as the Flashlight A, this machine employs a circular-section fuselage with tandem dual-wheel landing gear, known as the "bicycle" variety. The crew, consisting of a pilot and a radar operator, is seated in tandem under a conventional bubble-type cockpit canopy. Swept-back horizontal tail surfaces, in the well-known Soviet jet fighter tradition, are mounted rather high on the swept vertical fin. Forward-firing armament is believed to consist of a pair of 37-mm. rapid-fire cannon, which are very heavy-calibre guns for use in a fighter. An alternative armament system may comprise a launching tray for unguided fin-stabilized rockets, air-to-air guided missiles not as yet being in evidence in the Soviet aerial arsenal. The wings, con-

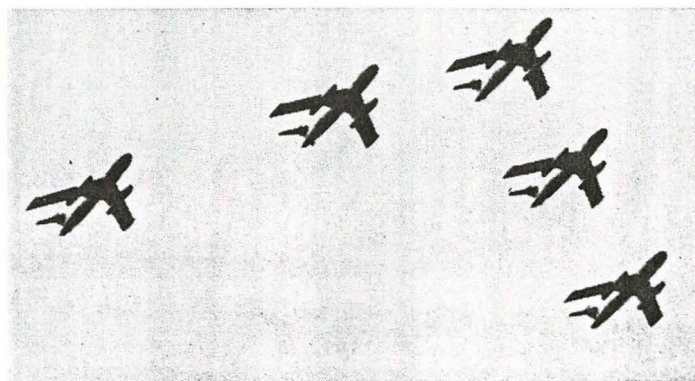
stant in chord except for the leading-edge extensions on the inboard panels, are swept back at an angle on the order of 37 degrees and are used to mount the two underslung axial-flow turbojet powerplants, reportedly of the afterburning PA-10 type. Retractable outrigger stabilizers, forming a part of the landing gear, are installed in wing-tips.

Two progressive developments of the initial "A" model of the Yakovlev-25 are referred to collectively as the Super Flashlight. They are a light attack fighter-bomber, ("Shturmovik") and a modified all-weather fighter version of the basic Yak-25 with a pointed radome, designated by the Allies, respectively, Flashlight B and C. The B close-support and tactical reconnaissance variant is characterized by transparent panels in a pointed nose section, with the navigator/bombardier accommodated in the glazed compartment ahead of the single-seat cockpit occupied by the pilot. An additional function of the pilot is thought to be that of the gunner, aiming remotely controlled tail cannon armament by means of a radar or periscopic sight. Both the Flashlight B and C utilize longer, more powerful axial-flow turbojets, estimated at 10,000 lbs. of thrust. Both forms of the Super Flashlight were publicly revealed on June 24, 1956, at the Tushino military airfield during the annual airpower display. It is unlikely that any of the Yak-25 series are supersonic, except in a dive, but the later B and C developments are likely to have maximum speeds in close proximity to Mach 1.

Characteristics described in the Technical Data table refer to the Flashlight A all-weather and night fighter.

**TECHNICAL DATA** — Maximum speed: App. 700 mph. Range: App. 1700 miles. Ceiling: App. 60,000 ft. Weight: Loaded app. 35,000 lbs. Engines: Two app. 9000-lb. thrust turbojets. Armament: Two 37-mm. automatic cannon and/or unguided air-to-air missiles. Wingspan: App. 47 ft. Length: App. 52 feet.

Two-seat all-weather fighter



and jet exhaust pipes

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## BOEING IM-99 BOMARC

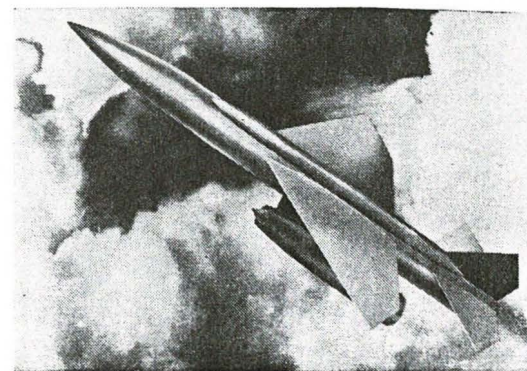
Previously designated F-99, the Boeing Interceptor Missile 99 made its first flight in 1952, two years after the development program was initiated, and is currently being readied for service with the U. S. Air Force as a target-defense pilotless interceptor. Nearly as large and with more resemblance to a piloted fighter than any other ground-to-air missile, Bomarc employs a circular-section fuselage conforming to the principles of the Area Rule and was developed jointly by Boeing and the Michigan Aeronautical Research Center, from the initial letters of which the name "Bomarc" was derived. It was preceded by a number of pilotless research vehicles in the Ground-to-Air Pilotless Aircraft program which flew shortly after World War II and attained speeds in excess of 1500 mph. It may therefore be assumed that the IM-99 has a speed in the Mach 2.5 range. Bomarc utilizes the same "reverse raked delta" wing shape as the later G.A.P.A. missiles and is powered by two 28-in. ramjets, mounted on pylons attached to the fuselage. It takes off vertically and is accelerated to the operational speed of its ramjets with the assistance of a solid-fuel Aerojet-General booster rocket. The Marquardt ramjet, a pair of which have been destined for the IM-99, passed a series of extensive flight trials while mounted on a supersonic Lockheed piloted test vehicle which was designated X-7 and became airborne through the use of a Boeing B-29 "mother" aircraft which launched it at a high altitude. The machine was then accelerated to supersonic speed by a rocket booster, to attain velocity sufficient for the operation of its ramjet powerplant. An appreciable amount of component testing for the Bomarc has been accomplished by means of a modified Martin B-57 (Canberra) bomber. The system has been experimented with in a 17-foot nose addition to the B-57's fuselage. Additional guidance development has been conducted with an F-94B Starfire flying testbed. No specific data or photographs of this advanced interceptor are available, and the illustration here is therefore an artist's conception of the highly secret missile.

The guidance system employed by the IM-99 is reportedly of the "command" variety. This system belongs to the category of the "beam-riding" type, and consists of two radar transmitters, one for the target aircraft

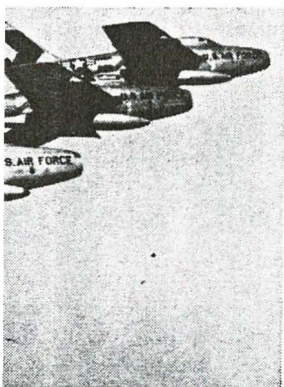
and one for the missile. Both feed data to a computer which in turn transmits steering radio commands to the missiles. After being guided to the general target area by the command beam-riding guidance technique, a homing system probably takes over to guide the missile directly onto the target aircraft. There are indications that the exceptionally large warhead of the Bomarc is of the nuclear type. The value of this fantastic weapon is evident from the fact that it could destroy whole fleets of bombers without physically hitting any of them, and possesses development potential for anti-ballistic-missile applications. Due to the high cost of the IM-99, there also evolved a plan to arm the supersonic missile with 6½-ft. long GAR-1 air-to-air guided rockets, and equip the Bomarc with a parachute through the use of which it may be recovered after being guided within the range of the target and firing its load of GAR-1s. Having a much greater range than its U. S. Army Nike counterpart, the Bomarc will be able to intercept an enemy bomber up to 300 miles from its intended target.

Intensified development of an improved model of this major USAF surface-to-air weapon is well under way for the air defense of the United States. Its importance to aeronautics is marked by the fact that it is one of the first aircraft that points to the end of the epoch of piloted interceptors.

**TECHNICAL DATA** — Maximum speed: App. 1900 mph. Range: App. 300 miles. Ceiling: App. 60,000 ft. Weight: Launching 8500 lbs. Engines: Two app. 10,000-lb. thrust Marquardt MA-20C ramjets. Armament: High-explosive warhead, Wingspan: 19 ft. Length: 39 ft. ■



Surface-to-air interceptor missile



underflash, and in June of various of these fighters had been destroyed by the French and Netherlands fighter-bomber and its to-reconnaissance counter-in operational service with the U.S. Air Force.

underflash is a reconnaissance version of the Thunderstreak bomber. To permit the installation of electronic gear in the fuselage and the air intakes behind the wing roots. Armament consists of six to four .50-cal. M3 machine guns. The modified RF-84F, known as the RF-84K, is intended to be a "reconnaissance fighter" and is based on a GRB-36 under the B-29. This scheme offers considerable advantages from the point of view of launching the fighter in the target area greatly increases the effectiveness of the bomber. The first RF-84F was launched under the Fighter Reconnaissance project in 1952. It is presently based at the Malmstrom Air Force Base, Montana. Technical data is the standard F-84F.

**TECHNICAL DATA** — Maximum speed: App. 1900 mph. Range: App. 300 miles. Ceiling: App. 60,000 ft. Weight: Launching 8500 lbs. Engines: Two app. 10,000-lb. thrust Marquardt MA-20C ramjets. Armament: High-explosive warhead, Wingspan: 19 ft. Length: 39 ft. ■



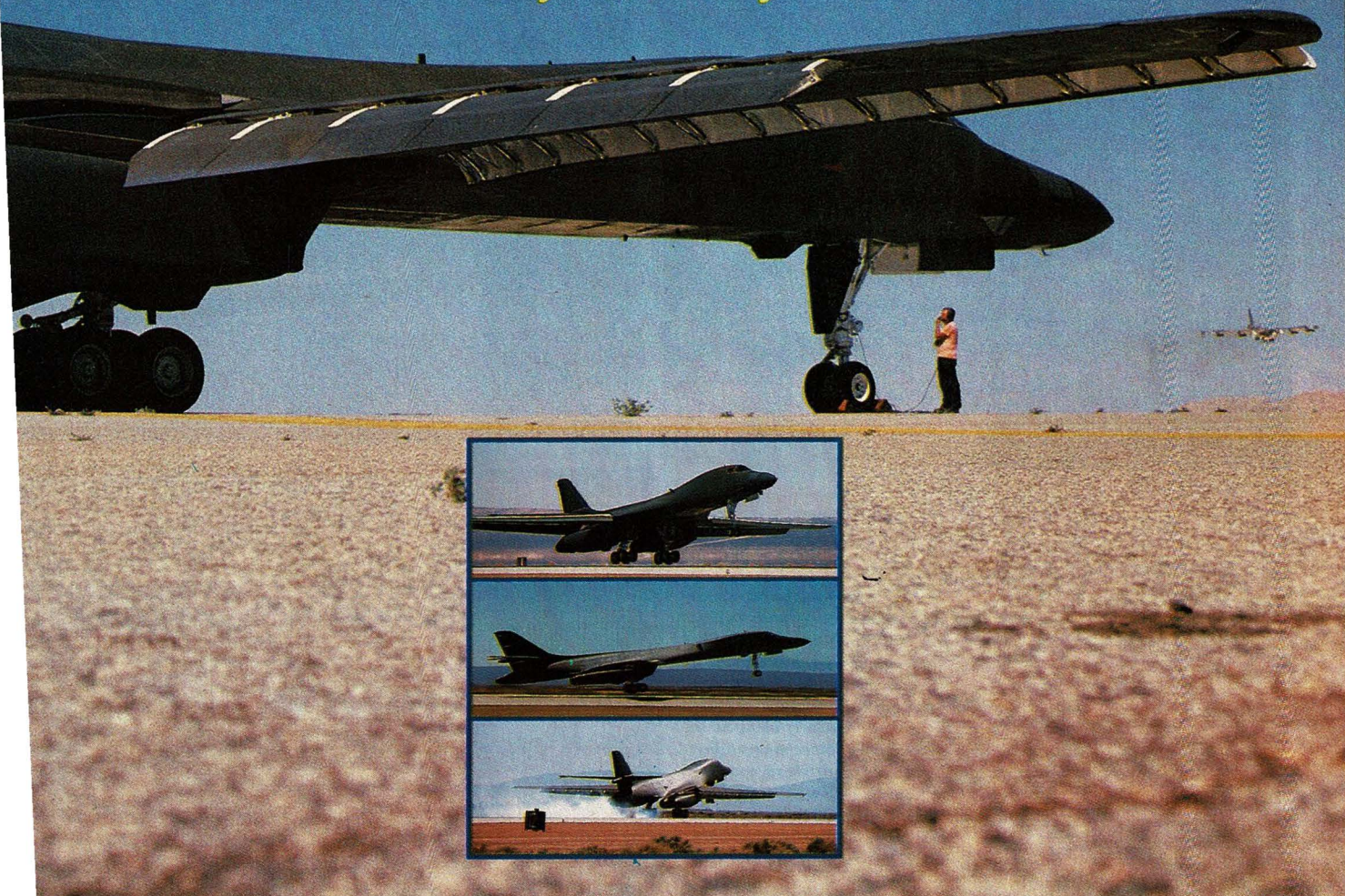
# BI

*The U.S. Air Force's  
supersonic nuclear bomber  
is ready for duty.*

## THE SPECTRE

of war is a dark prospect. Since the end of World War II, a simple premise—the threat of swift and certain retaliation—has successfully combined with diplomacy to prevent a nuclear exchange. In that time, the United States has developed and maintained a three-part land-, sea- and air-based nuclear capability to help ensure the

TEXT AND PHOTOGRAPHY  
*by David Almy*





effectiveness of that threat.

Military planners on both sides have long held that the air-based element of the strategic triad, while the most flexible of the three, might also be the least reliable if it actually came down to delivering the goods. Proponents of manned bombers cite a few strategic factors working in their favor, however. Although bombers are potentially vulnerable to Soviet defenses, they can be recalled; they offer targeting flexibility; and they take a relatively long time to deliver their weapons—a respite between launch and delivery that would enable options to be weighed more thoroughly. Once aloft and en route toward their target, strategic bombers would also be a more immediate (although not yet final)

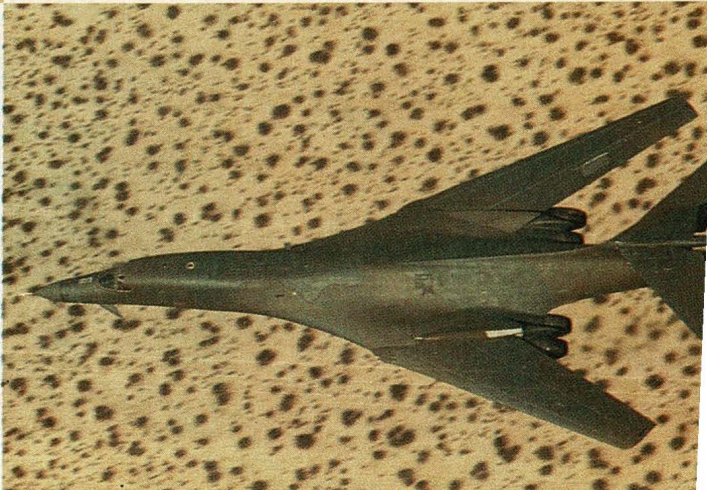
threat—an advantage not shared by sea- or land-based missiles.

A belief in a weakening of the airborne element has diminished the U.S.'s nuclear deterrent. This black art of deterrence is based entirely on perception—what they *believe*, not necessarily what is true. As such, the perceived ability of our strategic forces is critical to U.S. defense and foreign policy and, presumably, to the goal of avoiding war.

The airborne element of the strategic triad (and, one assumes, the perception of same) is about to be strengthened. The mainstay of the strategic bomber force, Boeing's B-52 series, is about to be replaced by Rockwell International's B-1B. First delivery took place in early July when the first



*A yellow shroud shields one of the B-1's four radomes during avionics testing (above). The cockpit provides everything needed to fly; there are no flight engineers. Both pilots' stations are nearly identical to ease crew interchangeability. Two air-to-air views, courtesy of the U.S. Air Force, show the B-1's wings swept forward for low-speed flight, and swept back for high-speed flying.*











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### Northeast

- FRG** Beechcraft East, Inc.  
Farmingdale, NY
- DAY** Ohio Aviation Company  
Dayton, OH

- LUK** Ohio Aviation, Inc.  
Cincinnati, OH
- CGF** Ohio Aviation, Inc.  
Cleveland, OH (eff. 12/1/85)

### Southeast

- LOU** Stevens Aviation, Inc.  
Louisville, KY
- TPA** Hangar One, Inc.  
Tampa, FL
- GSP** Stevens Aviation, Inc.  
Greer, SC
- GSO** Air Service, Inc.  
Greensboro, NC
- BHM** Hangar One, Inc.  
Birmingham, AL
- ATL** Hangar One, Inc.  
Atlanta, GA
- FTY** Hangar One, Inc.  
Atlanta, GA
- PDK** Hangar One, Inc.  
Atlanta, GA
- BNA** Stevens Aviation, Inc.  
Nashville, TN

### North Central

- MLI** Elliott Flying Service, Inc.  
Moline, IL
- DSM** Elliott Flying Service, Inc.  
Des Moines, IA

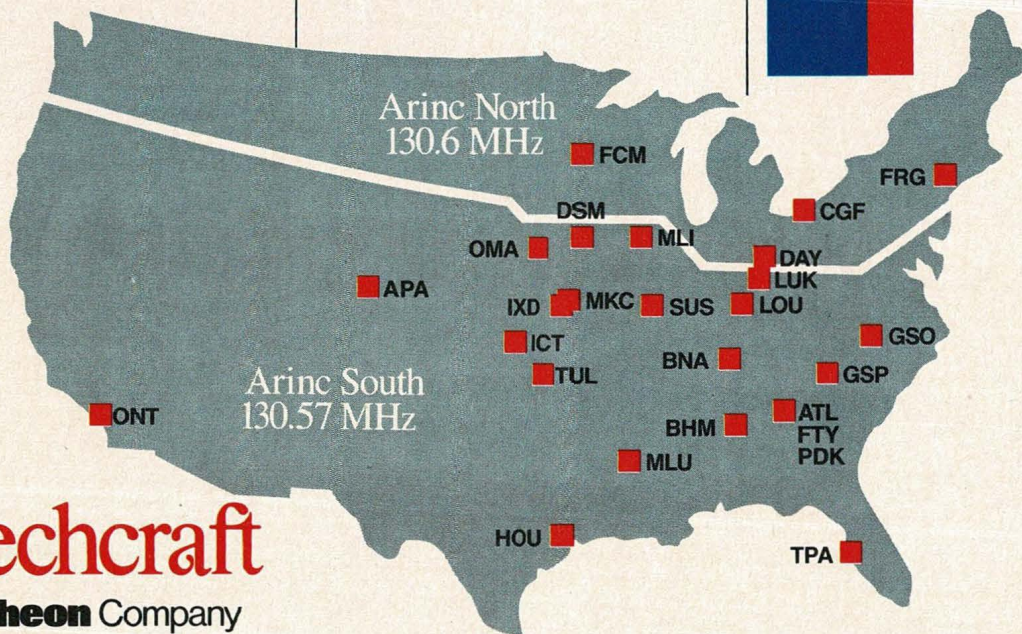
- OMA** Elliott Beechcraft of Omaha  
Omaha, NE
- FCM** Elliott Flying Service, Inc.  
Minneapolis, MN
- MKC** Executive Beechcraft, Inc.  
Kansas City, MO
- ICT** United Beechcraft, Inc.  
Wichita, KS
- SUS** Executive Beechcraft, Inc.  
St. Louis, MO
- IXD** Executive Beechcraft, Inc.  
Olathe, KS

### South Central

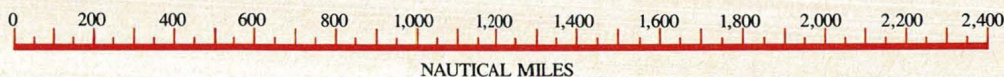
- MLU** Fleeman Aviation, Inc.  
Monroe, LA
- HOU** Houston Beechcraft, Inc.  
Houston, TX
- TUL** Tulsair, Inc.  
Tulsa, OK

### West

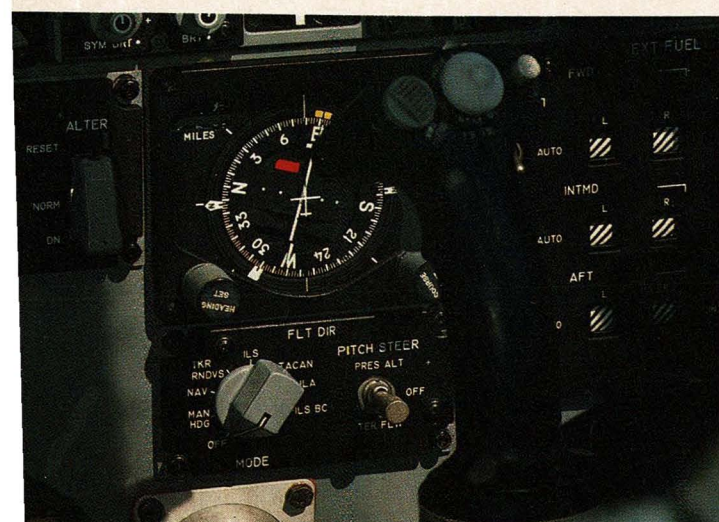
- APA** Rocky Mountain Beechcraft,  
Inc., Denver, CO
- ONT** Beechcraft West-Ontario  
Ontario, CA



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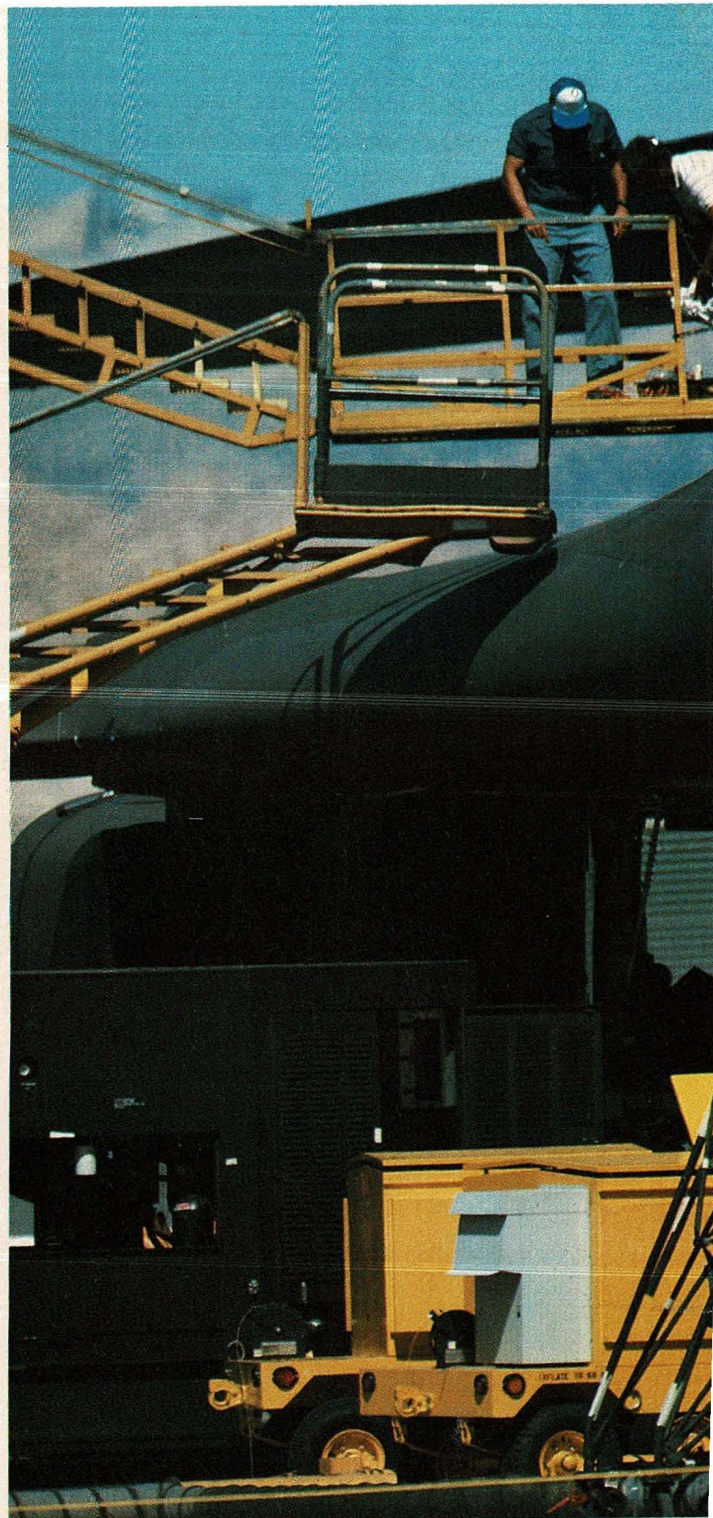


operational B-1 arrived at Dyess Air Force Base in Texas to begin crew initiation. Over the next two-and-a-half years, 98 B-1s will enter service at four bases across the midsection of the United States: 29 at Dyess, 17 at McConnell in Kansas, 35 at Ellsworth in South Dakota and 17 at Grand Forks in North Dakota.

Strategic concerns determined the mid-continent stationing of the aircraft. In the event of a submarine missile attack against the B-1s, the six or so minutes required for the missiles to reach the B-1s' bases would be sufficient, in theory, for the bomber crews to scramble and depart before the missiles arrived. The range of the B-1, even if missiles took out the Air Force's tankers, would be sufficient for the

bombers to deliver their payload without refueling, after which they would land at airfields in Europe or the Middle East.

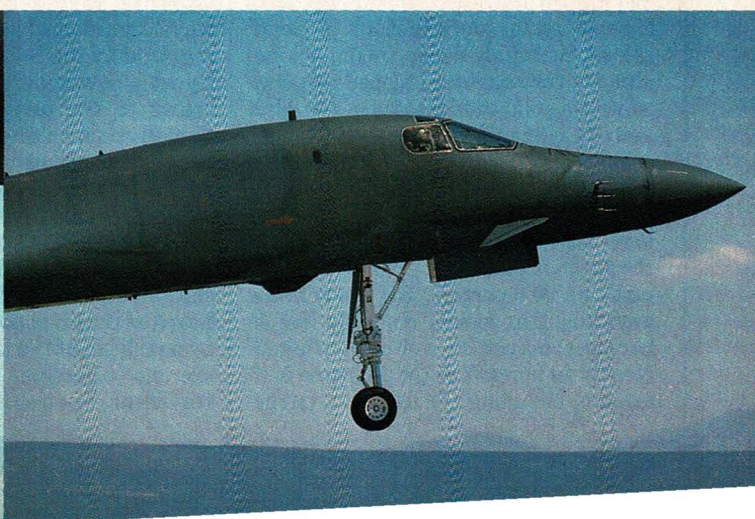
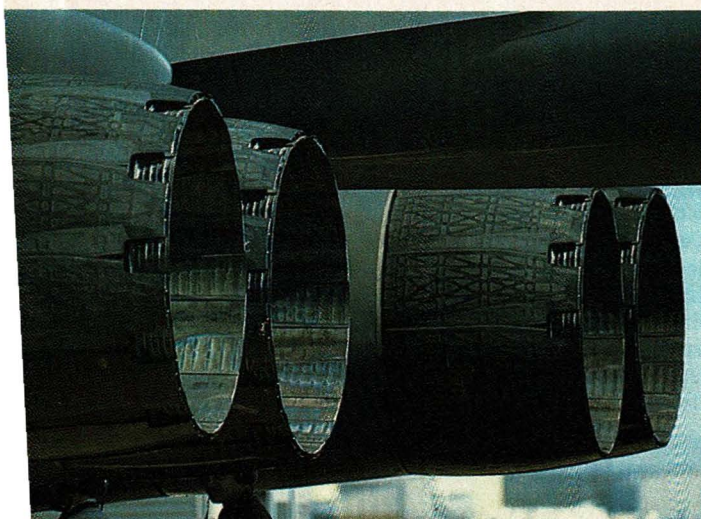
The mission of the strategic bomber has evolved over the last three decades into what it is today—to fly high and efficiently until the target landmass is near, then drop down and run across the surface. The B-1's design had been largely determined by 1970 when Rockwell was given the nod as prime contractor. A prototype first flew in 1974, and the Air Force planned to put the first production B-1 into service in 1979. President Carter pulled the plug in 1977, however, scuttling production. In 1981, President Reagan—with the help of the cards and letters of



*The complex fuel system (above) helps to keep tabs on the fuel in the B-1 and maintain its CG within limits. The open hatch on the roof (right) is actually one of two ejection ports that can be used by the offensive and defensive systems operators. The faint outline of the other hatch, just above one of the small windows installed for the systems operators, is visible at far right.*









erage of about a dozen vested interests in every congressional district—plugged it back in, the results of which we are now beginning to see. During its long ride on the procurement roller coaster back in the 1970s, the airplane acquired the nickname of “Be-One-Maybe.”

All the while, the venerable B-52 remained in loyal service. The B-52's greatest and incontrovertible drawback, however, remains its physical design. Large, lumbering and in many ways crude by today's standards, the B-52 was conceived when electronic warfare was in its infancy, and its configuration—particularly its eight pod-mounted, smoke-belching, infrared-hot engines—while ripe for its time, is extremely difficult to disguise electronically.

The B-1's radar signature alone, at one one-hundredth that of the B-52, has rendered the older Boeings ripe for retirement. The B-1's designed mission profile also calls for a Mach .85 dash speed at very, very low altitudes (more than 200 knots faster at about half the altitude of the B-52), all the while carrying one-third more nuclear or one-half more conventional stores than its predecessor.

Up close, the B-1 redefines the term “awesome.” At 147 feet, the finished airplane is as long as the MD-80, the stretched DC-9, yet three times heavier. With a maximum gross weight of 477,000 pounds, the B-1 is still only two-thirds the size of the B-52, yet weighs about the same. The B-1 looks taut, low, mean and sinister, though not nearly as brutal as the airplane it replaces. The wingtips droop but not as low as the B-52's, and there are no wingtip “training wheels” as on the -52.

The airplane is heavy because of the mission it has to endure. Single- or two-man fighters also weigh quite a bit for their size and, like a fighter, the B-1 has few hollow regions within its airframe. Nearly all interior space has been consumed by fuel (the B-1 is about half fuel by weight), structure, electronics and engines; the remainder is reserved for more fuel or a payload. It is an incredibly dense, solid machine: almost every surface I tapped responded with a solid thud instead of the clink you often hear from civilian airplanes.

Just under half of the airframe is aluminum, which is used as primary structure throughout most of the fuselage, including the two-spar wing and the aircraft's skin. Fiberglass is said to make up 30.6 percent, but I never saw anything that looked remotely like fiberglass; maybe it's well camouflaged. Nearly 20 percent of the airframe is titanium, including the tail spars (struc-

tural stresses on the empennage at well over 500 knots indicated must be extraordinary), the center section of the fuselage between the two wing-fuselage hinges, and other hot or highly stressed components. The wings swing forward to only 15 degrees of sweep for slow flight and rearward to 67 degrees of sweep for high-speed flying; they turn on huge Teflon washers that buffer the four-piece titanium hinges on each wing. Those two hinges, looking like parts of a bridge trestle, are magnificent pieces of engineering and machining. Massive, and peppered with dozens of huge bolts and rivets, they appear to have been carved from a single block of titanium and are the crux of the largest actuation system yet installed in an aircraft.

Seven percent of the B-1, including the landing gear and much of the engines, is steel. The axle on which the

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## “THE B-1 LOOKS TAUT, LOW, MEAN AND SINISTER, THOUGH NOT NEARLY AS BRU- TAL AS THE AIRPLANE IT REPLACES.”

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two stabilators pivot (independently, to aid roll control) is also steel. High-strength plastics are used sparingly, slightly more than two percent, and make up the flaps and the bomb-bay doors. The balance is taken up by polyimide quartz, the material of choice for the four radomes.

The configuration of the airframe was determined by two parameters: the mission profile and the desire to minimize radar visibility. The mission stipulates that the B-1 operate off runways significantly shorter than those required by the B-52; the B-1 must also fly at a low-supersonic, high-altitude cruise to the target's landmass and then drop down and fly just above the ground at subsonic speeds until target acquisition. The swing-wing was a complex compromise that yielded high-speed efficiency as well as improved runway performance. Leading-edge slats stretch across the entire span outboard of the pivot point, and flaps occupy nearly all of the trailing edge. There are no ailerons; spoilers and the stabilators are used for roll control. All

control surfaces are actuated by a hybrid hydraulic fly-by-wire system, with different arrangements operating different components. In some cases one to all of the four hydraulic systems back up a fly-by-wire system; in other cases it is the reverse.

Fully loaded B-52s use almost 10,000 feet of concrete when departing. For one takeoff I witnessed in the warm desert at Edwards, the first B-1, laden with full fuel, a load of unarmed gravity bombs and heavily instrumented, got off the ground in about 6,500 feet. Afterburners, a feature the B-52 lacks, are used during takeoff, and a departing B-1 makes a fair racket.

Much has been done to hide the B-1 from radar. If radar strikes a B-52 from the front, the metal discs (eight of them) that are created by the spinning first-stage compressor blades reflect the wave directly back to the source. Aside from curving or sweeping nearly all surfaces and careful material selection, some ingenious design tricks have been used to hide the B-1's airframe. Radar waves striking the front of the engine nacelles of the B-1 enter an S-shaped baffle that also serves as the intake duct. By the time they bounce into, around and out of that duct, they have been nearly smothered. Additionally, the fuselage is painted in a radar-absorbing coating that makes it appear almost black from certain angles. In bright sunlight, however, there is a definite pattern to the dark green and brown tactical camouflage that is supposed to hide the airframe from eyes and radars looking down from above. The identifier painted in a subtle silver on the tail of the number-one airplane reads “USAF 20001.”

The B-1 is essentially a bomb truck. Cavernous bomb bays, two forward of the main gear and one aft, can be filled with 65,000 pounds of various combinations of conventional or nuclear gravity bombs, cruise missiles, short-range nuclear attack missiles or auxiliary fuel tanks. If the weapon of choice is cruise missiles, the B-1 could carry eight in the forward bomb bay in a kind of Gatling-gun arrangement, and 14 more externally. The SALT II treaty, however, will limit the total to 20.

Below each side cockpit window on the lower half of the fuselage are small, swept-back rectangular canards. Operating independently and controlled entirely by computer, these small composite fins serve two purposes: at high speeds they damp yaw and pitch oscillations, smoothing the ride for the crew and lengthening the life of the airframe.

Two Garrett auxiliary power units provide electricity to start the engines.



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In the unlikely event of a quadruple engine failure, they can also be used to power primary instruments and controls. One way to start the APUs is with the "go" switch mounted on the forward landing gear. If ordered to scramble, the crew could run to the airplane and swat the go switch; by the time the four were aboard the APUs and the appropriate systems would be on line, allowing the crew to fire up the engines and go.

Four General Electric F101 turbofans with afterburners power the B-1. They are said to provide 30,780 pounds of thrust but, as is the custom, that rating includes the boost the engines get from the afterburners, even though it is likely to be conservative.

The B-1 carries only two tactical defenses. Flares can be launched to serve as white-hot decoys for heat-seeking missiles. Also for diversion, small, radar-reflective aluminum slivers called chaff can be launched to fool radar-guided missiles.

Flares and chaff are the only visible defensive weapons on the aircraft. All the others come in black boxes containing some of the military's most sophisticated electronics and are commonly labeled "ECM," for electronic countermeasures. To weave through the laby-

rinth of electronic defenses the Soviets have developed, the B-1 has become a flying computer center, carrying systems, countersystems and counter-countersystems. Eaton's AIL Division has come up with a series of digital computers that command transmitters and phased-array antennas to make mince meat of radar signals hitting the B-1 from any direction, first sensing them, then identifying them, then jamming them, all in a fraction of a second. The system will also keep track of its injuries when it is damaged and will re-route data around failed components to keep the system up. The black boxes of the defensive system alone weigh over 5,000 pounds and consume enough electricity when operating at full tilt to power about 115 microwave ovens.

The offensive avionics were organized by Boeing and enable the B-1 to navigate and launch its weapons. To fly low enough to avoid ground-based radar, the B-1 uses forward-looking and terrain-following radar, inertial navs and Doppler radar altimeters (good from zero to 5,000 feet) as well as a link to the Air Force's satellite system. As outgoing radar signals can also announce to the world your whereabouts, they, too, have been whittled

down. The navigation system operates through six central IBM computers, two microcomputers and additional processors within individual components. Success hinges on the theory that he who has the smarter and faster computers wins.

To enter the cockpit, the crew climbs a steep ladder and comes up into the cabin between the ejection seats and consoles of the offensive and defensive systems operators. A fairly wide stand-up aisle leads forward to the cockpit and the pilots' ejection seats. Visibility is spectacular: the pilots watch the world from high seats through four massive slabs of polycarbonate-and-glass sandwich, two in the front and one on each side, and two eyebrow windows.

Back behind the pilots, in mid-cabin, the offensive and defensive systems operators sit side by side across the aisle, facing forward. Each has a small window, normally kept shuttered so they can more easily read the three CRTs spread before each of them. Computer controls and displays occupy the desk space in front of the seats, spilling into the arch over the aisle. This is also the location of the code boxes through which would come the final command to drop The Bomb.

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It was an eerie feeling indeed to stand between these two stations in the near dark, with dozens of air conditioners and fans humming away, and contemplate just what this machine can do.

The Air Force believes that the B-1 will continue as the United States' front-line bomber until the middle of the next decade, at which time the Advanced Technology Bomber (ATB), or "Stealth," will assume the role. Government Plant Number 42 in Palmdale, California, just over the hill from Edwards where the SR-71, B-1 and space shuttle were built, is expanding with the construction of a huge hangar that the locals say will be occupied by Northrop, although Northrop will neither confirm nor deny ownership of the building. Northrop has been selected as prime contractor for the ATB.

In the meantime, the B-1 is now entering service and will shortly be a viable strategic force. This aircraft's existence, and its extraordinary capability, is diminished only by the critical importance of the policy that will guide its use. It is a comforting irony of that policy that this flying machine will be judged most successful if it never has to fly the one mission for which it has been so painstakingly designed. □

# The Chosen Few

*Meet one of the elite who flies the B-1.*

Six men are currently rated to fly the B-1. Two are test pilots with Rockwell, the remaining four fly for the Air Force: three Air Force test pilots are stationed at Edwards in the B-1 test program and one Strategic Air Command pilot is at Dyess to help with crew training.

Of those six, Lt. Colonel Frank Birk is the most experienced B-1 pilot on active duty. As Director of Operations for the B-1 Combined Test Force, Birk is the chief B-1 test pilot and has a little over 400 hours in type, having first flown the B-1 in 1979.

Birk likes the B-1, the largest airplane flown by a stick. He says, "It is a very, very complex airplane, systems-wise, but a lot of effort went into simplifying those systems as well as the displays and controls in the cockpit. From a stick-and-rudder standpoint, it's an honest airplane, with good control response, tremendous accelera-

tion, and very light control forces. It is fun to fly, but it's not a fighter. Most big airplanes are built with high control forces and are slow to respond, but the B-1 is quick to respond. The flight controls are well designed; we have spoilers and a rolling tail with stabilators that deflect symmetrically for pitch control and asymmetrically for roll control."

Birk estimates that once deployed the airplane will be flown manually only half the time. The autopilot is there, however, to be used at the pilot's discretion, although Birk himself hand-flies the airplane 90 percent of the time, largely due to his work as a test pilot. "The autopilot can be used during all phases of flight including high-altitude cruise and low-altitude terrain-following.

"Terrain-following is probably the most exciting part of flying the B-1," Birk continues. "The ground goes by

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very quickly—three football fields per second—and even during automatic terrain-following, you are extremely busy monitoring systems. When you're flying at 200 feet agl, you do get a sensation of speed that you don't get at higher altitudes."

The B-1 can be flown with or without the autopilot at high speeds (Mach .85) just above the ground. "In fact, the cockpit display gives me the same indications whether the airplane is flying itself or I am flying. So I watch the flight director's display for pitch and bank data and just follow it."

The terrain-following system has a selectable ride; soft, medium or hard. "Basically you get a harder pull-up and a harder push-over with the hard-ride setting. With the soft ride, the aircraft doesn't follow the contours of the terrain as precisely. With the hard-ride setting, you try to maintain exactly the same distance above the ground. Operationally, you would get closer terrain-following with the hard ride, but it may not always be necessary and it puts a lot more wear and tear on the airplane and the pilots as they pull up, push over, pull up, push over, and so on."

During high-speed low-level flight, the two small forward-mounted control surfaces help smooth the way.

They protrude from either side of the forward fuselage right beneath the windshields. "These canards are very effective; in fact, they reduce the oscillations in the cockpit by about 50 percent. You pick up a little of the canard's vibration and the noise. They don't

**"IT'S NOT CORRECT TO SAY THAT THIS IS JUST LIKE A BIG F-111," BIRK CAUTIONS, "IT'S FAR MORE COMPLICATED."**

move very far. They're high-frequency [control surfaces] and they use a lot of very small movements, but they're still effective because of [their] long moment arm to the center of gravity of the airplane."

Refueling is comparatively easy be-

cause the refueling port is on the nose, directly in front of the B-1's cockpit. In the B-52, it is above and behind the heads of the pilots. The pilots sit high, and view through only six windows (the B-52 has 16). Says Birk, "Visibility for the pilots in the B-1 is excellent, particularly for refueling. It doesn't have a bubble canopy like an F-16, but forward and side views are good. There is no trouble with forward visibility on landing."

Birk says that the takeoff and landing speeds of the B-1 are similar to a T-38's. The F-111, he says, "lands 20 to 30 knots slower, but in terms of angle of attack, or flying an approach, the B-1 flies a constant angle of attack. Flying the final approach is similar to the F-111. It's not correct to say that this is just like a big F-111, though," Birk cautions. "It is far more complicated." Birk believes that the B-1's flying qualities and systems are a combination of the F-111's and those of the latest models of the B-52, utilizing the best of both worlds.

Ninety percent of the B-1's pilots will be B-52 pilots, and the remainder will come from FB-111s. Birk feels that both groups will have little trouble transitioning into the new aircraft.

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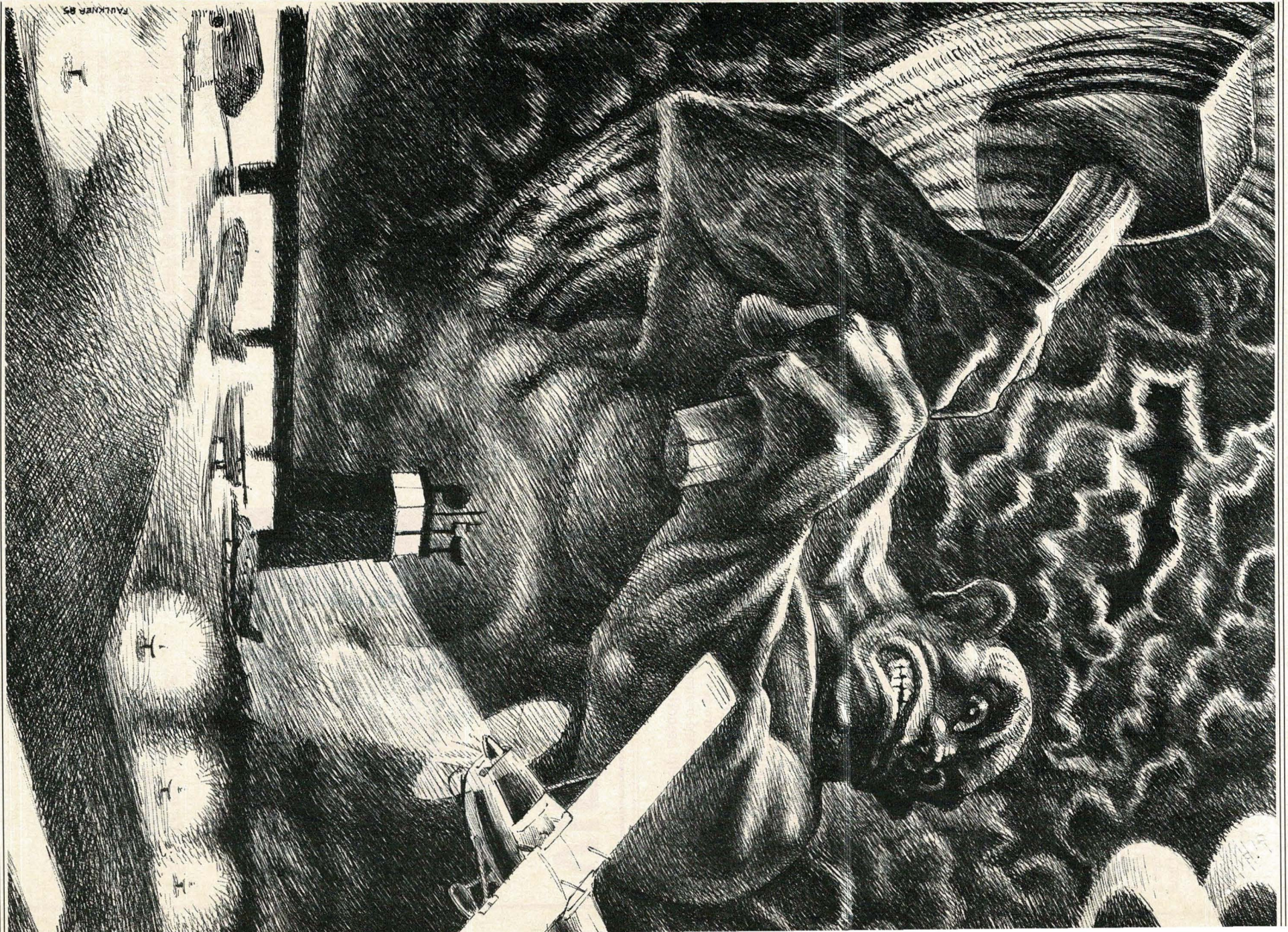
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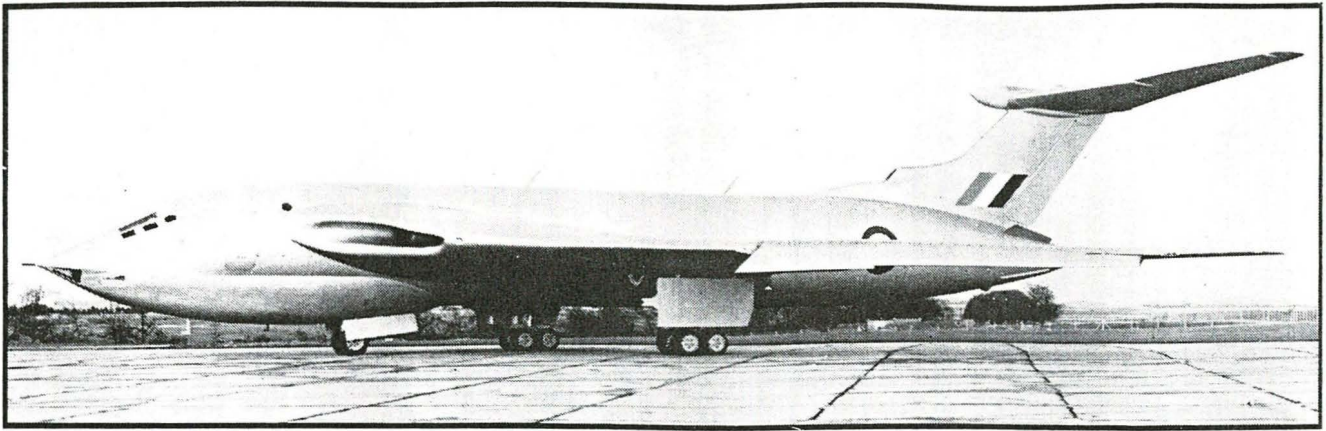
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# Bomber with a Difference

**T**HE AERONAUTICAL world stood aghast last month when Handley Page Limited lifted the security curtain on its new HP-80 Victor, a four-jet bomber with a unique crescent wing. Handley Page blandly asserts that "no other bomber flies as fast, as far and as high with as great a bomb load."\*

Actually, the aircraft should not have occasioned as much surprise as it did, for the existence of the crescent wing was widely publicized about a year ago when photos were published of the HP-88, a fighter-size experimental aircraft later destroyed in a crash which was being used to test this unusual wing configuration (see drawing at right). Basically, the crescent wing does not seem to be as radical an approach as the delta wing; it is perhaps the overall futuristic appearance of the HP-80 which makes it seem so different.

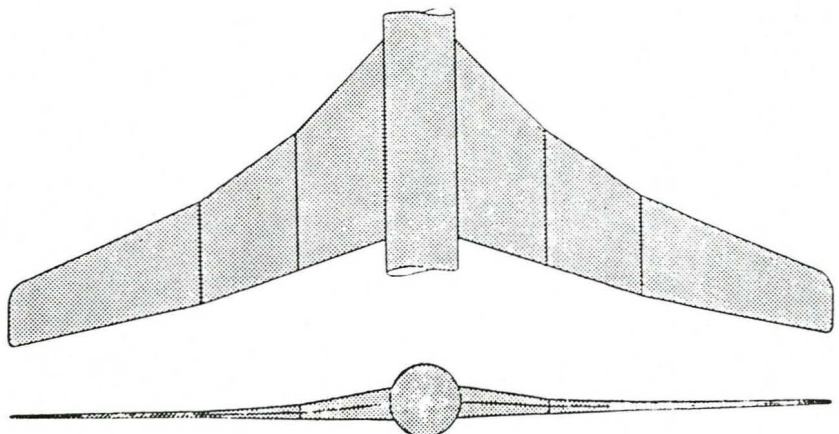
According to Handley Page Chief

Designer R. S. Stafford: "This wing is the complete and only answer to the demands of a most exacting specification. It calls not only for operation at high sub-sonic speeds at very great heights over long ranges but also good control over the whole speed range, particularly at approach and landing speeds near the ground."

One of the features of the design are the leading edge flaps, clearly evident in the pictures. The empennage is also rather unusual. The original appear-

ance of the Victor is further added to by the bulbous forward fuselage, which gives it a heavy-jowled look. The bomber's weight is borne by two main undercarriage legs—each fitted with a four wheel bogie—and a twin nose wheel.

The Victor, which made its first flight late in December, is powered by four Armstrong Siddeley Sapphires buried in the wing. It is now in production for the RAF. No other details are available at this time.



\*Other bombers which are described in a similar manner by their makers include the Vickers Valiant, the Avro Vulcan, and the Boeing B-52.



## Piasecki in Canada

Piasecki Helicopter Corporation of Morton, Pennsylvania, plans to establish a Canadian subsidiary, Piasecki Helicopter Co. of Canada Limited, in the near future. The new company will provide service facilities for the Piasecki H-25A helicopters on which the RCAF is to take delivery this year. Initially, only repair & overhaul facilities will be provided, but Piasecki is not overlooking the possibility of carrying out manufacturing operations in the future. It is understood that Arnprior, Ontario, is being considered as the location for the Canadian subsidiary's plant.

## 500th Beaver

Delivery of the 500th Beaver to be built by The de Havilland Aircraft of Canada Limited was made early in May to the Government of the Falkland Islands, which are located off the southern tip of South America.

In a brief ceremony at de Havilland's Toronto plant, Sales Director C. H. Dickins turned the Beaver's logbooks over to Air Commodore A. P. Revington, representing the British High Commissioner, and H. Oldham, United Kingdom Trade Commissioner. A/C Revington and Mr. Oldham accepted the Beaver on behalf of the Falkland Islands. Following the ceremony, the Beaver was dismantled and crated for shipment on its long journey.

The Beaver is now in service in 26 countries of the world, both as the civilian DHC-2, and as the military L-20.

## N.W. T-33 Program

Northwest Industries Limited is now making preparations for the T-33 overhaul & repair program that it has contracted to perform for the RCAF. Vice President & General Manager B. W. Pitfield told *Aircraft* recently. Northwest will be responsible for the repair and overhaul of all T-33's based in Western Canada, and this is expected to account for a large percentage of the total which the RCAF will eventually have in service.

The Edmonton firm continues to be active in other phases of aircraft work, too. It is now nearing the end of the

Mitchell program, which, when completed, will have seen 133 B-25's of various marks pass through the company's shops. A current Mitchell project is the production of a prototype armament trainer. This RM-1-19 is also intended to double as a light bomber and is additionally being fitted with photo equipment for photographing bombing results.

Work which this virile firm will undertake in the near future includes the repair and overhaul of RCAF Fairchild C-119F Packets, a considerable number of which are based at Edmonton with 435 Squadron.

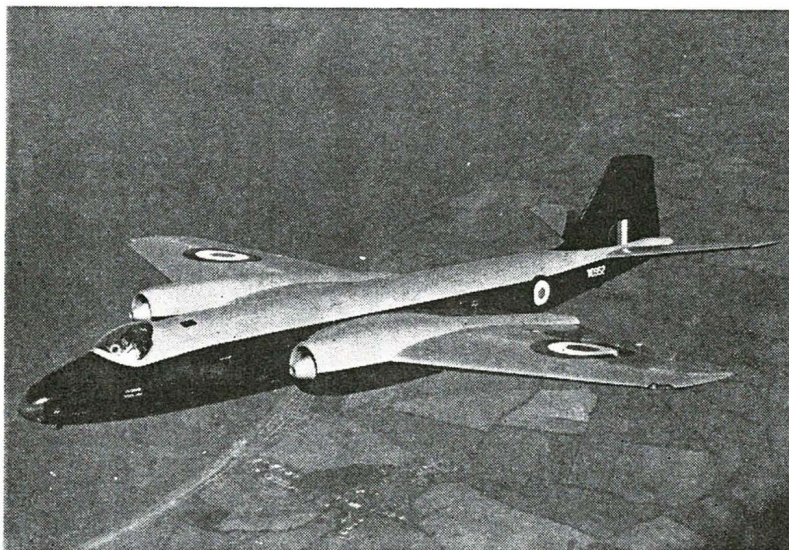
having a removable observer's seat alongside.

Other work in progress continuously at the plant is the production on a limited scale of Harvard and Canso parts. Powerplants are built up on the premises.

Employment at Northwest has now reached approximately 850.

## RAF Sabre Deliveries

The delivery of a group of 60 Canadian-built F-86E Sabres to the U.K. for the RAF was completed over the first May weekend. The delivery operation, known as "Operation Beechers Brook Four", was performed by just 30 pilots carrying out what they described as a "double shuttle". They first flew 30 aircraft on a single leg,



**NEW HEIGHTS:** This Bristol Olympus-powered Canberra, a flying test bed for the Olympus, recently set a new official world altitude record of 63,668 feet ASL. The old record was 59,446 feet, made in a de Havilland Vampire. Pilot of the Canberra was Wing Commander W. F. Gibb. Though the new record has been exceeded unofficially by far by U.S. experimental rocket powered aircraft (launched at altitudes of 30,000 feet from B-29's), this is the greatest height ever attained by a conventional aircraft. Olympus has a twin-spool compressor.

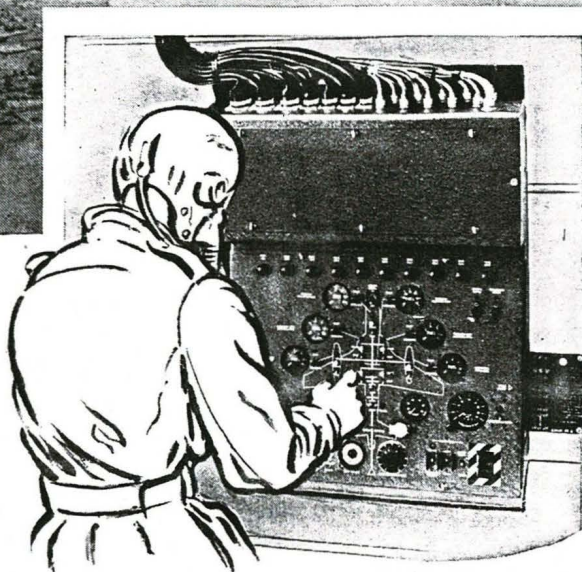
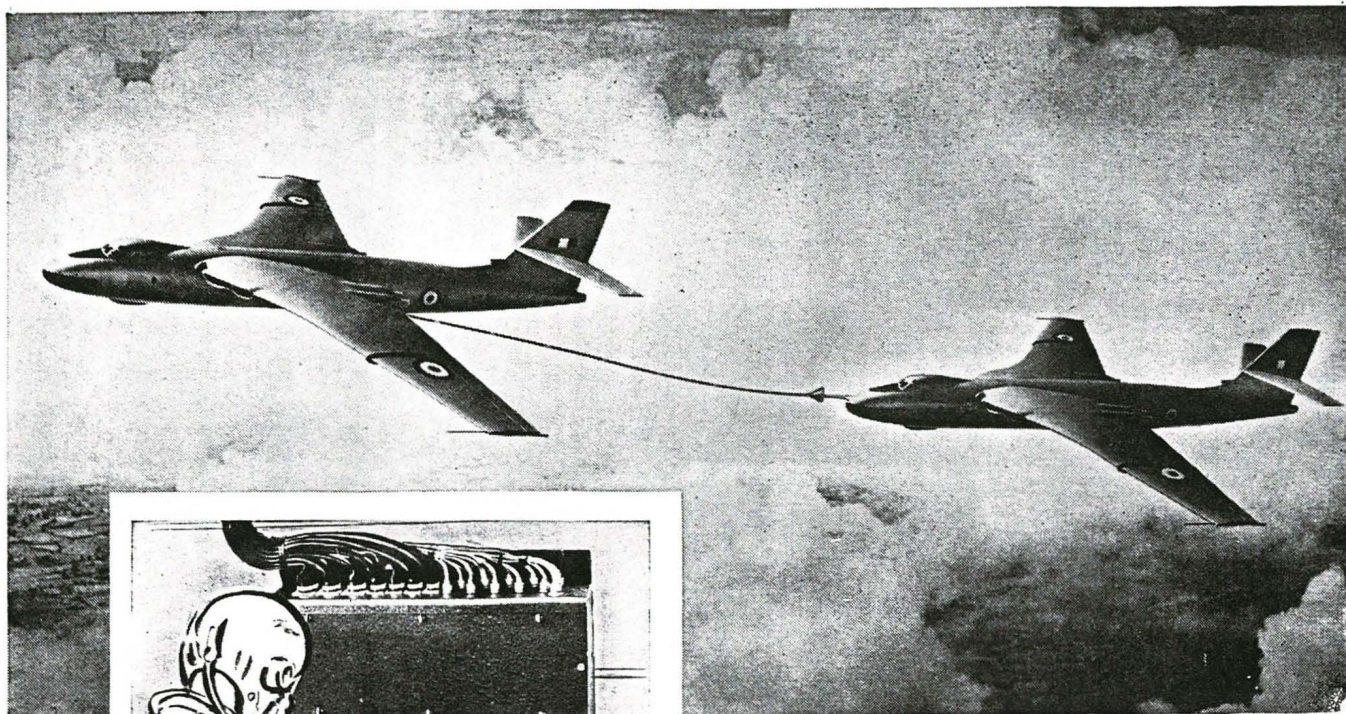
In the meantime, the Harvard repair & overhaul program continues. In this connection, Northwest undertakes to rehabilitate machines involved in "B" type crashes, as well as those suffering lesser damage or being time expired.

Overhaul and modification work is performed on Dakotas, and an interesting variation of this type recently turned out by Northwest is a search & rescue version. Besides being fitted with long range tanks, this version has observers' bubbles on both sides of the rear fuselage, each of these

then were ferried back to pick up the remaining thirty. When all 60 aircraft had been transferred over the first leg, the process was repeated for the second leg, and so on across the Atlantic. The route followed was that established by the RCAF's "Leap Frog" series of mass ferry flights.

On April 27, RCAF officials in Germany said that more than 100 Sabres were then waiting at Goose Bay to be ferried over to the U.K. for the RAF. The 60 machines involved in Beechers Brook Four were evidently from this group.





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## IN-FLIGHT REFUELLING TECHNOLOGY

*By Matthias Gründer*

In-flight refuelling is very much a necessity during extended patrols and long-distance ferry flights or on military missions over hostile territory which cannot be approached via a direct route due to the enemy presence. The need to refuel applies not only to strategic bombers and transporters, including tanker aircraft themselves, but also to tactical fighter aircraft and helicopters.



The history of air-to-air refuelling has seen a variety of technical solutions, two of which are predominantly used today: the flexible drogue trailed from a tanker into which the receiving aircraft thrusts a probe ("probe and drogue") and the rigid boom. A third variant, a wing-to-wing hose refuelling system, has only been used by Russian strategic bomber forces and will therefore not be discussed further in this article.

The probe and drogue system consists essentially of a hose with a metal basket at the end that is connected to the tanker aircraft's transferable fuel tanks. The rim of the basket is made from a strong fabric and is designed to inflate in the air stream, forming a wide cone. At the centre of the drogue is a hose coupling with a quick-acting locking mechanism, into which the approaching pilot of the aircraft to be refuelled thrusts the tip of his probe. Once contact has been made, depending on the particular system, between 700 and 2,600 kg of fuel flow into his tanks per minute. In this way, it normally takes only a few minutes to refuel the aircraft.

If any problems occur during refuelling, it is naturally possible to disconnect the system rapidly and without complications. Otherwise, the heavy hose and drogue trail behind the tanker in a relatively stable manner, so that after making visual contact the pilot of the following aircraft can fly up to the tanker, adjust his speed to that of the tanker and lock on to it, all in a matter of seconds. The use of special positioning lights makes the procedure a lot easier.

The drogue system is based on an invention by the Englishman Alan Cobham who back in the 1930s had developed a system known as the "cross-over" system whereby the approaching pilot had to catch a trailing fuel hose and draw it towards him using a kind of harpoon. The apparatus, which seems somewhat complicated by today's standards, was viewed with interest by the American forces, but due to the outbreak of war it was not implemented. Only after the Second World War did the US Air Force introduce the system, converting a hundred



B-29 bombers fitted with the system into KB-29M tankers. However, the need for entire crews of tankers and bombers made the cross-over method unsuitable for smaller aircraft.

Cobham now went on to develop the probe and drogue system, in which the receiving aircraft locked its probe, which was initially attached either to the nose of the fuselage or on the wingtip, onto the drogue. Around 300 kg of fuel could be transferred per minute at that time, and the introduction of this system extended the range of American tactical fighter aircraft by an order of magnitude overnight.

Two different versions of this technique continue to be employed today. Under the first variant, one or more hoses fitted with a drogue are located together with the associated drive, switching mechanisms and pumps in the aft section of the tanker fuselage and are operated and controlled there by an operator. In the early days, the operator lay face down on a kind of stretcher and controlled the system with levers while reading off, for example, the fuel flow rate from indicators within his field of view. With today's more modern systems the operators sit in comfortable seats and can monitor the operation, sometimes even with the aid of a remote-controlled camera.

The second variant makes use of special pods which look very similar to auxiliary tanks and are generally suspended beneath the wings of the tanker. The system originally invented by Douglas and known as D-704 was refined by the American Sargent Fletcher company, which today is part of the Flight Refuelling Division of Cobham plc. These pods are available in various designs, but they all work on the same principle. A small propeller at the tip drives the fuel pump, and the fuel is pumped out of fuel lines running from the wings or the fuselage directly into the hose, which in turn is accommodated in the pod along with the drogue and hose reel. After refuelling, the hose is wound up again using a motor, and the drogue is drawn back into the pod. These relatively small, light and compact containers even permit smaller aircraft to refuel each other, as, for example, has been practised on German Tornados during prolonged flights.

Whereas it was only a few years ago that fuel-pump nozzles with rapid, automatic cut-off first appeared at filling stations, this technology has been in use ever since probe and drogue in-flight refuelling was first introduced. This is essential since neither the receiving aircraft nor the tanker can tell on the basis of the instruments available to them exactly when the tank is really full so that refuelling needs to be terminated. Sensors in the system are therefore used to report when the tank is full and automatically shut the valve, following which the operator issues the disconnect command to the receiving pilot.

However, due to its relatively low flow rate, the hose system also has a major disadvantage: larger aircraft, such as strategic transporters or bombers, would need to spend too long connected up to the tanker if they were to use this method. For this reason, Boeing developed a special rigid boom, which can be steered via two V-shaped stabilising control surfaces and has a telescopic, sprung pipe fitted with a fuel nozzle at the end. With this system, which is only in service with the US Air Force and was used for the first time with KC-97 tankers, up to three-and-a-half tonnes of fuel can be transferred per minute, reducing the length of the operation considerably.

With this refuelling variant the role of the boom operator becomes quite critical, as the boom moves out of the pilot's field of view during the final stages of aligning his aircraft. From this point onwards all further adjustment of the aircraft's position must be executed relying on commands issued by the boom operator until the latter can insert the "sting" into the special receptacle on the receiving aircraft, which is normally on the upper side of the fuselage.

These manoeuvres are always a little risky and have to be rehearsed by the crew at length and extremely thoroughly on a simulator before performing them for real. There have been incidents in which probes have been damaged due to clumsy manoeuvring on the part of the pilot or under the influence of adverse weather conditions, and this of course can be a major problem for other aircraft waiting to be refuelled. There have even been occasional crashes caused by aircraft colliding with the boom. Nevertheless, there is no sign of any alternative to the system currently employed emerging in the foreseeable future.

**From page 80 of FLUG REVUE 11/2000**

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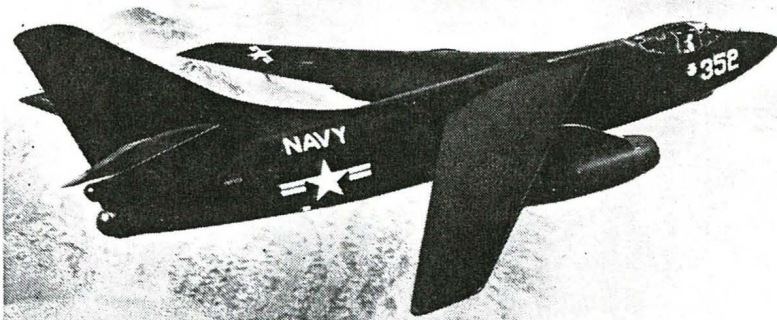
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Last updated 9 October 2000

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FLUG REVUE, Ubierstr. 83, 53173 Bonn, Germany





**ALL POWERFUL:** According to the manufacturers, the USN's Douglas A3D Skywarrior attack bomber is so powerful, that if its two P & W J-57 turbojets were supplemented by JATO, it could theoretically take off vertically. Designed for carrier-based operations, the A3D weighs in at 70,000 lbs. max. gross and can take off from an Essex class carrier without the aid of a catapult. It can travel at speeds of over 600 mph and operates at altitudes of over 40,000 feet.

of No. 1 Air Division in respect to both administration and operations. Although technically the Wing has been a part of the Air Division organization since the Division was formed, it has actually been under the operational control of RAF Fighter Command.

The movement started with the shift of 410 Squadron aircraft and personnel to Baden-Soellingen, Germany, from where they are operating until the

Wing headquarters has completed its move to Marville. No. 441 Squadron is carrying out a similar move to Zweibrücken, Germany, this month. North Stars from 426 Squadron are assisting in these moves, extending their scheduled transport flights between Canada and the U.K. to the continent for the period of the transfer operation.

The Wing's third squadron, 439, will remain at North Luffenham until the station closes, probably late in

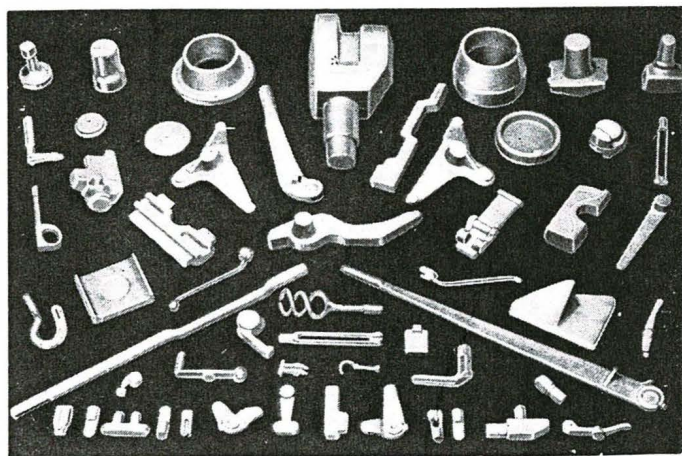
January, and will then fly over direct to its new base at Marville. It will be joined there later by the other two squadrons.

Aircraft from 435 and 436 Transport Squadrons, from Edmonton and Dorval, respectively, will aid in the move, during January, of 439 Squadron and the Wing headquarters. Four C-119's, two from each squadron, will be based in the U.K. for approximately a two-week period to aid in this move. During this period, it is expected that they will airlift more than 600,000 lbs. of equipment from North Luffenham to Marville.

The withdrawal of No. 1 Fighter Wing from North Luffenham will leave the Air Material Base at nearby Langar as the RCAF's only station in the U.K. North Luffenham has been operated as an RCAF fighter base, on loan from the RAF, since late 1951.

## New Navy Squadron

A new RCN utility squadron, VU-33, has been established on the West Coast and is based at Patricia Bay Airport, near Victoria, B.C. The squadron, commanded by Lieutenant-Commander D. J. Fisher, at present is equipped with three Avengers.



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cer of 147 Squadron of the RAF's Air Transport Command. This squadron has been responsible for the overseas movement of the entire 376 aircraft.

## H-21A Deliveries

Early this year the RCAF will take delivery of the six Piasecki H-21A "Work-Horse" helicopters which it has had on order through the USAF since early 1952, it was recently announced by AFHQ.

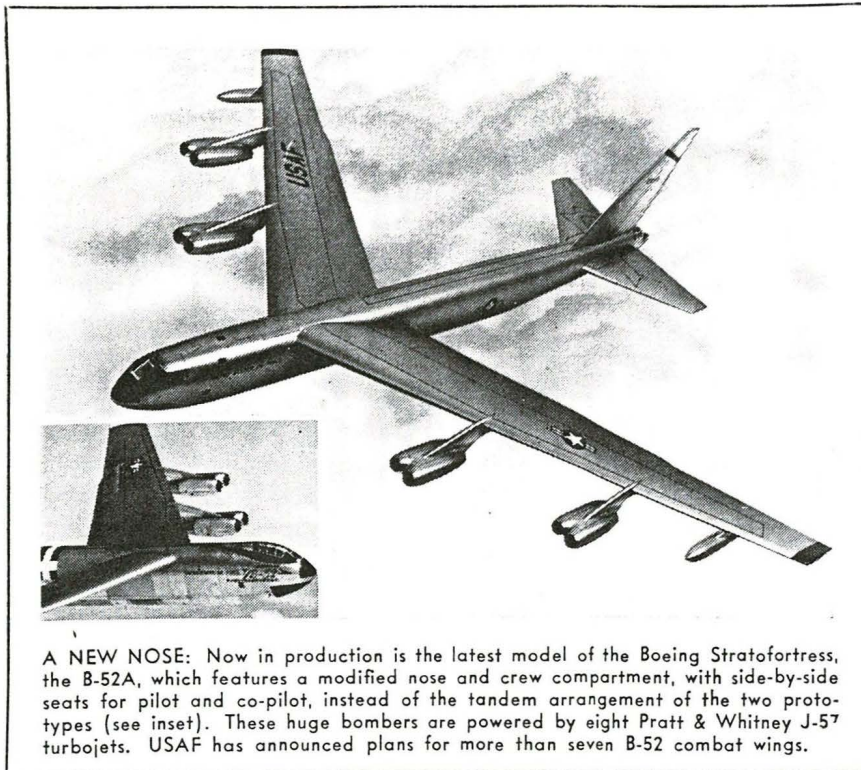
The new helicopters are to be delivered to the RCAF at Station Edmonton, where company pilots will check out several RCAF on the new type. The pilots are to be selected from a helicopter course now being given at the Canadian Joint Air Training Centre at Rivers, Manitoba, on Sikorsky S-51's.

The Air Force says that it will use the machines for rescue operations and in line with this role, the H-21A is fitted with omniphibious type landing gear, capable of landing on land, snow, swamp, or water. The cabin can be fitted with either 12 litters or 20 seats.

The Piasecki H-21A is claimed to be the biggest helicopter currently in production. Its fuselage length is 54 feet. Power is supplied by a single Wright R-1820 developing 1,425 hp for take-off (though de-rated to 1,150 hp in this installation, according to a Piasecki description of some time ago) and driving twin-rotors.

## Raise in Pay

Effective December 1, 1953, rates of pay and allowances for members of Canada's Armed Forces were increased. The new monthly basic rates and subsistence allowances for the RCAF appear in the accompanying table. The old rates appear in paren-



**A NEW NOSE:** Now in production is the latest model of the Boeing Stratofortress, the B-52A, which features a modified nose and crew compartment, with side-by-side seats for pilot and co-pilot, instead of the tandem arrangement of the two prototypes (see inset). These huge bombers are powered by eight Pratt & Whitney J-57 turbojets. USAF has announced plans for more than seven B-52 combat wings.

theses. It should be noted that the equivalent ranks in all three services receive the same rates of pay and allowances.

The rates that appear in the accompanying chart are for single men only and do not take into account any of the many ways in which both officers and men can increase their incomes substantially. Marriage allowances, for instance, now range, in the non-commissioned ranks, from a high of \$60 for AC2's to a low of \$40 for all ratings of flight sergeant and over, and, in the officer group, from a high of \$66 for pilot officers to a low of \$40 for ranks from squadron leader up. These compare with the old flat rates of \$30 for all non-commissioned

ratings, and \$40 for all officers.

Similarly, the total pay figures given for NCO's and men are for the standard group only. By the time a man in this classification obtains his Trade Group 4 rating, he is earning \$60 per month more than his counterpart in the standard group. Enlisted personnel also get pay increases for length of service. These can add a maximum of \$10, depending on rating.

In this line, too, the total pay figures given for officers are the "on appointment" rates. All officer ranks from flying officer to group captain, get pay increases after three years in rank and after six years in rank. The rank of flight lieutenant alone gets a third increase after nine years in rank. This can make a difference ranging from \$30 per month for flying officers to \$70 for group captains; or, in the case of the flight lieutenant with nine years in rank, \$75.

Foreign allowances of from \$9 to \$16 a month are paid to men serving abroad (\$13.50 to \$55.50 for officers), and additional allowances are paid if they are married and accompanied by their dependents. These amount to between \$10 and \$100 a month, depending on the country in which they are serving.

The announcement of the pay increases makes no mention of the separated family allowance, so presumably this is unchanged.

## COMPARATIVE TABLE OF ARMED SERVICES RATES OF PAY

	Basic Pay	Subsistence Allowance	Total
AC2 -----	\$92 (87)	\$61 (No change)	\$153 (148)
AC1 -----	\$96 (91)	\$61 "	\$157 (152)
LAC -----	\$107 (98)	\$61 "	\$168 (159)
Cpl. -----	\$127 (112)	\$61 "	\$188 (173)
Sgt. -----	\$144 (129)	\$72 "	\$216 (201)
F/Sgt. -----	\$165 (150)	\$81 "	\$246 (231)
WO2 -----	\$195 (174)	\$81 "	\$276 (255)
WO1 -----	\$224 (193)	\$92 "	\$316 (285)
P O -----	\$185 (170)	\$65 "	\$250 (235)
F O -----	\$230 (210)	\$89 "	\$319 (299)
Commissioned from			
F Sgt., WO2, or WO1 -----	\$288 (253)	\$89 "	\$377 (342)
F L -----	\$290 (255)	\$94 "	\$384 (349)
S/L -----	\$370 (335)	\$113 "	\$483 (448)
W/C -----	\$460 (395)	\$126 "	\$586 (521)
G/C -----	\$615 (555)	\$139 "	\$754 (694)
A/C -----	\$827 (737)	\$153 "	\$980 (890)
A/V/M -----	\$981 (881)	\$165 "	\$1,146 (1,046)



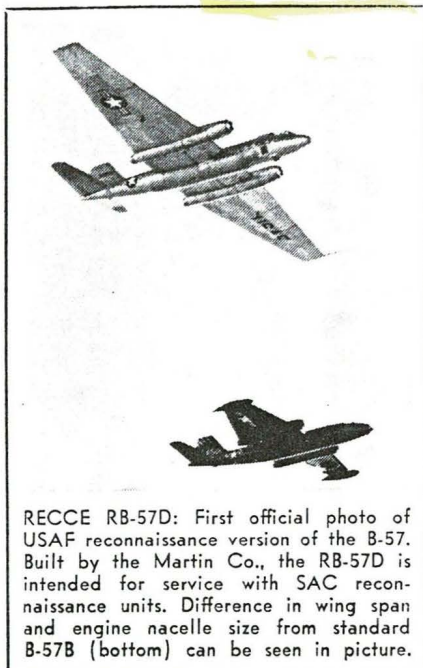
for the one-bomb drop and the problems of security when nobody was allowed to know what they were training to drop.

## All About Bonding

*Bonded Aircraft Structures* — published by CIBA (A.R.L.) Ltd. (Duxford, Cambs, England, 177 p., illus., \$7.50 pp).

This book may not *quite* "tell all", but it certainly presents a more complete symposium than has hitherto been available between two covers. In 177 large quarto pages, profusely illustrated, have been collated the 16 papers presented at the international bonding conference arranged by Aero Research at Duxford, in June 1957.

The book starts with a graphic statement on the basic principles of bonding by Dr. N. A. de Bruyne. Then follow two extensive treatises on "Design Aspects of Bonded Structures" by SAAB and Fokker, extensive exponents of bonding in the Draaken and the Friendship. The workshop aspect is dealt with by three proponents of the three techniques:



RECCE RB-57D: First official photo of USAF reconnaissance version of the B-57. Built by the Martin Co., the RB-57D is intended for service with SAC reconnaissance units. Difference in wing span and engine nacelle size from standard B-57B (bottom) can be seen in picture.

"Press Bonding" by de Havilland, "Autoclave Bonding" by Bristol and "Vacuum Table Bonding" by Fairchild. Tooling techniques are dealt with *in extenso* by R. J. Schliekelmann of Fokker and H. T. Fuffy of Short and Harland. The use of Araldite for skin/stiffener bonding on the Sud-

Aviation Vautour is described by C. Thomas.

"The Design and Testing of Honeycomb-cored Structures" by Bryan R. Noton of the Swedish Aeronautical Research Institute is an extensive treatise running to 44 pages, while the contribution of A. Holt of Avro on "Honeycomb-cored Structures" gives the works angle again. Some of Chance Vought's experience with fighters and missiles is described by B. A. Forcht in "Bonding of Aircraft Magnesium Assemblies with Redux Adhesive". R. H. Wilson of CIBA (A.R.L.) contributes on the use of Araldite for tools and glass cloth laminate components. Inspection of bonded structures is covered from the A.I.D., MoS, and of honeycombs by CIBA (A.R.L.) Appropriately, the final, forward-looking paper on "High-Temperature Adhesives," largely about Hidux, comes from the company's research manager C. A. A. Rayner.

This is an excellent reference for the design engineer or the student requiring an overall picture of the present state of the bonding art.

—/H.S.

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with the RAF, and there were several all-Canadian Spitfire squadrons. The famous fighter has often been credited with winning the Battle of Britain and thus making possible victory in the Second World War. First tested in 1936, the Spitfires flew more than a million wartime and postwar sorties in 16 years of operational service.

The Spitfires got their baptism of fire on Oct. 16, 1939, when they took part in the downing of three German bombers attacking British shipping. They took a heavy toll of Nazi aircraft during Hitler's all-out air offensive against Britain in 1940. During the following years of combat, the Spits underwent many changes to keep pace with new enemy weapons and tactics. Their speed was increased from 360 mph. to 450, and their armament from eight Browning machine guns to four 20-mm cannons. At the end of the war, the then highest speed by any aircraft was accurately measured at Farnborough when a Spitfire reached 620 mph. in a dive during research flights.

## Carrier Commissioned

HMCS Bonaventure, the Royal Canadian Navy's first Canadian-owned aircraft carrier, was commissioned at Belfast, Northern Ireland on January 17.

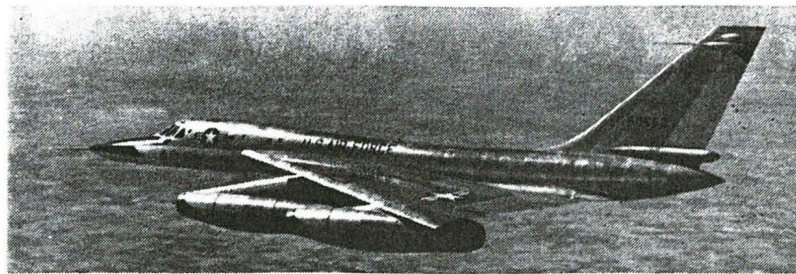
## Britannias for ATC

The RCAF's Air Transport Command is definitely to get a version of the Bristol Britannia to replace the out-dated North Stars presently in use. Long-standing rumors have now hardened into fact and Canadair has been given the go-ahead to start preliminary work on a transport version of its CL-28 MR Britannia. This will be known as the CL-44. It will probably be two years before the first one is ready for acceptance flights.

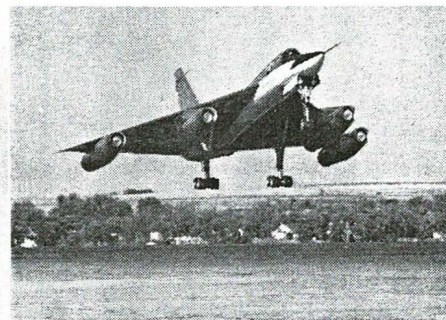
## Swedish Dragon

The Saab J-35 double-delta supersonic jet fighter has gone into quantity production for the Swedish Air Force, with deliveries scheduled within the next few years.

The SAF, which has designated this highly advanced aircraft the J-35 Draken (Dragon), has been working with Saab designers for seven years on the project. In the three Saab J-35 prototypes, the Swedish Air Force has found the answer to its requirements, laid down in 1949, for a fighter which could intercept enemy bombers in the



**THE HUSTLER:** The USAF Convair B-58 Hustler, the U.S.'s first supersonic bomber, is photographed in flight. The Hustler is designed to operate at altitudes above 50,000 feet, is powered by four General Electric J-79 turbojet engines with afterburners. The aircraft is 95 feet long, has a wingspan of 55 feet, and carries a crew of three. It has the ability to carry a wide variety of external pods filled with offensive or defensive weapons at supersonic dash speeds over the target area. It has out-run an F-100 chase airplane, with less than full power.



transonic speed range.

The unusual configuration of the Saab-35 came about as an answer to the problem of reducing air drag and getting sufficient volume in the aircraft for equipment, fuel and armament.

## Radar Helicopter

The USN's new Sikorsky HR2S-1W radar helicopter is now undergoing initial flight tests. The Navy is evaluating it as a new method of extending a fleet unit's early-warning coverage beyond that of shipboard search radar.

In most cases, the helicopter radar could detect a low-flying enemy aircraft more than twice as far away as could a shipboard radar set. The helicopter can be carried on an escort carrier or other Navy vessel large enough for a landing platform, with a fleet unit at sea beyond the coverage area of land-based Navy radar picket planes or blimps. It can be sent up as needed, to hover over the ships or to fly out beyond them for added radar coverage.

The radar, designed and built by General Electric, is described as the most powerful airborne search radar in production today. It is widely used by the U.S. Navy in anti-submarine work, and in airborne early-warning

airplanes and blimps. It is also being used by the U.S. Air Force in its comparable radar picket airplanes.

## Atomic Bomber

The U.S. Air Force, apparently confident of success in building an atomic powered bomber, has started organizing a complete weapons system for the operation of such aircraft. The same secrecy which has surrounded the nuclear propulsion project for devising an atomic airplane engine also cloaks the new weapons program.

Atomic-powered bombers will impose operational requirements and make possibly strategy entirely different from those for present aircraft weapons systems. Available information indicates that the USAF already has let contracts for development of some of the equipment needed. A nuclear-powered aircraft could stay in the air far beyond the endurance of any one crew. The longest routine training periods for heavy bomber crews now are about 48 hours. An atomic-engined aircraft might be able to fly for weeks.

Towards this goal, the U.S. Atomic Energy Commission recently completed a big nuclear aircraft propulsion test facility, including a runway as well as static test equipment, in Idaho.



## Canadian Air History

Aeronautical items of historical significance to aviation in Canada are being sought for possible use in connection with the documentary film which the National Film Board is planning to produce to commemorate the 50th Anniversary of Canadian Flight.

The Film Board would like to locate film clips depicting aviation events which took place in Canada in the early days of aviation, particularly in the period following World War I and during the early thirties, though movies and stills from any other period might be useful as well. The Board is also seeking parts and components of old aircraft, especially those with a historical connotation.

Readers who have or know the location of any such films or aircraft parts or components are asked to communicate with: The Editor, *Aircraft Magazine*, 341 Church St., Toronto 2, Ont. Do not forward any material to either this address or the National Film Board; information only as to its whereabouts is being sought at this time.

## Added Insurance

The Great American Insurance Company and the Great American Indemnity Company have become members of the Canadian Aircraft Insurance Group. Through membership in CAIG, these companies will participate in the writing of aircraft hull insurance and aircraft liability insurance respectively.

The Canadian head office of the Great American Companies is in Toronto with branches in Quebec, Montreal, Ottawa, London, Sudbury, Winnipeg and Vancouver. The Canadian Aircraft Insurance Group is managed by Canadian Aviation Insurance Managers Ltd., in Montreal.

## Turbine Ops Panel

A new turbine operations panel to co-ordinate the joint effort of the world's airlines to develop the most efficient flight procedures and requirements for the new generation of turbojet and turboprop aircraft has been created by IATA's Technical Commit-

tee. The group will consist of seven experts from American, British, Canadian, Dutch and French airlines.

Concentrating on the actual flying problems of turbine-powered aircraft, the IATA panel will determine how they will differ from those aircraft now in use, and establish guiding principles for holding patterns, rates of descent, cruising speeds and altitudes, ground handling and other aspects of actual operations. Their assignment is the logical further step in the international airlines' joint attack on jet problems which began with a worldwide symposium six years ago. Subsequent studies of problems of fuel, infrastructure, communications, weather forecasting and other problems will now be synthesized by the new group.

J. T. Dymont, who was chairman of the IATA jet symposium in 1950 and has since headed its jet fuels study, will be chairman of the new turbine operations panel. The results of the panel's work will be circulated to airlines to assist their own planning and will be submitted as well to ICAO's jet operations panel, in which governments are studying requirements for runways, ground and navigational aids.

## O-Ring Distributor

Pneumatic Industrial Equipment Co. Ltd., 2432 Kingston Road, Toronto 13, has been appointed distributor for Parker O-rings and related molded rubber products. The appointment was announced by Parker Appliance Co.,

Cleveland, Ohio. The new distributor will maintain stock for prompt servicing of needs throughout the Southern Ontario area. Technical assistance will be available to the Canadian distributor by the Parker Co.

## Morocco in ICAO

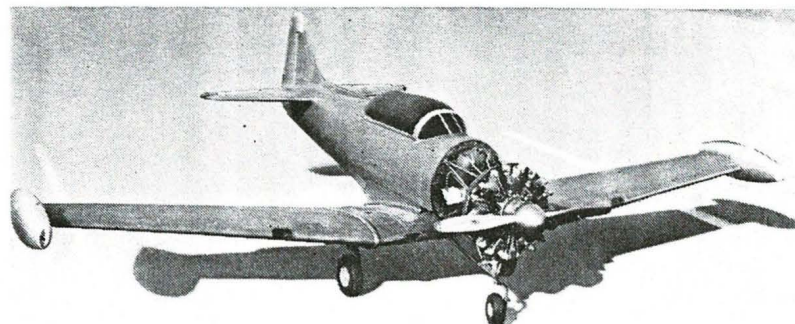
Morocco has become the 70th member state of the International Civil Aviation Organization. December 13, 1956 was the effective date.

## B-58 Hustler

According to reports, the new Convair B-58 Hustler medium bomber is able to out-fly the USAF's fastest operational jet fighter. In tests at Edwards Air Force Base, Calif., the Hustler is said to have "run away" from the North American F-100 Super Sabre equipped with afterburner. The F-100 is advertised as having a top speed of nearly 900 mph. with the afterburner cut-in.

The B-58 is destined to replace the Boeing B-47's now in USAF squadron service. Powered by four General Electric J-79 engines rated at 15,000 pounds thrust each, the Hustler is almost twice as powerful as the B-47 which has a top speed of over 600 mph. The Hustler is believed to be the only bomber in the world capable of exceeding the speed of sound in level flight.

Designed and built by Convair, the Hustler is capable of flying non-stop to any point in the world with mid-air refueling. With a nuclear payload, the B-58 could demolish installations in the most remote sections of Russia,



**HARVARD NEW LOOK:** An extensive conversion for the famous T-6 (RCAF Harvard), training airplane, increasing its performance, and adding to its safety features, has been developed by Erle L. Bacon Corp., Santa Monica, Calif. Called the "Super 6", conversion has been developed for sale primarily to foreign air forces. Features include: tricycle landing gear; modernized power package with jet stacks and augmentor cooling; one-piece canopy; single disk brakes, tip tanks.



and with a greater margin of safety to its crew, because of its speed, than any bomber now flying. It is even faster than the MiG-21 Super Farmer, mainstay of the Red Air Force.

## PENSIONED OFF

(Continued from page 35)

boom pocket editions were designed during World War II. The first prototype flew in September, 1943. Production models began appearing in

general service with the RAF some while after VE Day. Along with Gloster Meteors, they kept Great Britain in the forefront of military aviation.

In March, 1948, John Cunningham, de Havilland's chief test pilot, broke the existing altitude record for airplanes by booting a modified Vampire powered with a special Ghost engine up to 59,492 feet. This record stood unbroken for many years and was one of the prestige-making accomplishments of the Vampire.

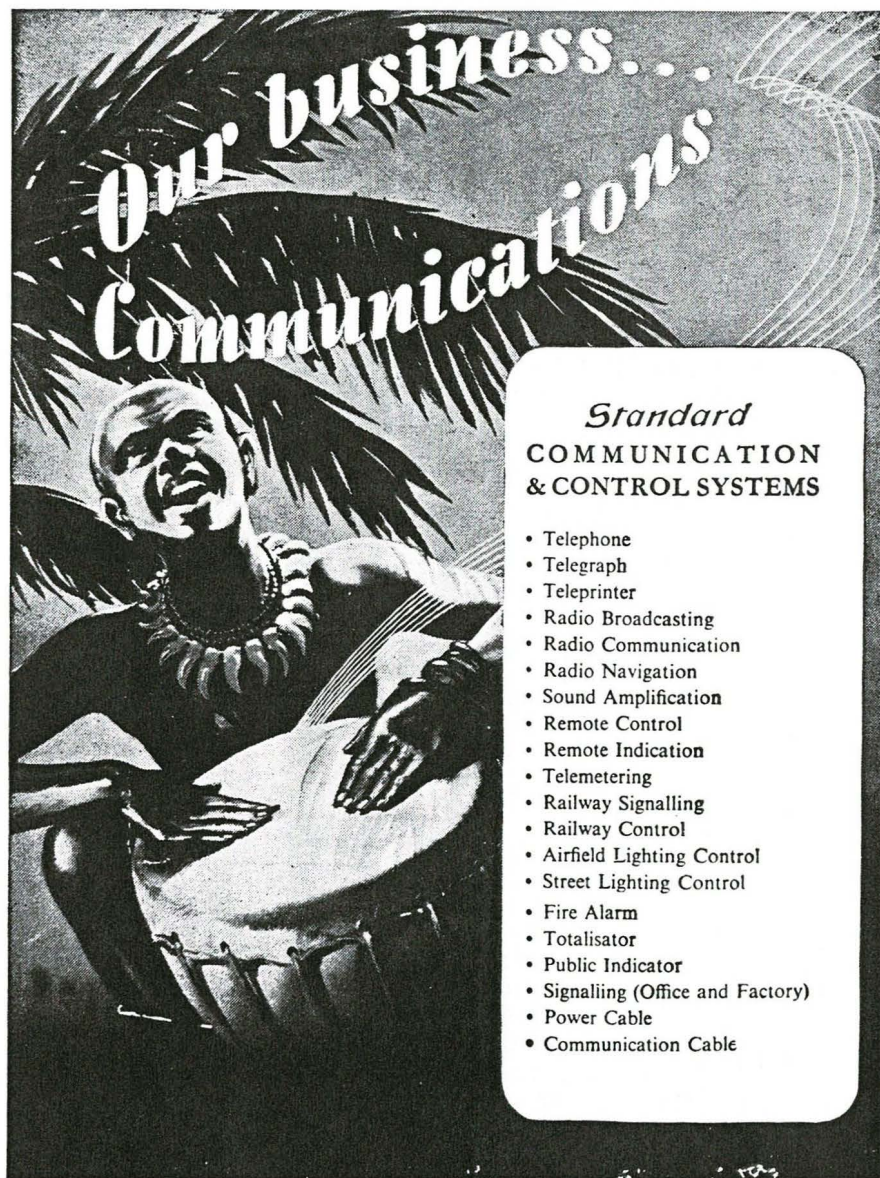
The Mark 3 version of the DH-100 came into service with the RCAF in

1948, when the government placed a \$7 million order for 85 Vampires. At the same time as the few existing Regular Force squadrons were getting their Vamps, the Auxiliary squadrons were equipped, too. They remained Canada's front-line fighter until 1951, when the regular force began replacing them with Sabres. Even so, the operational training unit continued converting jet pilots on the reliable Vamps. Finally however, even these were relegated to the Auxiliary units across the country.

**High & Low:** In its hey-day, the Vamp was touted as a high level performer. However, even before its eclipse as the best, the British had recognized its value close to the deck. The Mark 5 ground attack version was brought out. Besides its regular arsenal of four 20 mm cannon, it toted along eight rockets and two bombs. Ease of handling, plus an unwavering line of flight made the Vamp the ideal ground attack weapon. Here was the airborne gun platform they'd looked for all through the war.

The Mark 6 was built for Switzerland, later the Mark 50 for Sweden. These aircraft were more powerful versions of the Mark 5, having Goblin 3 engines which delivered 3,300 lbs. static thrust. Nine years ago, this was enough to propel the wee beasts up to 40,000 feet in an advertised 16 minutes. And, as the advertisement went on to say: "... the Vampire is so outstandingly controllable at altitude that it can make real use of such a ceiling."

All this may have been so, but in Canada the swept-wing Sabre with the hydraulic controls had all-but shouldered the Vamp off the front pages. The twilight years for the small machine making the big noise began in 1952. The ever-increasing shortage of spares with the inevitable cannibalization of



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## COMING EVENTS

**February 13-14** — Annual Meeting, Air Cadet League of Canada, Chateau Laurier, Ottawa.

**February 25-26** — Mid-Season Meeting, CAI, Fort Garry Hotel, Winnipeg.

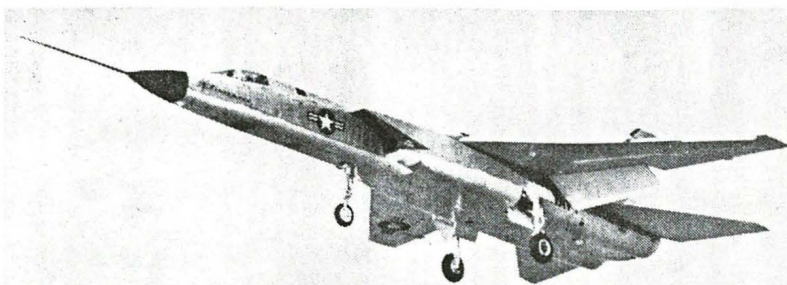
**March 18-21** — Second National Conference, ASME Gas Turbine Power Div., Sheraton Cadillac Hotel, Detroit.

**April 25-26** — AITA Semi-annual Meeting, Empress Hotel, Victoria, B.C.

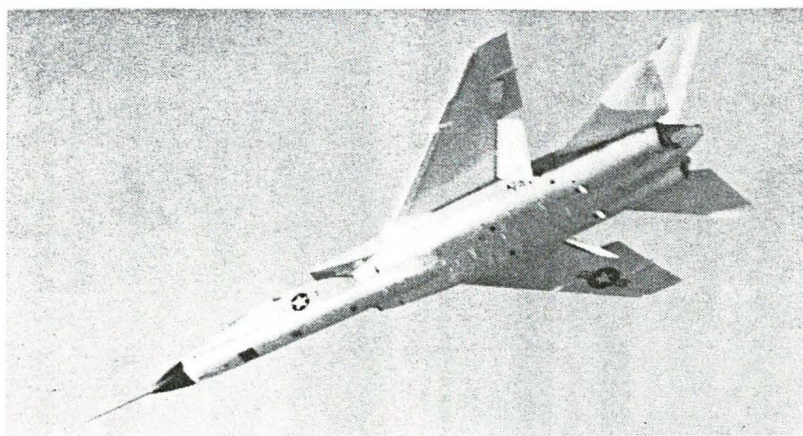
**June 8** — Air Force Day across Canada.

**October 2-4** — Annual Meeting and Forum, National Business Aircraft Assoc., Cosmopolitan Hotel, Denver, Colorado.





**DELIVERY WAGON:** North American A3J-1 Vigilante supersonic attack weapon system, shown here on its first flight Aug. 31, can deliver nuclear or conventional weapons from high or low altitudes. Linear bomb bay runs lengthwise in fuselage; bomb is ejected rearward. Power is by two GE J-79-2 turbojets of approx. 15,000 lbs. th. each. A3J-1 is designed for carrier operation.



bility for the Canadian operation. The company will continue manufacturing operations in St. Thomas. The 20,000 square foot plant is located on a 5 acre site suitable for expansion, and has about 100 employees.

### Last CF-100 Simulator

The Hon. Raymond O'Hurley, Minister of Defence Production, last month inspected the last of 12 CF-100 flight simulators built by Canadian Aviation Electronics Ltd. for the RCAF. The Minister was making his first visit to the Montreal electronics firm. He was accompanied by D. A. Golden, Deputy Minister.

### GE Drive for Arrow

A contract for a new type hydraulic constant speed drive for the CF-105 Arrow has been awarded to General Electric. The new 40 KVA drives are for the Mark II production version of the Arrow, which has increased electrical requirements. The drives will convert the variable speed of the Iroquois engines to the constant speed required by two 40 KVA generators.

Called a roller-actuated piston drive, the new unit embodies a new concept

in the field of constant speed drives. It employs a combination of spherical and cylindrical pistons as well as tiny precision rollers which when used with the cylindrical pistons, extend the speed range capability of existing drives. The new concept also makes possible the design of small drives with both high power and wide speed range capabilities.

### Filters by Jarry

A recently signed agreement between Jarry Hydraulics, Montreal, and Micro Filter Sales Corp. of Glen Cove, N.Y., has given the green light to the Canadian company's long contemplated plans to design, manufacture and sell filters for the aircraft industry.

"We have been prepared to go into this field for some time," explains John Truran, director, engineering & sales for Jarry "and have done extensive preliminary design and research work. The hold-up has been in getting exclusive rights to a top quality filter component."

The new agreement allows Jarry to make filters using "Rigimesh" — a highly effective product of Aircraft Porous Media Inc., an affiliate of Micro

Filter Sales Corporation.

"The arrangement is all-embracing," Mr. Truran continued. "We will act as sole Canadian agents for the American company's filters and filter components, but will also be designing and manufacturing our own filters incorporating their mesh. We are prepared to produce any type of oil, fuel, hydraulic or general aircraft system filter in our Montreal shops."

### Orenda Spares Order

A \$1,000,000 order for jet engine spares, tooling and technical information, has been received by Orenda Engines Ltd. from Fabrique Nationale d'Armes de Guerre of Belgium.

The order will assist the Belgian firm in carrying out a contract from the Belgian government to overhaul and repair Belgian Air Force CF-100 aircraft and their Orenda engines.

### Canadair 540 Certificated

The U.S. CAA has now fully certified for all types of commercial operation the Eland turboprop version of the Convair 340 airliner, now in production as the Canadair 540.

This is the first occasion that a twin-engined airframe of American design with any propeller turbine engine has received certification. It is also the first time that an aero-engine firm has equipped an aircraft with its powerplants and obtained for it an internationally accepted certificate of airworthiness for civil operation.

### Seat Overhaul

Timmins Aviation Ltd. has been awarded a Department of Defence Production contract to repair, overhaul and modify RCAF aircraft seats.

### Hoze-lok Distributors

Railway & Power Engineering Corp., Ltd., is announced as a franchised distributor of Hoze-lok industrial hose assemblies and reusable hose fittings. Extensive stocks will be maintained at their Montreal and Toronto offices.

### Contracts Awarded

Contractors awarded business in excess of \$10,000 by the Department of Defence Production during the period July 16, 1958, to August 15, 1958, include the following. The list does not include orders placed by the Department outside Canada, or with other agencies, or increases in orders placed earlier — nor do orders classified as secret appear here.

Names appearing in bold face are current AIRCRAFT advertisers.

Abercorn Aero Ltd., Montreal, \$15,506