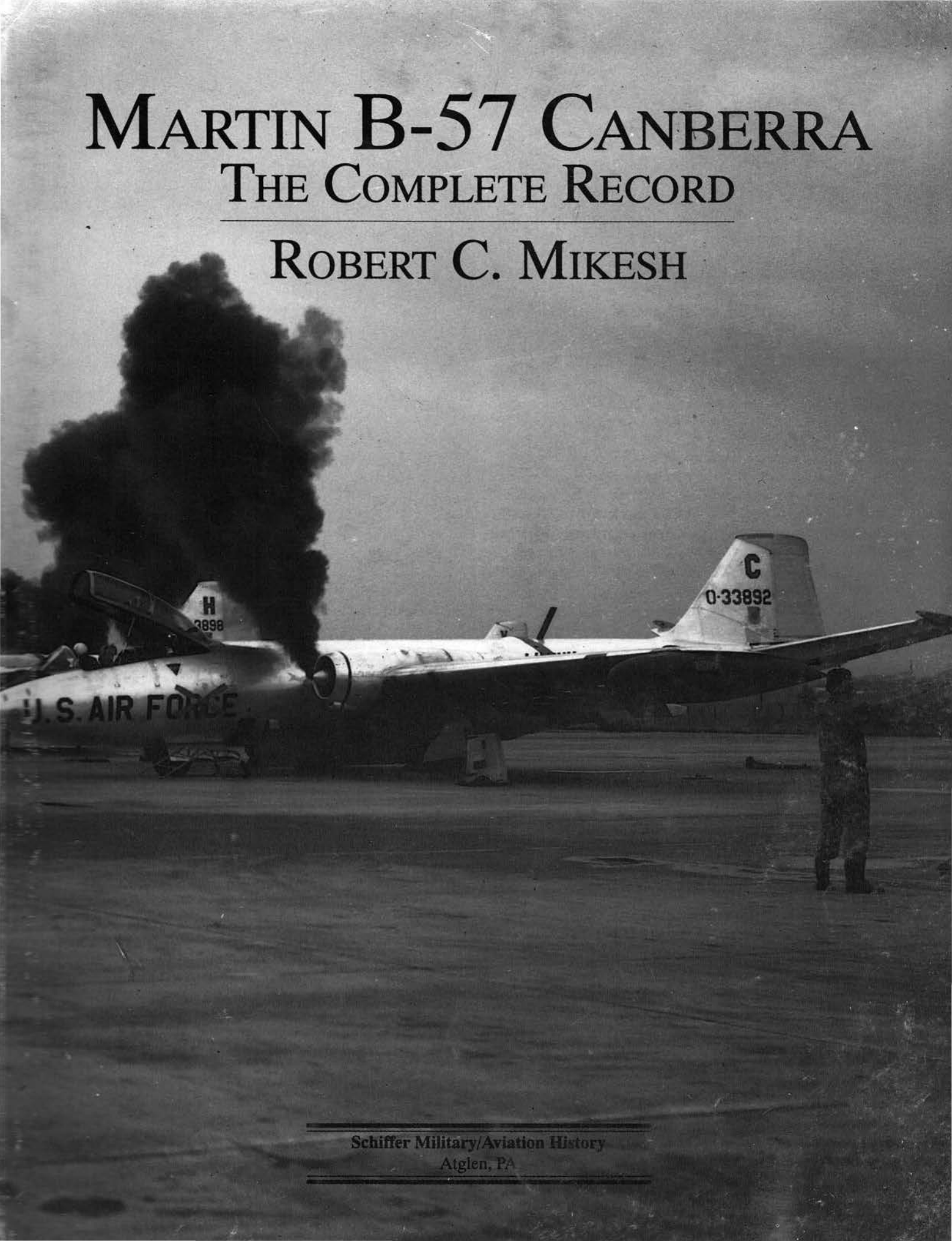
MARTIN B-57 CANBERRA
THE COMPLETE RECORD

ROBERT C. MIKESH



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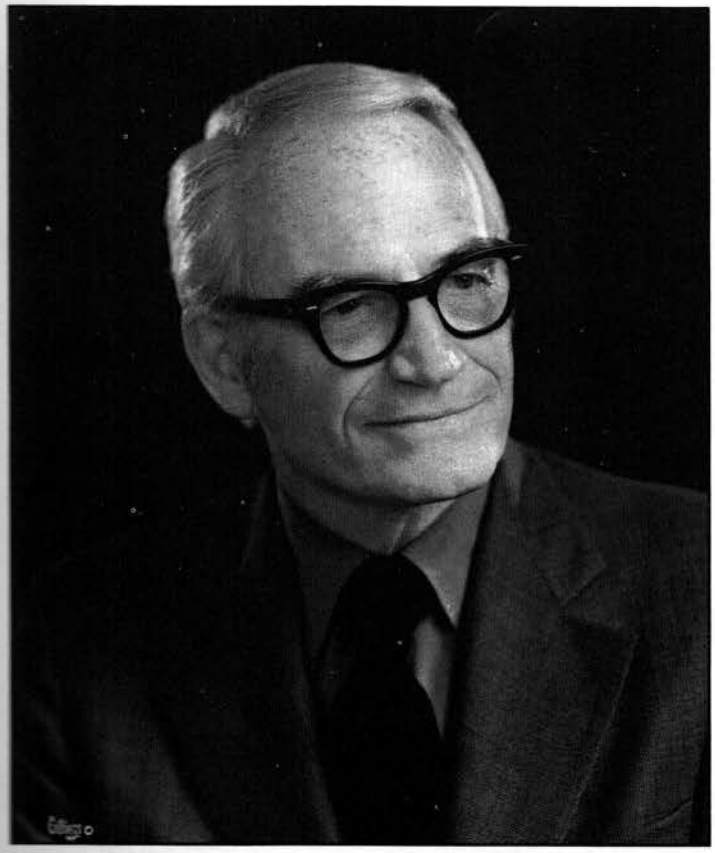


Barry Goldwater had been Senator from Arizona for 30 years and once was a candidate for President of the United States. He is a staunch advocate for a strong military force for the United States and had served many years on the Senate Armed Services Committee. In this capacity and as an Air Force Reserve Major-General, having received his military wings during World War II, he took every opportunity to acquaint himself, firsthand, with the flying equipment of the military services. In pursuit of this, Senator Goldwater has several hundred hours, first pilot time, in the B-57 Canberra.

FOREWORD

A new generation of aircraft and pilots has come into the US Air Force since the B-57 was phased out of military service. In fact, when mentioning to present day pilots that the B-57 was an airplane that I had once flown, there is question in my mind if they are certain what I am talking about. With the phase-out of the B-57 Canberra in 1983, so went the era of the tactical bomber that had its beginning before World War II. In fact, while the B-57 was in Air Force service, it was the only tactical bomber in inventory. Replacing its mission is what we know today as 'strike aircraft' ranging from fighter-bombers to the 'A' series of aircraft like the A-10.

The B-57 did not pass into oblivion easily. In fact, in some circles it was considered an 'old' airplane when it flew combat in Vietnam, yet they stayed around for nearly another twenty years after dropping their first bombs in anger.

My experience as a B-57 pilot began with 'Star Flight' at Andrews AFB, near Washington, D.C., in the early 1960s. This unit was comprised of a handful of B-57s and pilots set aside for administrative flights for those of us who could share the flying duties as well. It was here that I first met author Robert Mikesh and we often flew together when I had to quickly visit a distant Air Force Base. Straight and level flying is fine for getting somewhere, but there were opportunities to see what the airplane could really do. After Bob demonstrated a loop off the deck in this bird, then allowed me to try my hand, I couldn't help but exclaim, 'By golly, this really flies like an airplane should.' I was impressed with its maneuverability which was far better than I would have expected of an aircraft of this size. Its soundness and flexibility in mission profile made it a superb combat weapon, and it served in that capacity year after year in Southeast Asia compiling a remarkable record for itself. It is amazing, considering the length of time this aircraft was in service, that it performed so well in so many different capacities. Because of this, it gathered hundreds of admirers over the years, especially from those of us who have had the rewarding firsthand experience of flying and working with this rugged, versatile airplane – the B-57 Canberra.

Barry Goldwater

Barry Goldwater
United States Senator

INTRODUCTION

My first glimpse of the Canberra was the classic photo of it in a steeply banked turn at the introductory show at Farnborough in September 1949. My reaction after disbelief, was relief – that this was not a USAF plane that I might one day have to fly. To me, its straight, wide and stubby wings looked totally antiquated. How quickly we change, for in a short time I was waiting anxiously for our unit to be equipped with the American-built version of this bomber, and from the first time I flew the B-57B, I was hooked on it forever.

Time has proven that the straightforward design was correct, for the basic Canberra airframe design stayed in continuous U.S. military service until 1983, and in other countries even longer. As the immortal DC-3 is the great workhorse of the air transports, the Canberra certainly occupies a similar niche in history among combat aircraft.

This acceptance by the United States Air Force in lieu of American types is a lasting tribute to the British design team that created it. By the time production B-57s were reaching tactical bomber units, the Douglas B-66, also in production, was being converted to other missions even before its acceptance in the tactical bomber role. For years the B-57 remained the only jet tactical bomber in the USAF. When it had dropped its last bomb, there were no pure tactical bombers to replace it nor has there been since.

Perhaps the term 'tactical bomber' in itself is obsolete, for 'attack aircraft' and 'fighter-bombers' fill this mission requirement of close air support that the B-57 did so well. The term as well as B-57s themselves, nearly came to an end as far back as the late 1950s when tactical bomber units began phasing out at a steady rate due to mandatory military cutbacks. Only one combat wing remained (yet it too was scheduled for deactivation) when an escalating war situation in Southeast Asia reversed Air Force thinking. The Canberra played an important part in the nine years of combat that followed. When the fighting ended, the B-57s were removed from the role of USAF combat aircraft, and the dwindling numbers retained in service were reassigned to a peacetime mission. At this writing however, one WB-57F still remains in service for high altitude evaluation missions for NACA.

Earlier than I like to remember, I decided one day to write a book about the B-57, for I was in my third pilot assignment with Canberras (later to become five B-57 unit assignments, fifteen years, and 2,000 hours) and they had become an important part of my life. I began gathering information about the airplane and its crews and soon had more material about the B-57 than one book could handle. That book became *B-57 Canberra At War 1964-1972* published by Ian Allan in 1980. In time, that book became out of print, depriving this story of the B-57 from others that were interested or became interested as a new generation of readers. Fortunately, Schiffer Publishing Ltd. agreed to reissue the book and in so doing allowed me the opportunity to insert many details that had to be left out of the original, make adjustments where needed, and to add more to the story that had surfaced from the first edition. We are fortunate to have color photographs added to this volume.

The overall story of the American-built Canberra is contained in both books, but readers close to the subject will recognize that some aspects of its history have been passed over lightly, and others omitted completely. One book cannot contain all the detail I would like – the total story of the B-57, an airplane that served in so many capacities and stayed around as a U.S. military airplane for 29 years.

Much of the credit for the content of this book is shared with many people, including fellow Canberra pilots who had some facts more clearly in their mind than I. Many of their names appear throughout this history, for airplanes and people cannot be separated. The B-57 has touched many people – those that designed and built the Canberra, the crews that flew it, and those that supported it so caringly on the ground – I only regret that everyone's contributions cannot be recognized within this history of an aircraft that will not be easily forgotten.

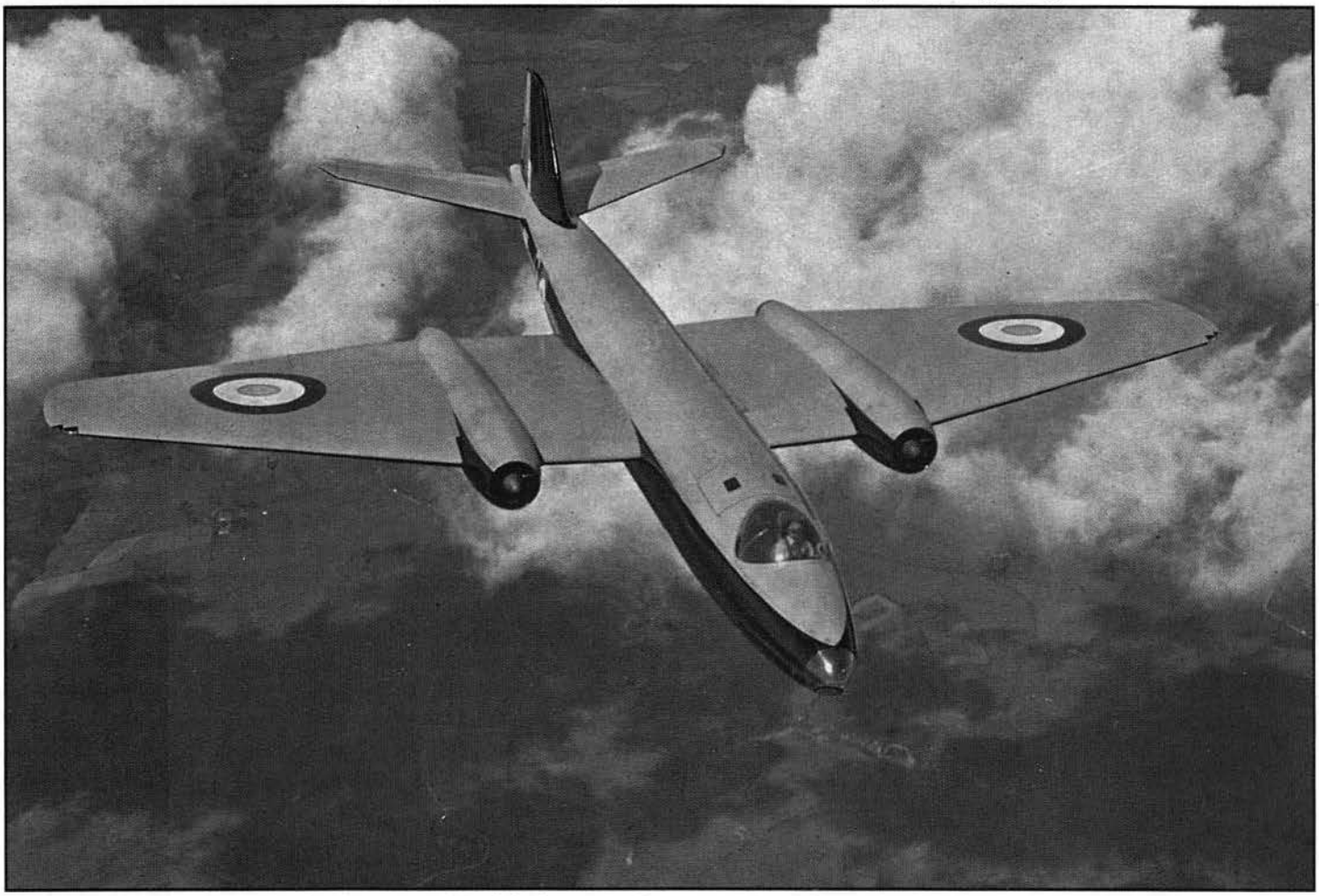
1

BIRTH OF THE CANBERRA

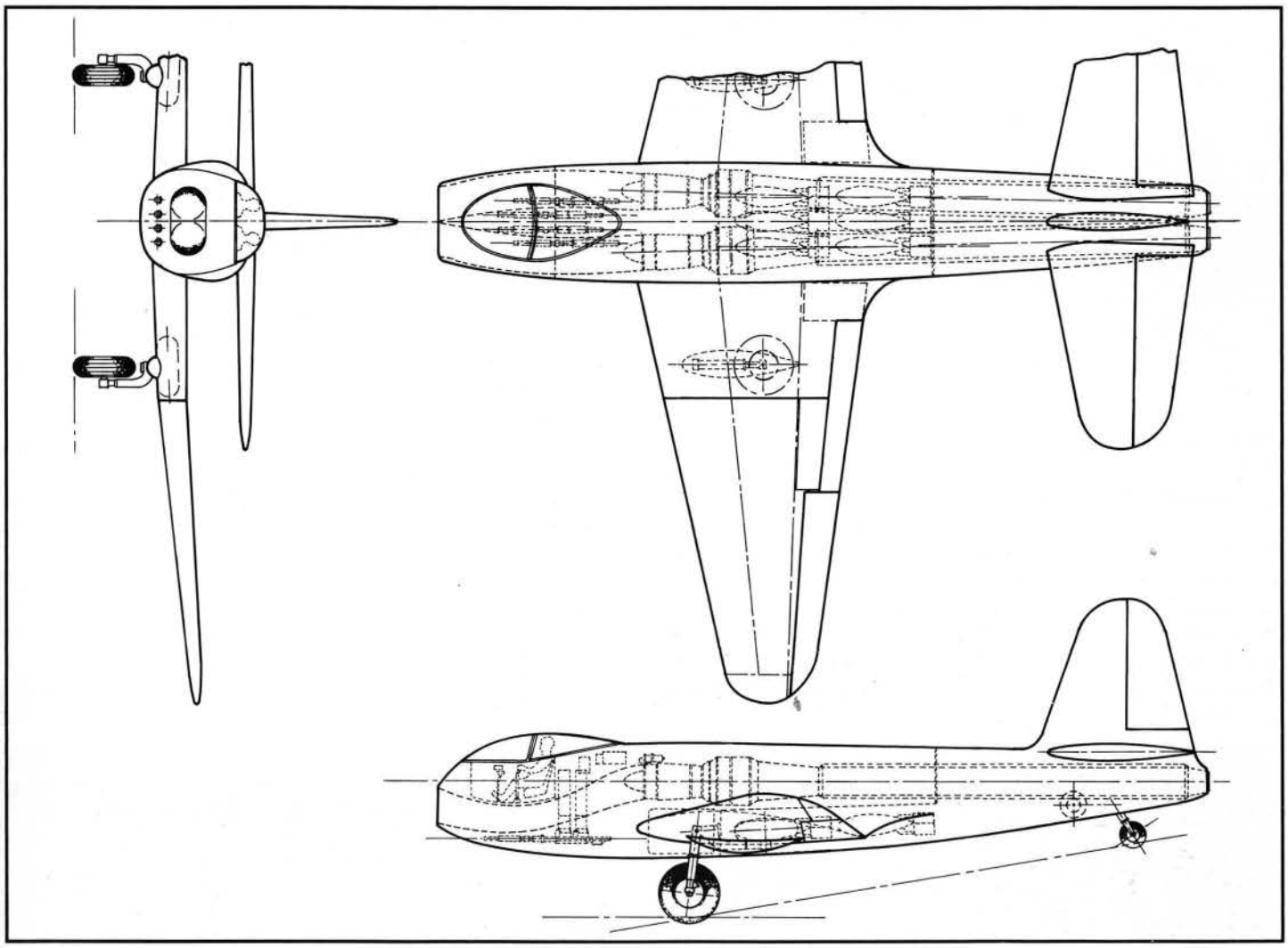
The merits of an airplane can often be measured against what it was designed to do and how well it meets those requirements. The success of the Canberra is not only attributed to having fulfilled the initial design requirements, but due to the 'stretch' capability of its basic design, it became highly adaptable to a multitude of other tasks as well.

To trace the concept of the Canberra to its very earliest glimmer may well have been the idea that Mr. W.E.W. Petter had for a jet fighter-bomber replacement for the Royal Air Force's Whirlwinds and Typhoons. When 'Teddy' Petter was Technical Director for Westland Aircraft Ltd in 1944, the jet age had already began, and any tactical airplane having a propeller was immediately declared obsolete. It was here that Petter's jet aircraft concepts began developing before he left Westland. Not only did Petter have a single engine concept along the lines illustrated here, but his thinking began with a twin-engine concept with both engines in the fuselage.

It was that same year, 1944, that Petter moved to Preston, Lancashire. He become Chief Designer for English Electric Company Ltd, leading a new design team, for English Electric had not built an airplane of their own design since 1926. The company had suspended its aviation activities that year and this had lasted until 1938 when the war years brought English Electric back into the



First flown on 13 May 1949, the cleanly contoured English Electric Canberra was Britain's first jet bomber. Its concept was so right that it remained in production for 12 years, and some are still in service at this writing. Low wing loading and a low aspect ratio wing were designed into the Canberra, giving it fighter-like handling qualities, as well as high altitude capability resulting in maximum fuel economy.



The earliest concept of a jet powered aircraft that is traceable to the Canberra is this design by W.E.W. Petter when still working at Westland in 1944. Upon leaving Westland for English Electric, this twin jet engine fighter-bomber concept became the embryo that led to the Canberra.

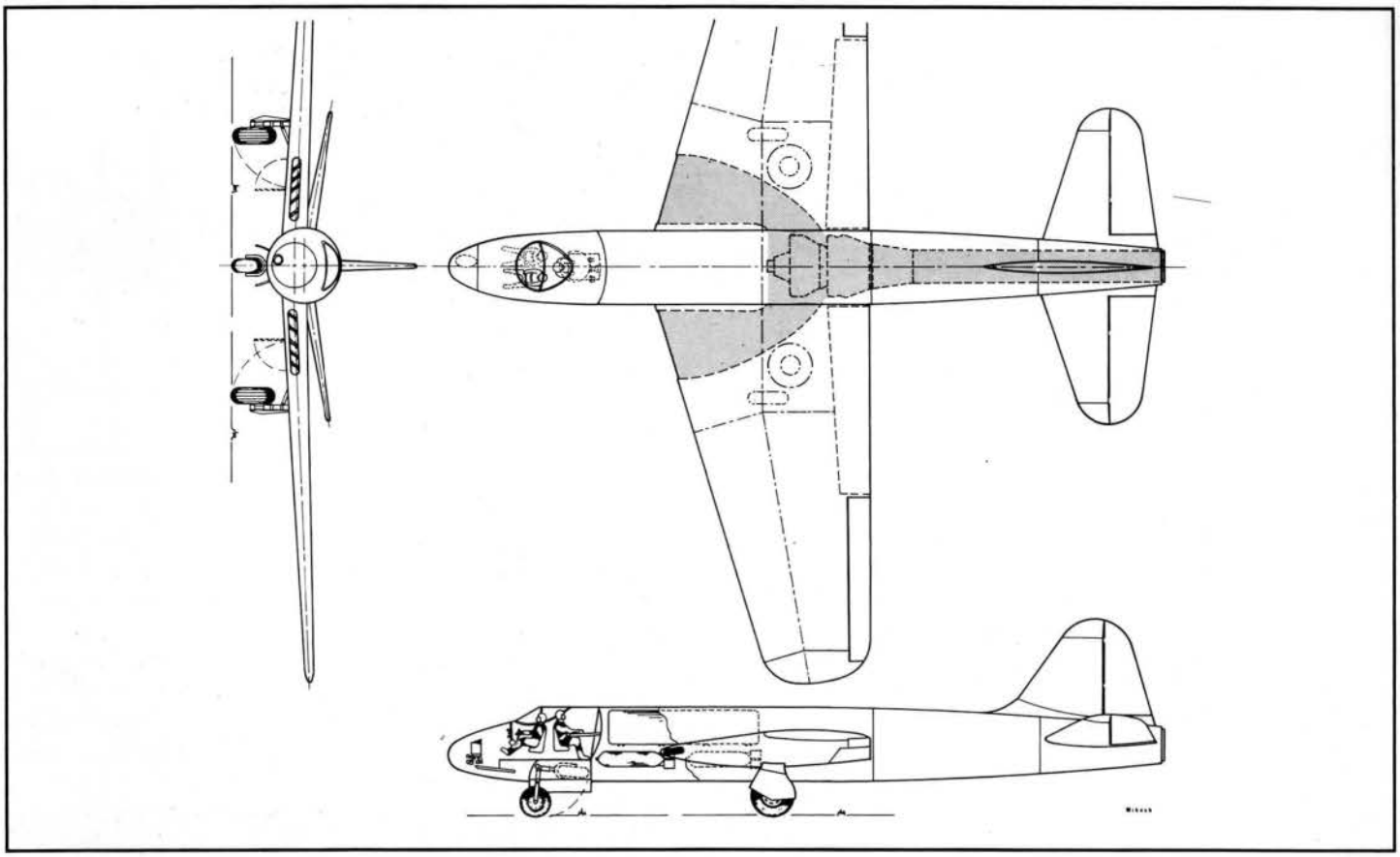
aviation field by manufacturing aircraft of other companies, namely the Halifax and Hampden bombers. When jet powered aircraft came into the picture, the Ministry of Aircraft Production invited English Electric to develop a jet aircraft design written around their own proposal of meeting certain broad requirements.

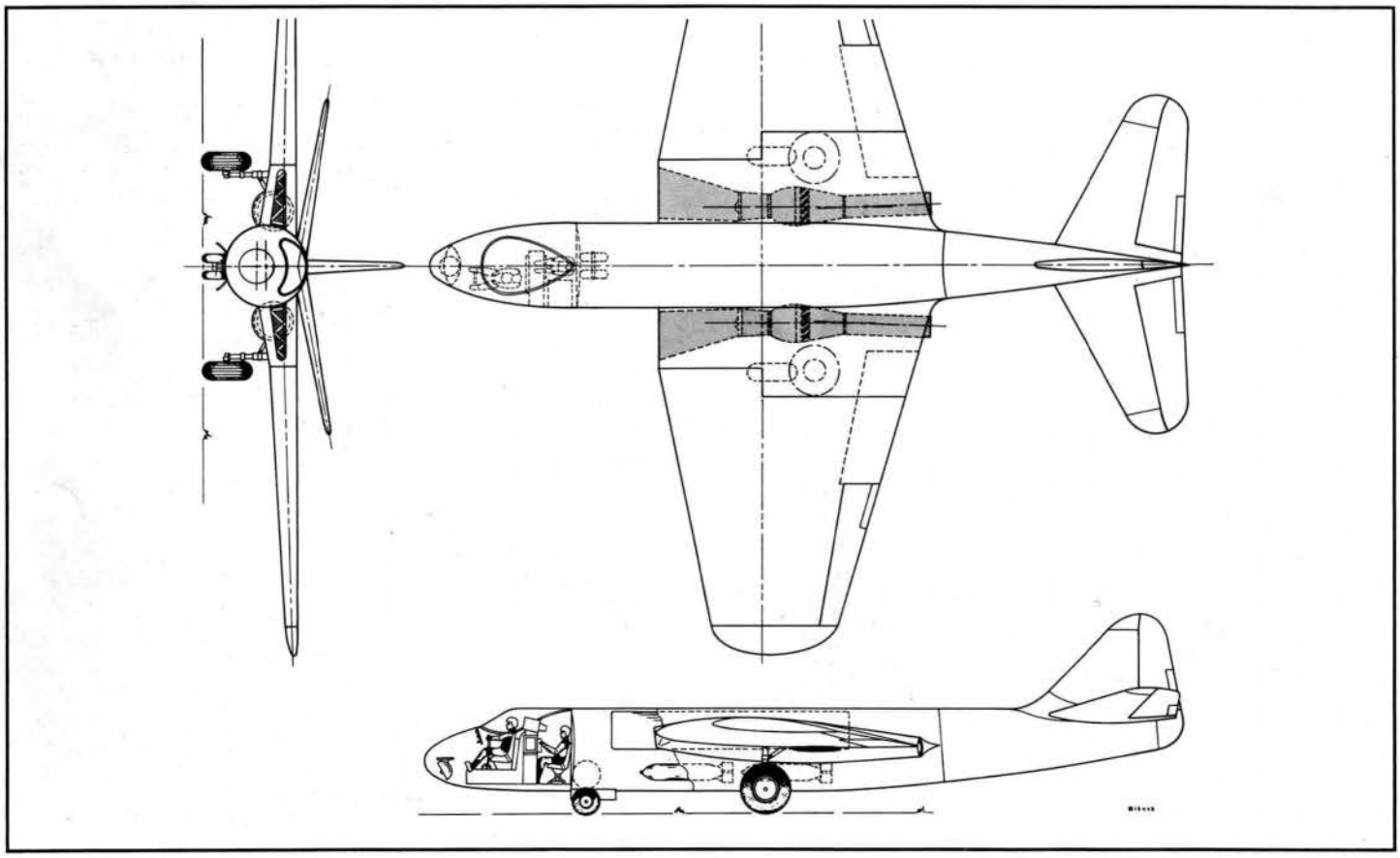
Starting with his earlier thoughts on jet aircraft design, Petter and his new design team members considered a jet bomber concept, one that might have the qualities that would replace all RAF bomber types then in service, considering in particular the mission requirements ranging from the Mosquito to the four-engine Lincolns.

Design work began, and by June 1945 the new airplane had the lines of a mid-wing monoplane, powered by a single, very large turbojet, crewed by a pilot and navigator. The entire design was built around a proposed Rolls-Royce engine which was to have a 5ft 6in diameter, which they planned to mount in the center of the fuselage. This two-stage centrifugal engine, though unusually large, was expected to produce 12,000lb static thrust – enough to make anyone take notice in those early jet years. The single unit concept was decided upon after a careful study had been made of other engines then available, and all were considered inadequate for a bomber. Although the craft would be large, weighing in the neighborhood of 40,000lb, it would cruise at 500mph at between 35 and 40,000ft. Even in this embryonic stage, the design showed a resemblance to the now familiar lines of the Canberra.

Before the design study became too advanced, the rapid development of jet engines led the English Electric design team to re-examine its plan, and in so doing dropped the single engine concept substituting two engines buried in the wing-roots. The new engines were axial flow Rolls-Royce AJ65s, a forerunner of the Avon, having a much smaller frontal area than the originally considered centrifugal engine. With the oversized engine no longer in the fuselage, the bomb bay area was expanded to carry an assortment of weights including one 8,000lb bomb. Fuel tankage was reduced since the axial flow engine had a lower specific fuel consumption for the designed range of the bomber. The elimination of the fuselage jet tail-pipe also made possible a simpler and lighter weight aft section. Engine air inlets remained in the leading edge of the wing which had been established in the single engine design.

When the newer Rolls-Royce engine appeared in late 1945, the design was again modified by placing these engines within the wing at about the one third span point. As weight reduction continued in the design, the wing area was able to be reduced from 1,040





OPPOSITE: Early transitional designs leading to the Canberra were these two designs. In 1945 this jet bomber was a single engine concept having the centrifugal-flow jet engine buried in the fuselage. By 1946 with the advent of axial-flow jet engines, the proposal had two of these engines mounted in the wing roots. Design changes that followed, evolved in a logical development pattern that became the prototype Canberra.

to 960sq ft without increasing the planned wing loading, and the aspect ratio was also reduced from 5.4 to 4.9. With this third conceptual design for a jet bomber, the configuration we now recognize as the Canberra began to take form.

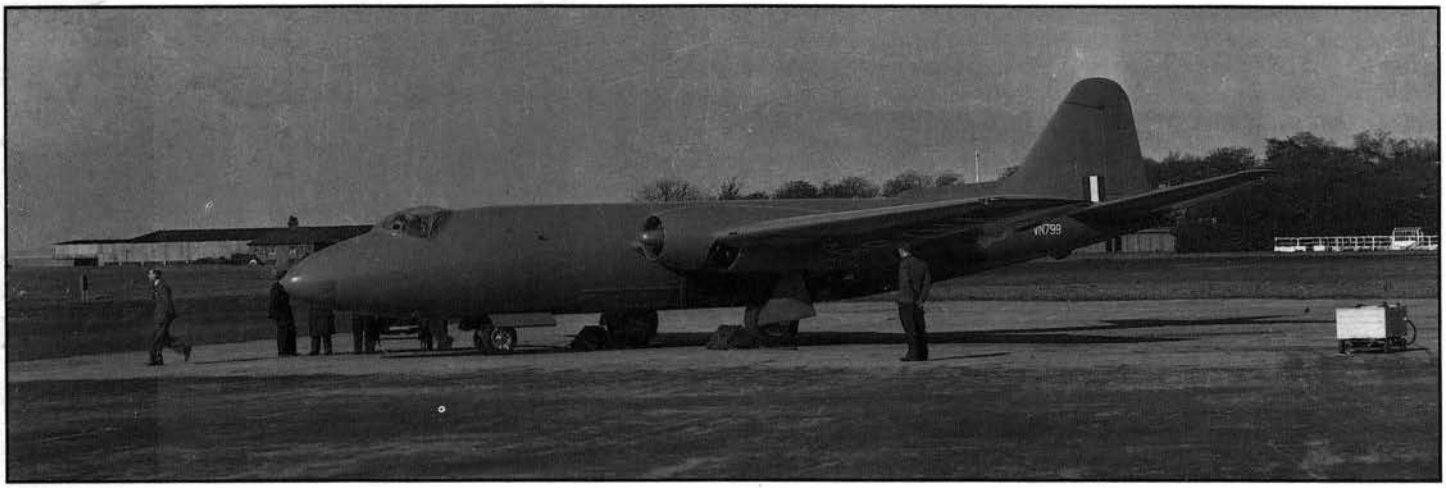
Since the newly organized design team was a new addition to the English Electric Company, their initial home was temporarily in a wartime acquired garage in Preston and it was there, in the lower level of the building, that the shape of the Canberra was put together in the form of a wooden mock-up. The design met the Ministry of Supply B3/45 specification and on 7 January 1946, a contract for four prototype English Electric A1 aircraft (as the unnamed Canberras were then called) were ordered for production and test evaluation.

A whole new field of performance factors complicated the initial design strength for this and all other jet planes. As aircraft speeds approached the compressibility stage near the speed of sound, a new set of structural strength rules had to be developed relative to the speed of sound. The measurement of speed in the conventional manner of miles-per-hour, had no relationship to speed of sound, which varies with height and temperature. This new method of speed

This may well be the first roll-out picture of the Canberra in preparation for initial engine run-up. The open side hatch is for cockpit access for the three crew members. Initial concept of the Canberra was that of a high altitude radar bomber. This accounts for the radar-dome nose later changed to clear. (BAC)

values came in the form of Mach numbers, where Mach I equalled the speed of sound, and measurement of speed is made from this point. The Canberra was not intended to be a transonic or supersonic aircraft when carrying a useful military load since it was unlikely that greater thrust would be obtainable from two Avons during the operational life of the aircraft. Instead it was to operate at high altitude in the Mach 0.7 range, therefore its design could remain uncomplicated because it introduced few engineering problems associated with speeds closer to Mach 1, which were then

Britain's first Canberra B1 nears final assembly at the former American aerodrome near Warton. It was from here that the first flight took place on May 13, 1949. The uncowled engines were a marvel for their smaller diameter than reciprocating engines of comparable power. (BAC)



The grand-daddy of them all, VN799, the B1, Britain's first jet bomber, designed and built by the English Electric Co Ltd., now British Aerospace Corporation. In its earliest form, this prototype had a stabilizing dorsal fin, and rounded rudder tip, later to be deleted. (BAC)

difficult to overcome. This simplicity was the secret of its success. It was built to meet certain performance factors in the most practical structural form, thus eliminating complications in unproven design theories for high speed.

The wings of the Canberra were not swept back as no advantage would be gained at the maximum speed for which the aircraft was designed to fly. According to 'Teddy' Petter, the technical solution was found to lie primarily in the right choice of wing. A light wing loading, a comparatively low aspect ratio, a smooth structure and a modest thickness/chord ratio were all deemed to be prerequisites. In addition, great strength could be built into the wing because of its thickness, without being a deterrent to its speed. The depth of 27in was a mere 12% in relation to its fore-and-aft measurement of 19ft which was large for an airplane of this size, and the upper and lower surface curved equally about the fore-and-aft center line of the wing. This symmetrical airfoil section was employed as a means of avoiding violent pitch-changes when the critical Mach number was exceeded, yet without sacrifice of good control characteristics.

A high altitude performance was the objective for the design of this airplane rather than speed. When measured against the Meteor, which had a practical intercept altitude of 40,000ft, the design of the Canberra with its low wing loading, was to have the same turning ability at 50,000ft, giving the bomber a drastically superior

The Avon RA2 powered prototype Canberra in the air. Tip of rudder has already been trimmed which proved necessary after the first flight. Dorsal fin was eliminated on production models. Bareheaded Beamont can be seen in the cockpit of the blue painted craft. (BAC)

performance over fighters of that period. In anticipation of this mark of performance, defensive armament was not considered in the design.

As the construction of the first Canberra began in near wartime security at Preston, English Electric acquired the former American aerodrome at nearby Warton, where final assembly and first flights would take place. By early May 1949, taxi tests began with Roland Beamont at the controls. Beamont had been with the company for two years after leaving the RAF as a wing commander, and had followed the development of this jet bomber from its beginning.

Once completed, the Canberra was proven ready for flight with three 10ft high hops during taxi trials that took place on the day before the scheduled first flight. These hops were at Beamont's insistence, for this would confirm the effectiveness of flight controls before being fully committed to the air. The fact that each of these hops was for a distance of about 1,200ft after a take-off run, and then landing, all well within the runway length and without over stressing with wheel brakes, was the first practical proof of the exceptional qualities of the airplane.

When the day for the first flight arrived, Petter was overheard to ask Beamont if he 'really wanted to fly today?' It was Friday, 13 May 1949. Beamont responded, however, that 'it was as good as any other day,' and proceeded to take the Canberra off the runway at Warton for its maiden flight which lasted 27 minutes.

All that was hoped to be accomplished on that initial flight of England's first jet-bomber was realized. The only uneasiness experienced during the flight was a sharp directional jerk each time rudder pressure was applied. Once assured that rudder trim was centered, no further rudder movements were made that might aggravate the situation. Following the flight, Beamont made the following entries in the flight report which serve to illustrate his enthusiasm for the airplane:

> 'Apart from the rudder condition described, the aircraft handled smoothly and easily. All services operated satisfactorily although in the case of tailplane actuation some alterations (as to rate) may be necessary . . .
>
> 'Both engines and airframe were remarkably quiet in flight and the noise level in the cockpit allows excellent radio reception . . .
>
> 'Rudder and aileron trimmers were set at neutral for take-off and were not required again in the flight . . .'

Following the flight, and based on Beamont's recommendations, the rounded top of the rudder which included the balance horn, was trimmed down, and no further suggestion of directional problems were encountered. This accounts for the squared off appearance of the rudder that carried into production models.

On flights that followed, Beamont discovered that the aircraft performed more like a fighter than a bomber. Aerobatics had not been written into the design requirements but, flown within the design limits of speed and 'G' forces, there was nothing to limit the airplane from rolls and loops. Exploring its potential away from inquisitive eyes, Beamont prepared a flight routine for the coming Society of British Aircraft Constructors' Exhibition and Display at Farnborough that September, which would punctuate the Canberra's first public showing. As expected, the airplane stole the show. The

This is the American Martin-built B-57 which was developed from the British Canberra. There is no noticeable exterior differences. The interior layout of the British Canberra was three place with two crewmen seated side by side behind the pilot. The American B-57 had only two crew positions, the second being seated low and behind the pilot. (Martin)

American publication *Aviation Week* tells of this often talked-of event:

> 'Canberra Shows Off – biggest military surprise of the show was the English Electric Co Ltd sky-blue Canberra jet bomber. US observers were not impressed with the Canberra's straight wing and somewhat conventional configuration on the ground. But in the air the combination of test pilot R. P. Beamont and the 15,000lb thrust from the two axial Avons made the Canberra behave in spectacular fashion.
>
> 'Its speed range from 500 to less than 100 mph was ably demonstrated by Beamont who followed his high-speed passes on the deck with an approach using full flaps and gear down and bomb bay doors open that slowed the Canberra to less than 100mph. At this speed he rocked the big bomber violently with ailerons to show the full control available as it approached stalling speed.
>
> 'Beamont whipped the bomber (designed to carry a 10,000lb bomb load) around on the deck like a fighter, flying it through a series of slow rolls, high speed turns and remarkable rates of climb. The Canberra was originally designed for radar bombing at around 50,000ft, but Beamont's demonstration convinced many Britishers the new bomber may prove to be another Mosquito in its versatility at everything from low-level attack through high fighting to high altitude bombing.'*

The Canberra met with immediate acceptance. Production orders for the RAF's new bomber were filled not only by English Electric, but Handley Page Ltd., A. V. Roe, and Short Brothers & Harland as well, to a total of 546 machines. Capitalising on its speed and performance, it was quick to set innumerable records throughout the world. Its model variants are countless, as well as its service in air forces of other countries. As a combat plane for what it was designed to be, it has proven its worth in more than one conflict. The list of British Canberra's accomplishments will be endless since a number of British-built Canberras remain in service at this writing. But that is another book – and another story.

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* *Aviation Week & Space Technology*

2

AMERICANS BECOME INTERESTED

American spectators at early demonstrations of the Canberra were equally as impressed as all others, but the US military observers could not envisage what they might do with the airplane if it were theirs! As one reporter put it, 'it is neither "fish nor fowl" in that it is slightly too large to be a fighter, slightly too small to even be a "light" bomber.' To Americans, it fell in a class like that of the Mosquito, in which there was no comparable US type. But in 1949, this was not a problem for the Americans. It was totally a British airplane.

By 1950, however, the United States Air Force was in the market for an airplane to replace the aging Douglas B-26 Invader. With its sudden involvement in the Korean conflict, the Air Force was caught short with bomber types left over from World War II. United Nation's air superiority allowed curtailment of enemy supply lines during daylight hours, but it was at night that the North Koreans had little resistance to movement. The only bomber suited to the night interdiction role was the B-26, and night attack with these nimble aircraft was purely visual.

As a B-26 night intruder pilot in Korea, in the early stages of my Air Force career, I felt that the most important aspect to a newer airplane was for it to carry more bombs and be able to remain longer over the supply routes in the target area. We had heard of a jet bomber being contemplated as a replacement for the B-26, but we could see little use for a faster airplane. There was also promise of sensing equipment that was under development to be used for non-visual night interdiction operations, but to use this sophisticated equipment properly, there was obvious need that a more advanced aircraft should be acquired first. An even more urgent reason was to have a replacement for the dwindling inventory of B-26s which, at wartime attrition rates, was forecast to be depleted sometime in 1954.

Eventually, the concept of Air Force needs in terms of the next light bomber was focussed on night interdiction duties. This was in the summer of 1950, and a committee of Air Force officers was appointed to evaluate all available British, Canadian and United States aircraft that might be quickly adapted to the night interdiction role. To assure dispatch, the selection was to be made exclusively from existing designs, since creating a new type would add years to development time. With this as a prime prerequisite, few could foresee that problems lay ahead which might well take longer to solve than those associated with a new design. Aircraft of existing types to be considered were the Martin XB-51, of which two were flying, the North American B-45 Tornado, already in the Tactical Air Command inventory in substantial numbers, the North American AJ-1 Savage, a composite jet and reciprocating-engine bomber, designed to operate from large Navy carriers and already in fleet service. Foreign designs included the A. V. Roe Canada Ltd, CF-100 Canuck, a twin-jet all-weather interceptor, and the

In the early 1950s, the United States Air Force was badly in need of an aircraft to replace the Douglas B-26 Invader. This was the A-26 light bomber of World War II called upon for Korean War duty in which its numbers were being exhausted.

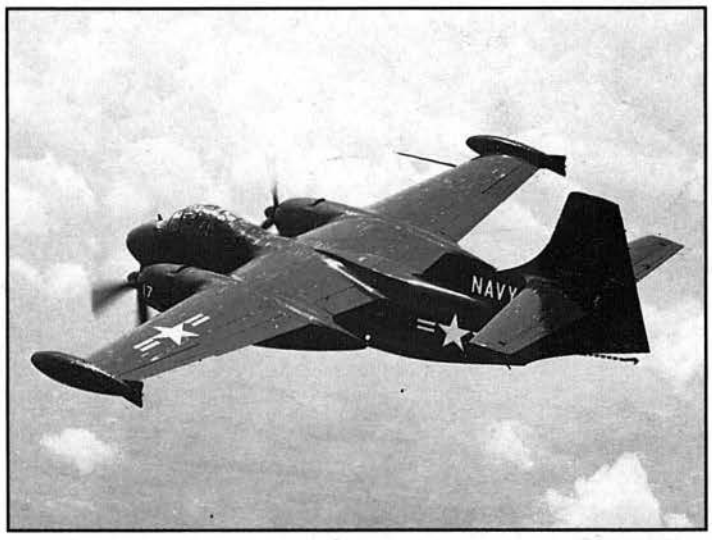
The Martin XB-51 was designed to meet certain military requirements, only to have them changed when the need for a night intruder materialized during the Korean War. This tri-jet came close to winning. (Martin)

The CF-100 built by A. V. Roe Canada Ltd was a very new fighter nearing production status. It was soon learned that it did not have the potential for being a jet bomber, yet those who flew it gained much in evaluating the all-weather and night flying qualities that could be built into such an aircraft.

English Electric Company's Canberra. This light bomber with its fighter-like maneuverability and speed, had possibilities!

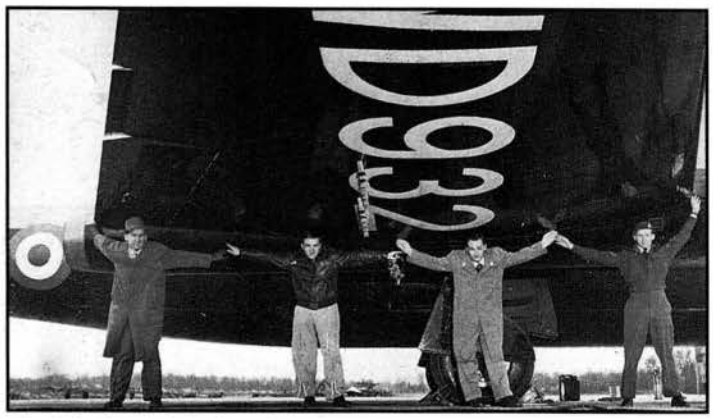
After several gruelling months of evaluation by the board of Air Force officers, the final selection was to be made with flight demonstrations and comparisons at Andrews AFB outside Washington, D.C. in November 1950. The delayed arrival of the Canberra caused this date to be changed to 26 February 1951. This Atlantic crossing by the Canberra added even greater publicity to what was in store for the fly-off at Andrews AFB. Departing Aldergrove, Northern Ireland on 21 February, the crew of three RAF officers headed for Gander, Newfoundland. Since this was an RAF bomber, it was thought to be more appropriate that an RAF crew make the flight rather than the demonstration pilot already slated for the fly-off. The 1,785 nm flight was made in 4hrs 40min giving an average ground speed of 383kt. This was an unofficial record time for an Atlantic crossing in either direction, and was also the first direct, unrefuelled Atlantic crossing by a jet aircraft. A few days later on 24 February, the aircraft flew from Gander to Andrews AFB, the

North American B-45 Tornado had promise in the night intruder role, but its structure was based upon World War II design. Two engine nacelles housed its four jet engines. With four engines it had good partial engine performance. Pilots rated it easy to fly.



Another North American product in the evaluation was the AJ-1 Savage. This was already in fleet service but showed little growth potential for the Air Force requirement. Augmenting two R-2800 radial engines was one J33 turbojet buried in the aft fuselage area. (North American)

For several weeks, bad weather across the North Atlantic delayed the arrival of the new Canberra in the United States. Anxious spectators crowded around the sleek bomber as it came to Andrews AFB, near Washington, DC on 26 February 1951 where it was to be demonstrated. Its reputation for performance had preceded it and to many, it was a foregone conclusion that it would be selected by the USAF.



The 19ft chord of this broad Canberra wing is dramatically demonstrated in this view taken soon after airplane's arrival in the United States. The low stance to the ground simplified the plane's maintenance appreciably. (Martin)

point of the intended demonstration. While there was little doubt that the Canberra would out-perform its contemporaries, its flying demonstration was deemed necessary to silence those opposed to accepting a foreign aircraft into the inventory. Furthermore, a strong faction felt the Martin XB-51 was the best selection to make, but no firm decision could be made without a rigorous fly-off.

The flight routine for each aircraft at Andrews was to be a tight turn in each direction over the spectators, a slow speed and high speed pass and finally a short field landing. Elementary as it may sound, all of this was to be accomplished in a maximum of 10 minutes, a difficult task if the aircraft was not highly maneuverable.

Flying the British entry was former RAF Wing Commander Roland Beamont, test pilot for English Electric, and the Canberra test program. He was a master now in the Canberra, having flown the attention-getting show at Farnborough in an earlier version. His first reaction to the flight schedule was extreme disappointment, for it imposed an unreasonable limitation for demonstrating the full capability of the Canberra. Quick to see a solution to the problem, Beamont realized that nothing was said about use of any time left over from the allotted 10 minutes. The Canberra was easily capable of performing the routine in nearly half the prescribed time, while competing aircraft with heavier wing loadings such as the chief contender, the XB-51, *could not complete* the sequence in time.

To start the fly-off, the North American B-45 roared off the runway and into the distance, leaving twin thick smoke trails as it climbed almost imperceptibly into the clear morning sky. Eventually it reappeared, thundered past the spectators and homed in on the opposite horizon. Soon it returned and performed what some

While the British Canberra was being considered for American acceptance, Martin's Chief of Flight Testing, O. E. 'Pat' Tibbs (right) is shown familiarizing himself with gadgetry on the English bomber with Wg Cdr Roland P. Beamont (left) English Electric chief test pilot. An RAF crew ferried the Canberra to the US but Beamont did the demonstration flying. (Martin)

An innovation used on both the British Canberra and the American B-57 were these speed-brake fingers. These protrude on both the top and bottom of the wing to help reduce speed. On the American B-57B and later models, these were supplemented with fuselage-side speed-boards.

Four landing flaps provided considerable surface area. These were two-position hydraulically operated and air-load balanced.

To those who saw the Canberra perform, there was no doubt that this new bomber was superior to all other aircraft in its class. The Americans needed a new jet tactical bomber, one selected from existing designs. The best plane was one being built by a foreign power, fortunately an ally. There was no common ground for comparison, for the Canberra was a replacement for England's legendary Mosquito, another aircraft without an American counterpart. (Martin)

interpreted as the programmed 360deg turn. But its time was already up and observers showed signs of impatience while waiting for the Tornado to land so the demonstration could continue.

The AJ-1 Savage and Avro CF-100 were far more agile and accomplished the routine in respectable fashion. Next, the Canberra's prime contender, Martin's XB-51 circled overhead and was seemingly unnoticed by the crowd. It did not land at Andrews, but proceeded back to its starting point at the Martin plant at nearby Baltimore. Now the real showstopper headliner was on stage and onlookers knew it. The star performer was the English Electric Canberra. Its low clearance to the ground and broad, yet stubby wing, were not pleasing lines compared to the more accepted swept wing designs, but in the air, its performance overshadowed any cosmetic shortcomings. After a short take-off roll, the bomber rotated at 80kts, and quickly assumed a 45deg climb at 150kts. After sufficient altitude was gained, it wheeled around, and still at full power, flashed past the crowd at nearly 500kts. With what sounded like a dual flame-out, power was chopped to decelerate and the plane was brought around into the first 360deg turn at a tight four Gs within the bounds of the airfield. Then a reverse in direction was made for the second turn, having advanced full power again, holding 2.5 Gs at 200kts. After completing this second turn in about half the width of the airfield, wings were levelled and the Canberra shot up to an altitude where the gear and flaps were extended and it spiralled down to the scheduled slow fly-by at 110kts. This ended the program with three and a half minutes remaining before the landing had to be made. Taking advantage of this time, Beamont snapped up the gear and flaps, applied full power and zoomed back to a thousand feet over the heads of the reviewing officers. Gear and flaps were dropped again and a tight 360deg landing pattern was executed which put the bomber on the runway with one-minute to spare.

The Rolls-Royce Avons on this early model of the Canberra were started by a powder-charge cartridge positioned in the nose of the engine. Later Canberra models carried three cartridges, while the Americans when using the Sapphire retained the single shot starter charge but of a larger size.

This spectacular showing ended with some embarrassment, but the situation seemed ignored by many in attendance. At the point of touch-down, white sand that had recently been put down on ice went unnoticed by the pilot. With heavy braking pressure for a short run landing, the left wheel momentarily locked and blew the tire. There was no damage, and some spectators regarded this as a further demonstration of the forgiving nature of the airplane.

This demonstration of aircraft at Andrews only helped to confirm a decision that had been all but finalized a few weeks earlier. The Canberra had been chosen as the most suited for the night interdiction role. The just completed aerial demonstration had been staged ostensibly to support this decision – a decision obscured by politics and one which was not overwhelmingly supported by those involved in the final selection.

3

THE EVALUATION

The committee of officers selected to evaluate the airplane candidates spent six months on the project. Their objective was defined: first, match an existing airplane that can best destroy tactical targets at night and under bad weather conditions, one with the capability to destroy stationary and mobile targets with conventional and atomic weapons of sufficient size, and lastly; be capable of photographic and electronic reconnaissance. A more defined yardstick was developed with performance figures for use in measuring an aircraft's potential for the night intruder and tactical bomber/reconnaissance role.

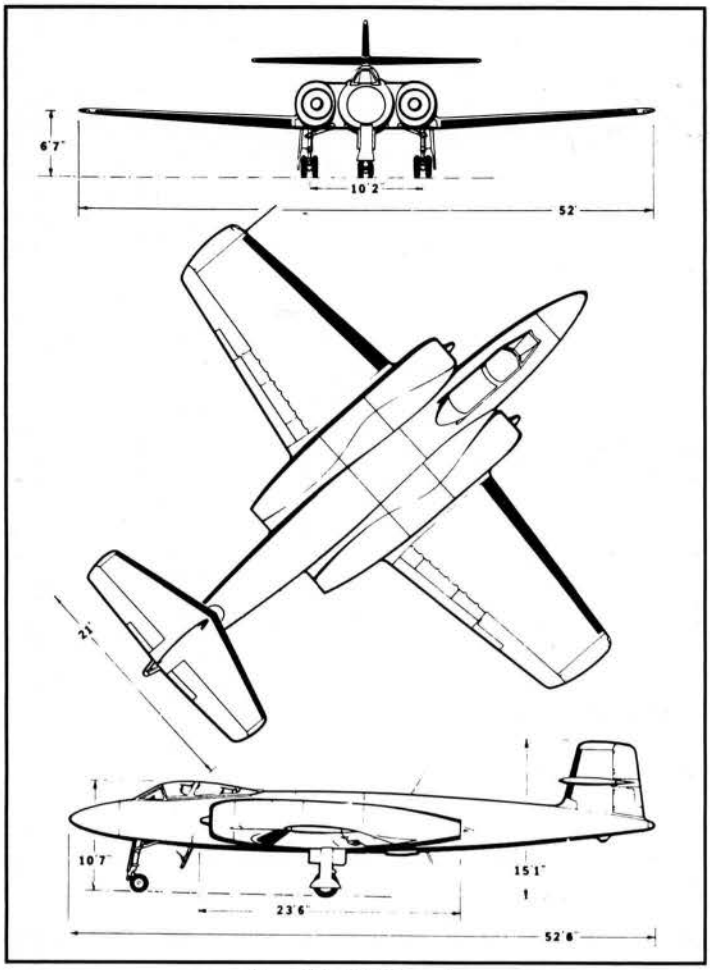
Yardstick for night intruder (1950 concept)

Take-off ground roll:	3,000-5,000ft
Rate of climb:	5,000-8,000ft/min
Cruise, loaded:	350-450kts
Service ceiling:	30,000-40,000ft
Max speed:	450-550kts
Target area time:	6min bomb, 6min evasion
Bomb load:	6-10 500lb GPs
Guns:	6-10 .50cal or equivalent
Rocket capability:	May be carried
Radius of action:	800nm

Unfortunately, each aircraft evaluated had been designed for a different mission objective. Consequently, for this test, each had to be evaluated in relation to the mission for which it had been designed. Its adaptability to the light bomber role was then to be considered. The evaluation committee was more than casually interested in Canada's new Avro CF-100 Canuck, the prototype of which had just flown a few months earlier in January 1950. This was a two-seat all-weather and night twin-jet fighter, and had many of the qualities desired for the new tactical bomber. Because of its small size, however, they concluded that the Canuck could not carry a sufficient bomb load without a major redesign of its structure. Further, the maximum range that could be designed into the airplane was far short of that required for the bomber.

Just a year before the introduction of the CF-100, North American came forward in May 1949 with the AJ-1 Savage as a Navy carrier-based strategic attack plane. At the time it showed great growth possibilities, promise which failed to be fully realized. The plane had two R-2800 radial engines and a J33 turbojet located under the tail. The Savage had many of the qualities as a light bomber that the evaluation team was looking for. It could operate well from short unprepared fields and had satisfactory range and loiter capabilities for the intended mission profile. Its bomb load capability

The CF-100 was most unusual in design with its thick center section joining the two 6,000lb thrust Avro Orenda turbojet engines. With addition of tail warning devices to detect attacks at night or in weather, the evaluation committee graded the CF-100 able to survive combat encounters well beyond its anticipated operational life span. One measuring yardstick was ability to defend against attack by F-86 type fighters as seen in the background. (Avro)



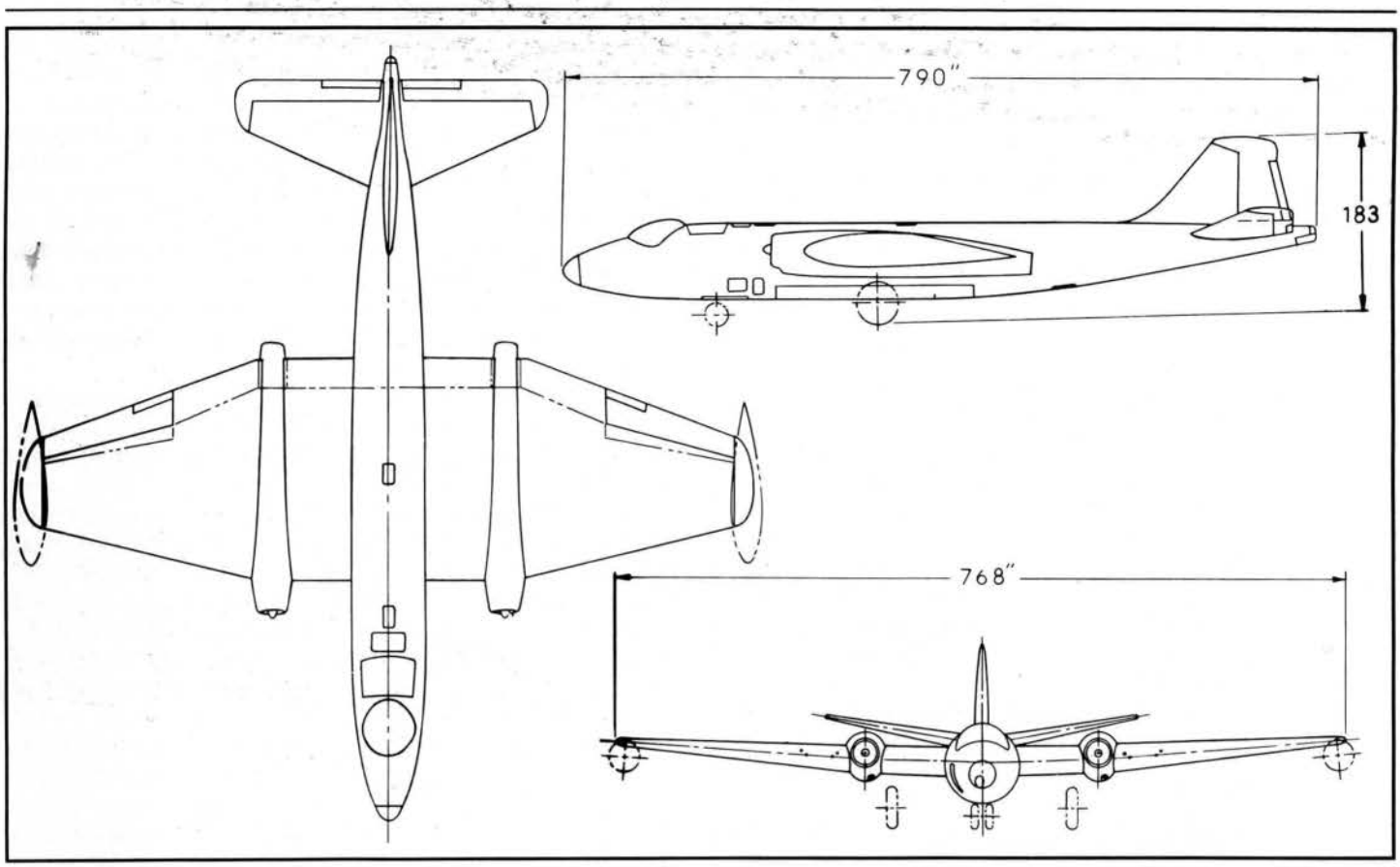
Avro CF-100 Canuck.

was greater than required, yet the Savage retained its maneuverability to perform night attack missions. It proved to be a very stable bombing platform, a feature the committee was highly conscious of. The cockpit gave good all-round visibility to the side-by-side crew, except in rain, when droplets would just hang on the windshield. Interior layout was excellent for night operation and all-weather flying which matched well with the plane's stability. Unfortunately, the AJ-1 was one of those transitional aircraft that did not have the speed and performance being demonstrated by the new family of jet aircraft presently under development. This, coupled with the complicated hydraulic system, made the evaluation committee feel that the craft would be too vulnerable to aircraft and ground fire. Another objection was that this navy bomber did not carry forward firing or defensive armament. North American engineers gave assurance that this could be remedied, but the team members felt that such a major redesign would add penalties to the plane's performance, already marginal.

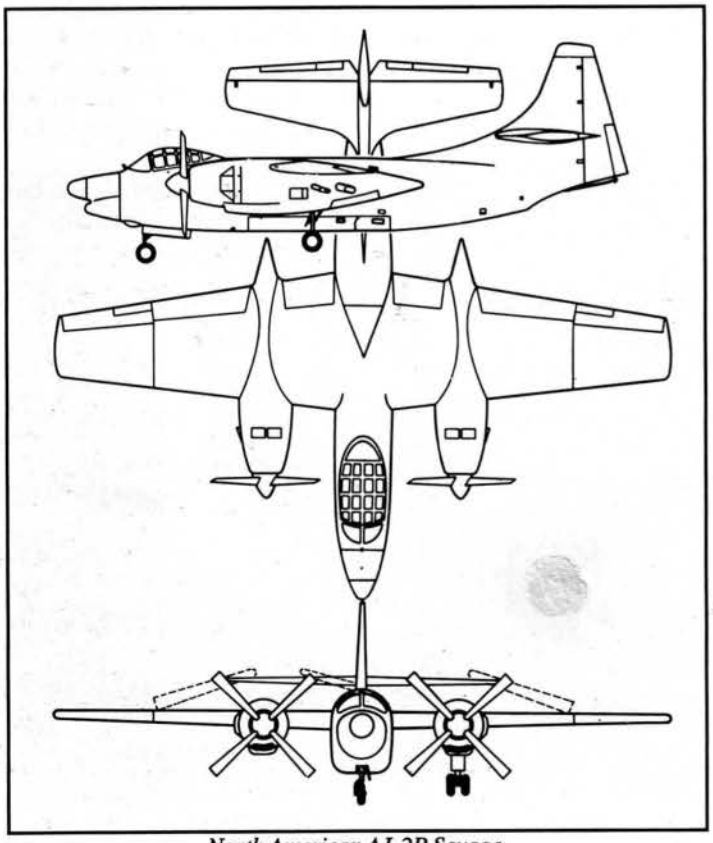
Consideration of the English Electric Canberra as a candidate for the night intruder mission was based on an earlier examination of the airplane in England by Air Force officials. In August and September 1950, this group led by Brig Gen Albert Boyd, of the Air Materiel Command, had gone to England and been enthusiastic over the new bomber. Few disputed that England was more advanced in jet technology than any other nation. Furthermore, unlike others, the British were proud to share their finding with closely allied nations. This superiority was based upon England's production of jet engines with greater thrust and durability than those of U.S. jets. After enumerating the good and bad features of the Canberra, Gen Boyd and his committee concluded that by USAF standards, the British aircraft seemed best suited for the following three roles, in order of preference: all-weather fighter, tactical reconnaissance vehicle, and medium-high (25,000-40,000ft altitude) short range bomber. It is hard to envision this bomber as an all-weather fighter, but when examining the qualities needed for this type of mission, the Canberra possessed many of the key prerequisites. Among these were high altitude, stable platform with speed and range making it superior to any current or contemplated USAF all-weather fighter for combatting B-50 and B-36 type targets. Ironically, the recommendations pointed out that it was doubtful that the Canberra could be employed above 35,000ft because of acceleration limitations, a supposition which was to prove erroneous.

In the short range tactical reconnaissance role, the Canberra was able to operate at altitudes beyond the reach of a great majority

North American offered an alternative to the AJ-1 Savage, the A2J-1 featuring turbo-props and other refinements. Its development could incorporate the Air Force requirements, but the prospect was shelved in lieu of more advanced designs. (North American)



English Electric B2 Canberra.



North American AJ-2P Savage.

of then operational interceptors. Finally, the success of the Canberra as a medium to high altitude, short range bomber seemed to hinge primarily on the capability of the navigation-bombing system to be incorporated into the airplane. The lower the altitude of the penetration and bombing run, the Canberra would be more vulnerable to MiG-15 type interceptors. In addition, speed would also have to be reduced on the bomb run to minimize bomb bay turbulence, further penalizing the Canberra.

On a purely economic point, the reviewing group felt that a Canberra selection would have considerable merit by virtue of its incorporation into the MDAP (Mutual Defense Assistance Pact) program. In that case however, it should be integrated into the USAF only after the successful conclusion of a 'rigorous evaluation' of at least one aircraft and accelerated service testing of 10 service test models. At this point in the selection process, if the Canberra was, indeed, a potential American bomber, it would be purchased directly from British production lines for the U.S. portion of MDAP participation. Given this set of ground rules, the Canberra must have really impressed the visiting selection board, especially when one considers how hungry U.S. manufacturers were in the five years immediately following World War II.

One very pertinent observation from the committee noted that: 'It is mandatory that the USAF accept the general airframe, performance, and load carry capability as is in order to retain the advantages accrued as a result of the design philosophy used in the Canberra aircraft.' In theory this is a desired concept, but in any new airplane, changes are inevitable and this group noted that if finally procured in production quantity, the airplane should have

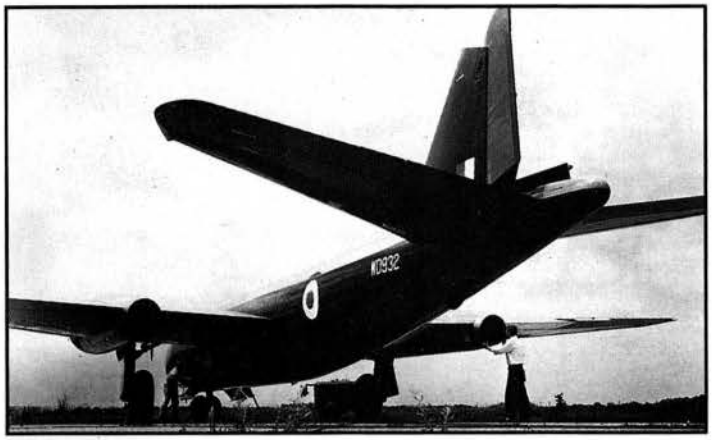
Early English Electric Canberras like this B Mk 2 were powered by Rolls-Royce Avon 101 engines of 6,500lb thrust as compared to the J65 Sapphire with 7,200lb of thrust built under license from Armstrong Siddeley which powered the Martin B-57. The Canberra design was void of defensive armament, relying on its speed and maneuverability to escape interception. Martin's B-57 was developed from this variant.

no less than 25 specified changes incorporated into it to make it suitable for USAF needs.

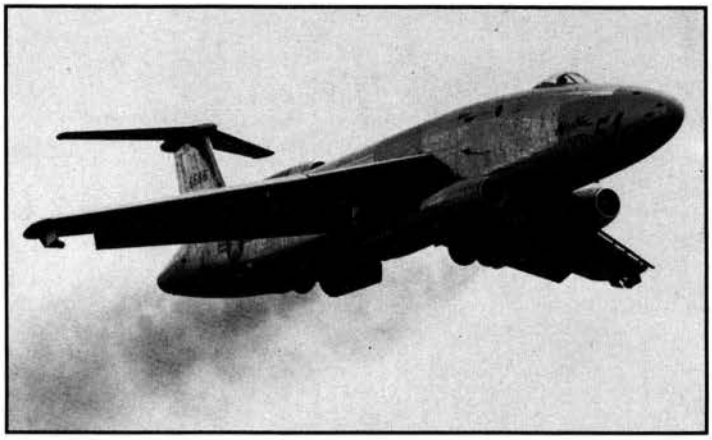
Now the qualities of the Canberra were to be evaluated for its merits in the night intruder light-bomber role based on the Boyd report being reviewed by the committee. Taking into consideration the many good features the report noted, committee members felt, however, that the Canberra's greatest deficiency would be in target tracking – either air-to-ground or air-to-air, because of its light wing loading causing an unstable platform in turbulent air. Minute corrections would also be hard to make while following the bombardier's command. This may be valid in theory, but in actuality it did not hold true for this airplane. From my own flying experience in the B-57, it was a very 'rough rider' in turbulent air due to its non-flexing wing. More than once my lap belt could not be tightened enough to keep my head off the canopy, but turbulence did not set up an oscillation effect and it remained stable for easy target alignment. Bomb run corrections at altitude were often 'stiff', but practice and flight instrument interpretation compensated for this. Obviously, the committee did not have this actual experience with the Canberra from which to correct these assumptions obtained from the earlier report.

The Canberra's crew facilities were rated marginal. The pilot had sufficient cockpit working room but overhead clearance was shallow. The navigator, located behind and below the pilot, scarcely

Since the Canberra was one of the very early jets of this relatively large size, its low stance with the ground seemed most unusual since propeller clearance was no longer a problem. This gave great ease to ground maintenance of the engines and other accessories. Cockpit entrance was one long step up to floor level through the nose hatch under the canopy. (BAC)



With the acceptance of the Canberra design for American usage, one of the first recommended changes was to add a drag chute to the tail cone. It became evident that this would be unnecessary for an aircraft able to stop after a 1,300ft roll at near empty weight, half that of the chief contender, the XB-51. Another unfulfilled prediction from armchair engineers was that the fin and rudder would be enlarged if accepted for American production. (Martin)



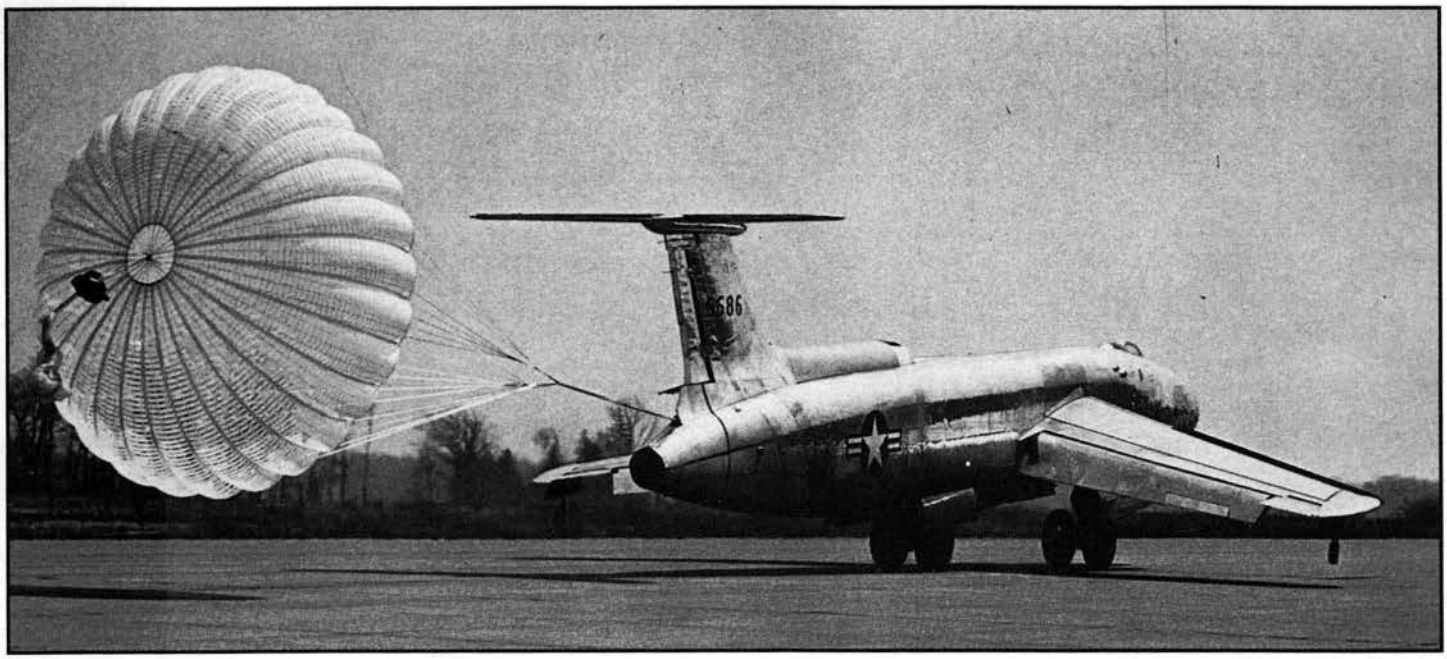
Martin's entry, the XB-51 is shown just after take-off, with gear and flaps coming up. XB-51 was unusual in that its wing could pivot on the fuselage to increase its angle of incidence when the wing flaps were extended. This was necessary because of the bicycle type landing gear that prevented the aircraft itself from making a pitch change angle for take-off. (Martin)

had room in which to work. His having to move forward to operate the bombsight, met with disfavor, and it was also questionable if the Norden bombsight, still standard in the Air Force, had sufficient space to be installed and operated.

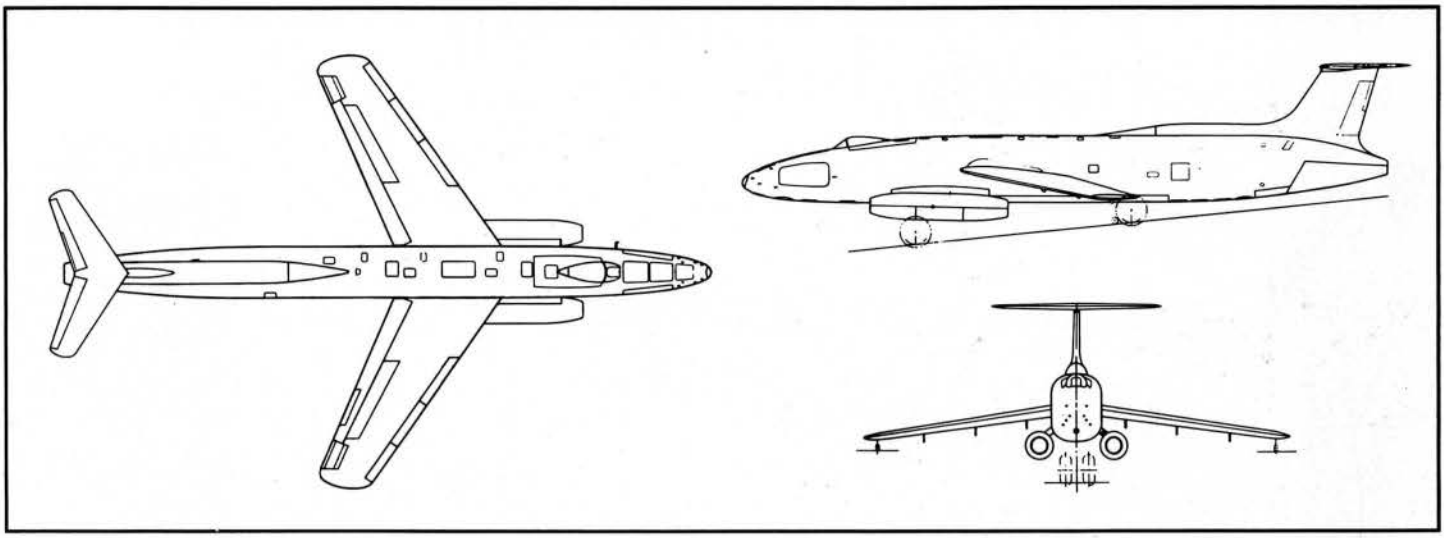
Should the Canberra be selected for the USAF and purchased directly from British production lines, changes would have to remain minimal by both necessity and Air Force directives. However, the essential change recommendations included: (1) adding forward armament, (2) Shoran bombing system, APW-11 bombing-aid radar guidance system, and a suitable gun/rocket/bombsight, (3) standard Air Force instruments and lighting, (4) Air Force oxygen system, (5) engine and airframe anti-icing, (6) correct stick force gradient from a push force to a pull force in the landing configuration at speeds below 120kts, (more on this later) and (7) suitable cockpit ventilation for low level summer operations.

Despite the Canberra's obvious strong points, the apparent favorite throughout the evaluation with others in the Air Force was Martin's XB-51 of which the first of two was flown in October 1949. The original mission of this aircraft was low level attack on surface military targets in support of ground forces. Although this experimental bomber was 'caught in the middle' when the primary mission for the Air Force's new light bomber was changed, the XB-51 seemed a natural for the new role, even if it became difficult to match it to the requirements set down for the night intruder aircraft.

The XB-51 was a burly machine. It had two J47 jet engines of 5,200lb thrust, mounted on the lower forward side of the fuselage



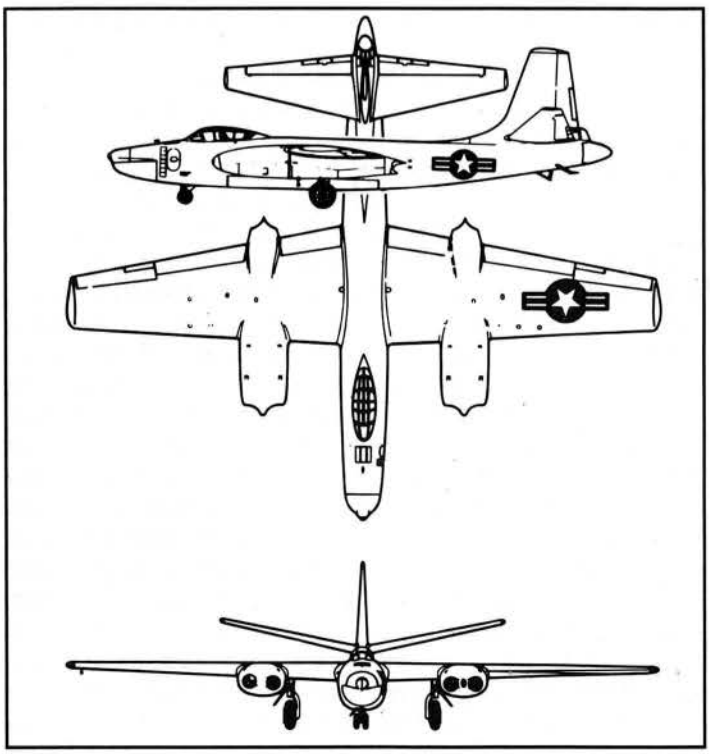
The tri-jet XB-51 incorporated a drag chute for emergency short field landings, a feature so well liked, that it was recommended to be included in the American built Canberra. The proposal proved unnecessary. Note the slight aileron and massive landing flaps on the XB-51. Spoilers were primarily used for lateral control. (Martin)



Martin XB-51.

and a third J47 in the tail. Having a tandem (bicycle) type landing gear, there was not the normal pitch change for take-off and landing. A variable angle incidence to the wing operated when the wing flaps were extended. Another unique feature was the first time use of a rotatable bomb bay door on which the bombs were mounted. When open, its load was the same as external stores, but without speed restrictions, up to its maximum allowable for the airplane of .93 Mach or 540kts IAS, whichever was reached first.

This Martin entry was a highly maneuverable airplane for its size. At low levels it had a very satisfactory turning radius in the speed range of 280-310 IAS, giving it excellent versatility for night bombing operations. However, its low limit load factor of 3.67Gs severely limited its capability during tactical operations and was graded unsatisfactory in this area of evaluation. Furthermore, despite a forecast of improved jet engines under development, there was little hope that the range and endurance of the XB-51 would improve sufficiently to meet the night intruder loiter time requirements. The XB-51 was not set aside quickly, however, for it incorporated many features to its advantage for a tactical bomber. These included single point refuelling, rebombing in nine minutes, rearming in 15, and low footprint weight, allowing it to operate from hastily-prepared airfields. In combat configuration it could operate if need be from 6,000ft runways at sea level, provided there were clear approaches. Its all weather characteristics appeared to be satisfactory. Despite being a dense airplane (crowded with actuating systems and other components) it was rated as being easy to maintain. In addition to its novel rotatable bomb bay door, it had pneumatic assist bomb release to assure positive release at high speeds. The small dimensions of the bomb bay however, severely restricted the load and ordinance varieties that could be carried.



North American B-45 Tornado.

From a defensive standpoint the level flight speed of .89 Mach below 30,000ft for the XB-51 made interception by then present-day fighters in the F-86 class extremely difficult. Its armor protected engines, remotely mounted from the basic structure, fire extinguisher system and fuel tank purging was all highly regarded as reducing vulnerability to aircraft and ground fire.

When the evaluation board came to the North American B-45, they did not make a formal investigation, as time was growing short and several on the team had flying experience in it as a TAC bomber. The Tornado had been around for several years following its first flight in March 1947, and more data was available on it than any of the other entrants. In general, those who flew it felt that the handling characteristics of the B-45 were satisfactory in the high speed range which was limited to .77 Mach, but the three Gs at that speed imposed a limitation on maneuverability. In the speed range of 250-300mph IAS, it was a nimble airplane for its size and considered capable of performing the night low level work satisfactorily. It had a surplus of loiter time available in which to survey the target area for interdiction work at the lower altitudes. While existing models were not equipped for gunnery or rocketry, a number of simulated attacks had been made in the B-45, and it was considered satisfactory for that type of work.

The B-45 had excellent crew accommodation. Its main drawback was the restriction of forward vision for the co-pilot by the front pilot's ejection seat, due to the tandem arrangement. Crew of four was carried, including a gunner in the tail compartment armed with two .50cal machine guns.

The Tornado had a great number of good features that matched the night intruder 'yardstick.' Unfortunately, its design was based upon World War II concepts and it was already the oldest of the types being considered. It was really too big and too heavy to be well suited to this role. However, as a stop gap measure for the Korean War, the committee did make the recommendation that existing B-45s in the TAC inventory be transferred to the night interdiction mission for the calendar year 1951. This was never done, however. Perhaps the reason was that at this time, heavy combat losses were being experienced in Korea with the few reconnaissance versions of the B-45 that were deployed there.

Armed with these evaluations of the five airplanes (some of which are shown in Appendix 1), the committee submitted their findings to a Senior Board of Officers on 15 December 1950. Instead of one, they picked two bombers as having potential in the night intruder role; the Martin XB-51 and the English Electric Canberra. Their proposed plan was to purchase immediately Canberras from England as an interim airplane to equip two of the contemplated four light bombardment groups of the newly restructured 95 Wing Air Force. This would allow time to produce the Martin B-51 to equip the remaining two groups, then to re-equip the first two Canberra groups with B-51s as well.

This recommendation was short lived, for the Senior Board did not agree fully with the way the evaluation yardstick was applied to available aircraft and believed that the AMC committee was prejudiced in favor of the B-51. They fully recognized that the B-51 was nearly 100kts faster than the Canberra, but the British bomber was far superior in flight endurance. The Canberra with its two 6,500lb thrust Rolls-Royce Avon engines allowed it to loiter for approximately two and a half hours over a target 780nm from its base. The B-51 even with future engines could loiter but one hour over a target 350nm from base. Concern was also expressed that the wing tip wheels on the B-51 would prove troublesome at hastily prepared forward bases, while the Canberra was best suited to this environment over all aircraft considered. Of importance also was the fact that the Canberra was the only light jet bomber contemplated for use in the then-current NATO (North Atlantic Treaty Organization) program of which the U.S. was a key member.

The board could not unconditionally recommend procurement of the Canberra above all others until it obtained more information from the British as to their ability to supply, over their own needs, 300 aircraft which would make up the four U.S. bomb groups. Should the Canberra become available at an acceptable rate, the board was very much aware that there would be a number of modifications necessary before it could fill the role of a night intruder bomber. Also recognized were the inherent problems of stocking and maintaining components of English measurement standards for replacement items, and using British type accessories. This would create a logistic problem, for all support would have to be established as a system separate from normal USAF supply channels. This uncertainty of purchase, the many modifications needed, the failure generally of the airplane to meet USAF standards, indicating the probability of operational problems, further confused and prolonged the issue before the selection board. Thus, for a more critical and penetrating evaluation they requested the immediate loan of one completely equipped airplane to be brought to the United States. The RAF agreed and one Canberra was set aside for the flight to the U.S. This airplane was WD932 described in a previous chapter and now handed over to the USAF on 5 March 1951.

While awaiting these final tests, the question of airplane availability, should the Canberra be selected, become a major issue with the board. Lt Gen K. B. Wolfe, Air Force deputy chief for materiel,

and a group of AMC officers visited England to obtain first hand production data. They soon learned that the British were willing to supply the Canberra to the United States, but deliveries could not be accomplished at a suitable rate for the USAF and still meet RAF commitments. A cost was quoted at $1,474,000 for each of the 300 Canberras that were to be contracted for.

An alternative for meeting production needs and the factor that saved the Canberra for the Air Force, was British willingness to grant manufacturing rights of the Canberra to the United States. However, with this prospect of major U.S. production involvement, Gen Wolfe and his group warned that the Canberra did not meet Air Force aircraft standards and that much of the proposed modifications necessary for U.S. production would entail serious problems. Since the Canberra was built to the British system, an entire redesign to U.S. standards would be necessary. It soon became apparent, however, that this was the only solution should the Canberra emerge as the winning choice. Anticipating U.S. production, the board recommended that a contractor be selected to manufacture the Canberra in the U.S.

The Glenn L. Martin Company was approached with the proposal to build the Canberra for the USAF should the XB-51 lose in the selection as a tactical bomber. They willingly agreed, for this assured them a much needed contract in either case, though it was evident they preferred to build an airplane of their own design. It was during this period of indecision that the designation 'B-57' was assigned to the Americanized version of the Canberra bomber. Within the Martin Company, this would be the Martin Model 272.

When the long-awaited decision making day in February 1951 finally came as the first Canberra arrived at Andrews AFB, members of the Senior Officers Board, Headquarters USAF, TAC and ADC were on hand to appraise the new bomber. On 26 February, the ground and aerial comparison between the vying aircraft types took place, and shortly thereafter the final decision was made. 'The Canberra,' the official board report noted, 'comes closest to filling the night intruder profile because of its excellent characteristics of endurance, range, maneuverability, and the visibility provided from the nose section.' Thus, on 23 March 1951, a letter was sent to the Martin Company requesting that 250 'B-57As' be manufactured to fill the night intruder bomber role for the USAF. The U.S. had purchased and was preparing to manufacture its first foreign military designed aircraft in 35 years, dating back to the S.E.5 and De Havilland DH-4 of World War I vintage.

4

CANBERRA - B-57 COMPARISON

My first close look at this new airplane came at Langley AFB, Virginia in October 1954, when O.E. 'Pat' Tibbs, director of flight and Chief Test Pilot for The Glenn L. Martin Co, flight demonstrated the B-57B to our unit. This aerial exercise was far more spectacular than the one given at Andrews AFB in February 1951, the one which clinched acceptance by the USAF of the Canberra design. Tibbs was not confined to a set or timed demonstration as was the case at Andrews, and the broad range of speed and maneuverability of the airplane was unbelievable unless seen. That afternoon, following the morning demonstration, Tibbs held an introductory and background briefing about the development and flight characteristics of the B-57. This evolved around his flight testing of the English Electric Canberra that was initially on loan to the Martin Company for that purpose. Reading from prepared notes, Tibbs' captivating and dry-humored story began to unfold:

> Reaching approximately 30,000ft with the Canberra, I increased the speed until it reached .83 Mach. At this point, because of severe roughness, I decided to discontinue further investigation of speed as I was somewhat dubious about the British method of determining limit buffeting values. It seems to me that probably it was based on the point *just before the airplane completely disintegrated.*'

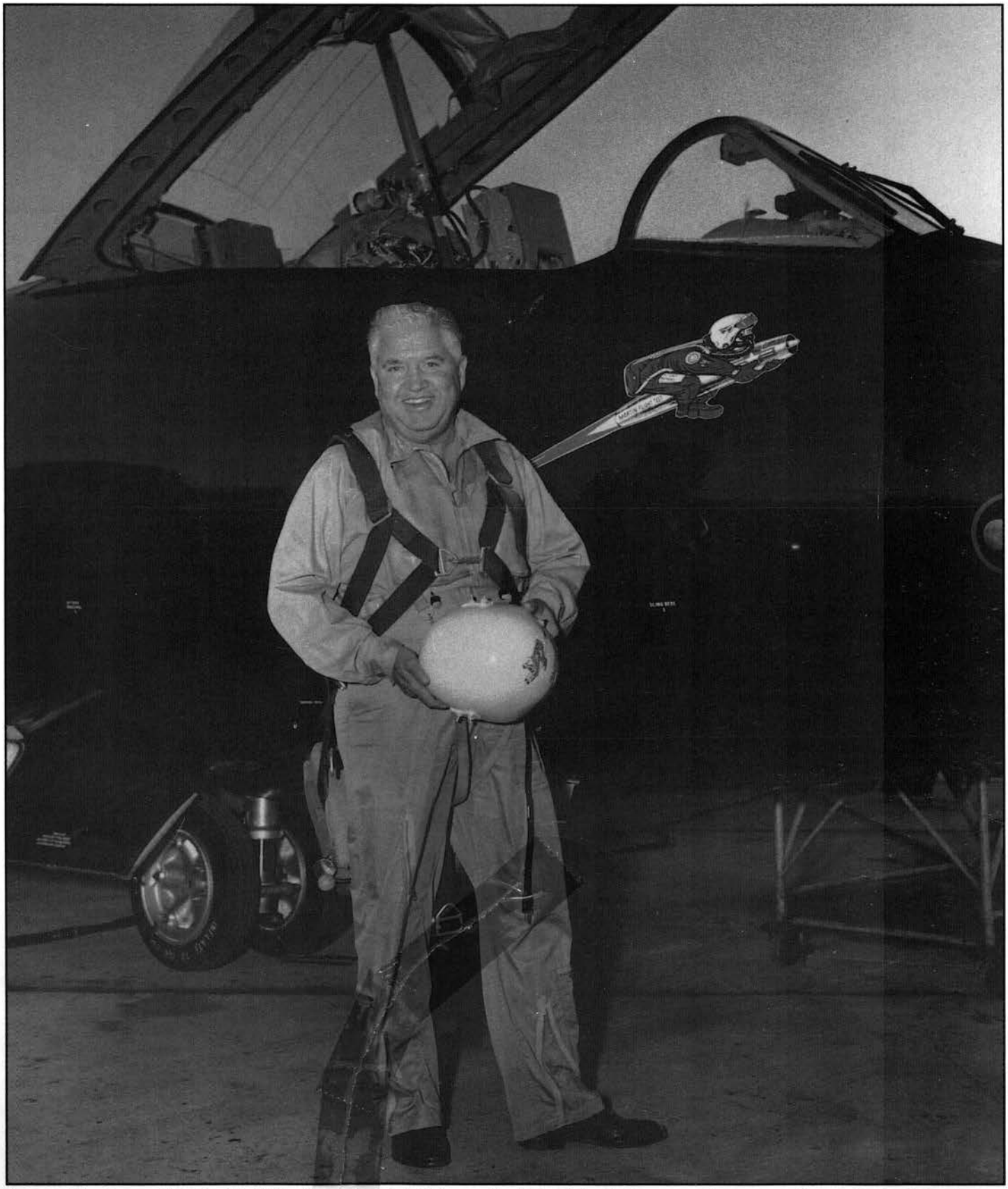
Pat's briefing went on after our uneasy laughter, covering our concern, had subsided:

> 'Now, the B-57 aircraft you see on the line and that you saw flying this morning resembles the Canberra I just described when I evaluated it in 1951. But believe me, gentlemen, there is no resemblance in the performance today of the two aircraft as far as the high speed characteristics are concerned.'

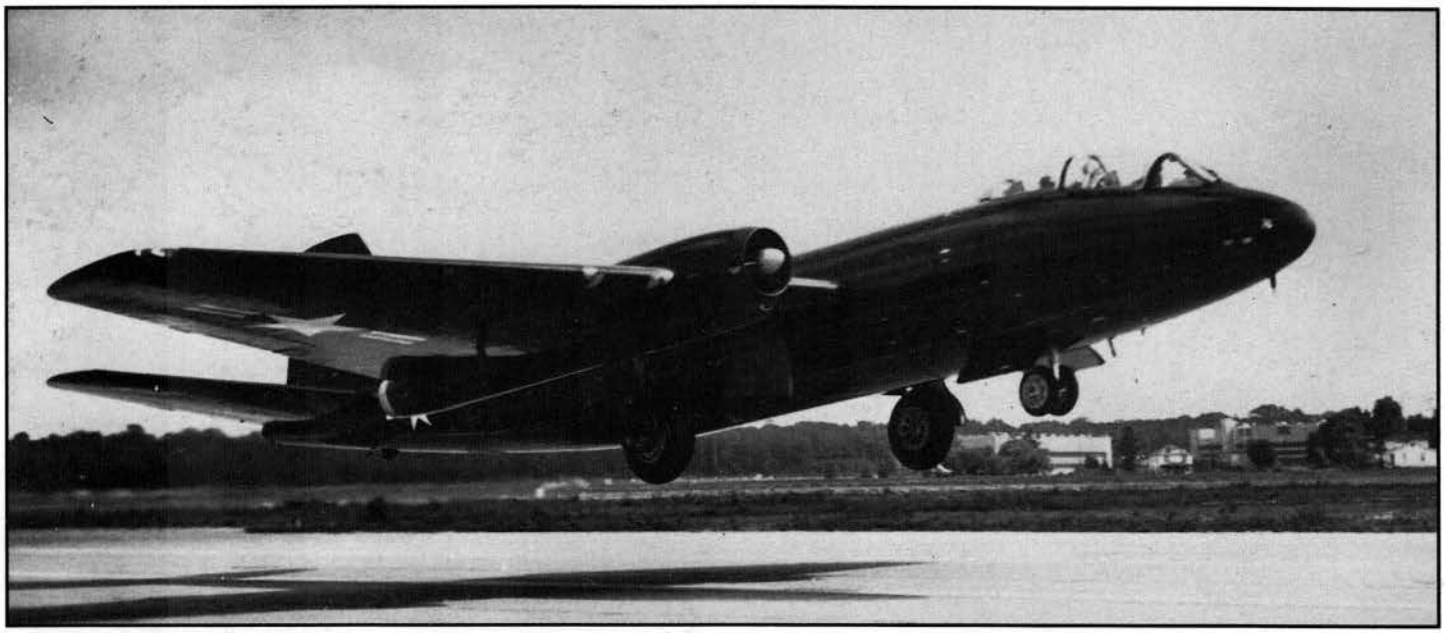
The alleged difference was not by accident. Originally, when the Air Force purchased the design rights of the Canberra, they had felt that little or no time for further aerodynamic 'clean-up' of the Martin-built product would be needed to match the *stated* performance of the British Canberra. However, with the advent of jet engines, the time had come where power out-put was exceeding the structural capabilities of airframes. In the case of the B-57 and British Canberras, if left at full throttle, especially at the lower altitudes, the airplane would reach a speed where it would disintegrate in a matter of a few short minutes. This point was being met at a low Mach number because of air flow buffeting before the aircraft reached the stipulated speed limitations, and the consequences did not augur well for the new Canberra. The British tried to cure this roughness at high speeds by increasing the strength of the fuselage skin. Tibbs jokingly described that approach as 'merely armor plating it, mainly just so they could live with the roughness.' But there was underlying concern in his voice. The cause of the problem had to be detected before the right solution could be made.

In tight formation with another B-57, Tibbs watched the lead aircraft as they approached and exceeded .81 Mach at 40,000ft to see where the trouble might be. The test aircraft had been provided

One of the finest demonstrations of the Martin B-57B to crews who were to fly them took place at Langley AFB, Virginia, on 11 October 1954. The author is in this group about to have a closer look at the Canberra following its aerial demonstration. At this point, the Canberra was still a curiosity with members of the 345th Bomb Group, for it was several months before the new bomber was assigned for operational use.



Seasoned Martin test pilot O. E. 'Pat' Tibbs demonstrated the full operating limits of the Canberra is such a way to make any skeptic take notice. Everything about Tibbs with test flying was professional, and if Martin built it, 'Pat' flew it first. Demonstrations were not 'air shows', but merely to show the reliability and capability of the airplane. They were still spectacular!



The short field take-off capability for the Canberra was impressive for any bomber. Flight demonstrations were often without wing tip tanks and a light fuel load, making the take-off distance less than 2,000ft, depending on wind and temperature. In this picture taken just after breaking ground, the wheels are already beginning to retract.

with a series of strings or tufts secured along the skin to visually indicate areas of turbulent air. By the gyrations of the tail, the problem area was obvious. 'I couldn't help but wonder how much of *that* an airplane would withstand before tail feathers would begin to part,' Tibbs continued. 'I loosened up my formation as a matter of self-preservation while we came back on our airspeed!'

A temporary fix was tried by covering and wrapping all the openings in the tail and aft fuselage section with tape. In the case of the B-57 design, it had an adjustable stabilizer used for trim. To allow for this movement, a large open slot at the attachment point to the fuselage was necessary, and this was the area of most turbulence. Air was going in through the fuselage members, reversing, and so forth, and was probably causing the trouble. A second flight test was made which revealed a marked improvement. All B-57s were then equipped with snug-fitting covers for these gaps, yet free movement of the stabilizer was allowed. Aft fuselage bulkheads were also sealed to further resist free passage of air in and around the inner structure. This was acclaimed as the greatest contribution by the United States to aerodynamic design improvement for both the British as well as the American built Canberras.

The obvious question was often asked at the conclusion of most of 'Pat' Tibbs' briefings: 'What differences did you note in comparing the flying characteristics of the British Canberra with that of the initial B-57As which were hardly distinguishable from the British counterpart?'

Prepared with an answer, Tibbs often started like this:

> 'Due to the Americanization, many think we have lost much performance over the British airplane. They usually indicate that they are sure we have installed a lounge, a bar, a ready room and so forth aboard, which would completely ruin the airplane. Well, let me say right now, nothing could be further from the truth. I can detect no difference between the two aircraft in take-off, climb out, cruise, etc – no changes. At first ours was just as rough, if not more so, as theirs until cleanup. Control forces are slightly lower on the B-57s than on the Canberra. This very desirable condition probably stems from a better aileron sealing job obtained in converting from British to American standards, plus the fact that the three control surfaces – elevator, aileron, and rudder – have slightly lower spring rates in the tabs.
>
> 'The greatest advantage with our airplane was the Martin rotatable bomb bay door. The Canberra has a speed limitation of 350kts IAS for opening its bomb bay, even though the doors slide up inside the fuselage. Ours could be opened at its maximum indicated airspeed of 500kts IAS with no adverse effect. In general, the performance of the B-57 is equal to or better than the English Canberra in every category that we have tested up to this time (1954).'

Tibb's opinions were not always shared by his English Electric counterparts, however. Tibb's overstatement in his briefing on performance was understandably for morale and sales purposes, but comparisons as stated were accepted as being exaggerated. According to Roland Beamont, former chief of flight test for English Electric, when reiterating this story to him about the differences in the two aircraft had this to say:

> 'As you know, I flew flight envelope and performance tests on the '57A and B models and found level performance identical and no improvement on buffeting from the gap-seal modifications which we considered to be cosmetic. All Canberras at Warton were tested to .84m after the prototype Canberra structure was cleared to .86m. Above that, a strong nose-down pitch occurred which could not be held until recovery below 15,000ft and at lower Mach. The buffet above .83 was heavy, but caused no problems. Control pressures were the same with both British and American models.'

Flight demonstrations were no easy task as evidence by 'Pat' Tibbs' sweat-soaked flying suit after landing at Langley. The B-57 did not have control boost and was a heavy airplane to maneuver at low altitude. The ground crew seemed more interested in removing nose hatch to reload starter cartridges for the next start, than to steady the makeshift ladder for Tibbs.

Following the morning flight demonstration and a well earned shower, 'Pat' Tibbs discussed in great detail with future Canberra flight crews the handling qualities of the B-57. Of interest to most listeners was his description of differences between the British-made Canberra and the Martin B-57. This was the briefing room of the 500th Bomb Squadron at Langley in October 1954 at which the author was in attendance.

For some inexplicable reason, the B-57 suffered a nose-up trim change at a lower Mach number than its British counterpart. This was only cured by fitting a small spoiler along the full span of the upper surface of the horizontal stabilizer. According to G.M. Hobday, English Electric's representative at Martin at the time:

'Without exception, the clean-up of the Martin built product including the stiffening of the rear fuselage, the sealing of the aft fuselage bulk heads and the stabilizer gaps evolved from British work and was in fact passed on through me to the Martin Company. There was in agreement that any improvements in design by either party should be passed on to the other.'

5

PRODUCTION AND SETBACKS

In order to reach this point in the development of the B-57B that was just demonstrated at Langley, many transactions took place over the preceding three and a half years following the Air Force acceptance of the Canberra design. On 9 March 1951, the Air Materiel Command (AMC) implemented the Canberra procurement and production program by authorizing the purchase of an initial quantity of 250 Canberras with FY 1951 funds. A license agreement between the two companies was consummated on 3 April 1951, covering the manufacturing and sale and use of the Canberra and spare parts solely in the U.S. to and for the Government. Royalties were not to exceed 5% of the selling price of the airplanes at fair market values.

To assist Martin in production, five subcontractors were to produce about 60% of the airplane by airframe weight. Kaiser Metals was to build the two wing panels and nacelles, as well as the rotating bomb bay doors. Hudson Motors furnished the aft fuselage section and the tail components, while Cleveland Pneumatic Tool Co supplied the main and nose landing gear. Other sub-contracted items included the canopy and nose cap, tip tanks, fuel cells, forgings and castings, ejection seats, hydraulics and electrical equipment. The engine was an American adaptation of the Armstrong Siddeley Co Ltd Sapphire engine having 7,200lb st. This was a more powerful engine than the 6,500lb st Rolls Royce Avon that powered existing Canberras, but the extra thrust would be needed for the anticipated added weight of the B-57. Wright Aeronautical Corp paid $499,800 for manufacturing rights to build the J65 Sapphire engine. Buick Motors Division of General Motors Corporation, sub-contracted and initially produced the engine for the B-57s.

The first Canberra drawings arrived from England on 1 June 1951 and work began immediately on the conversion from British

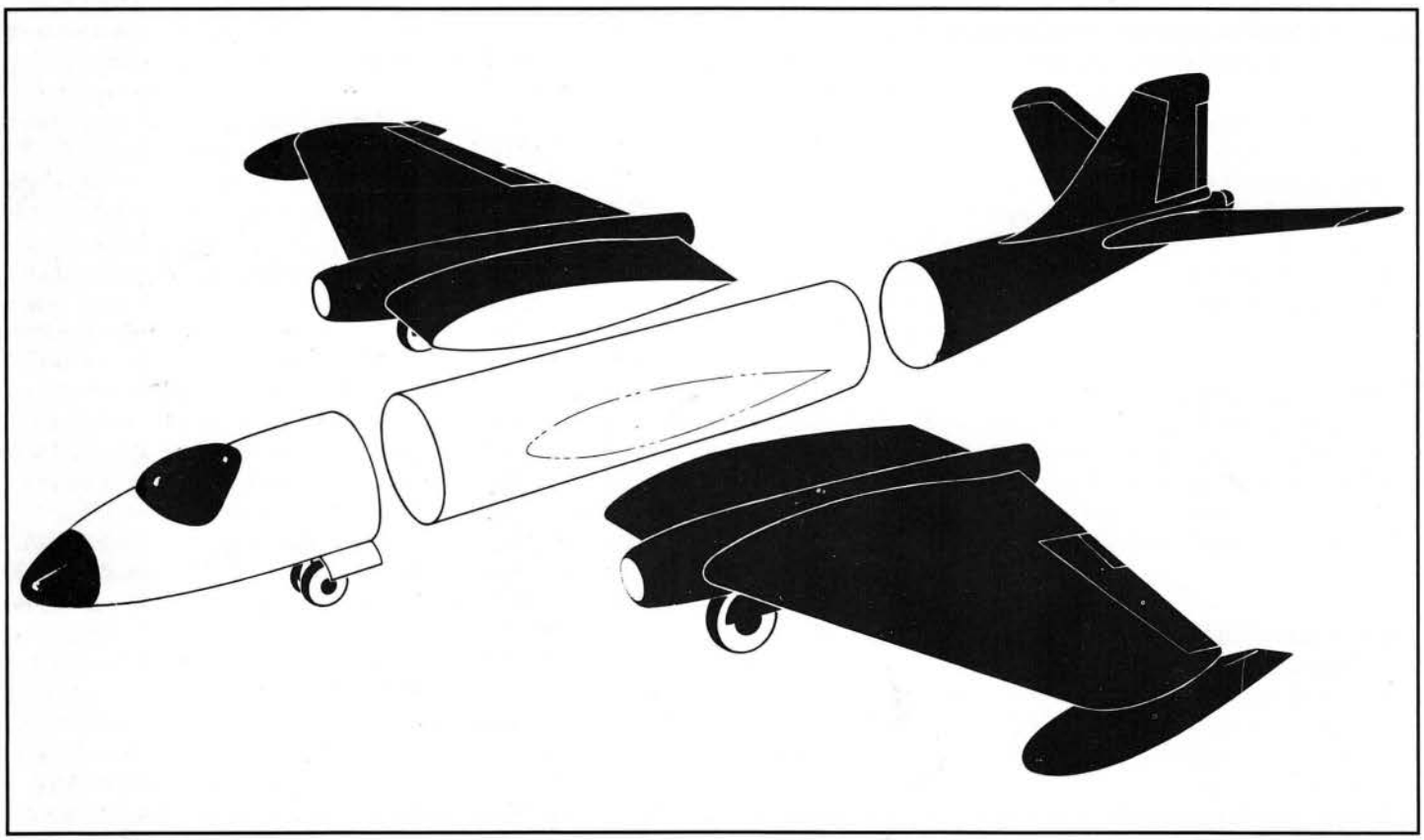
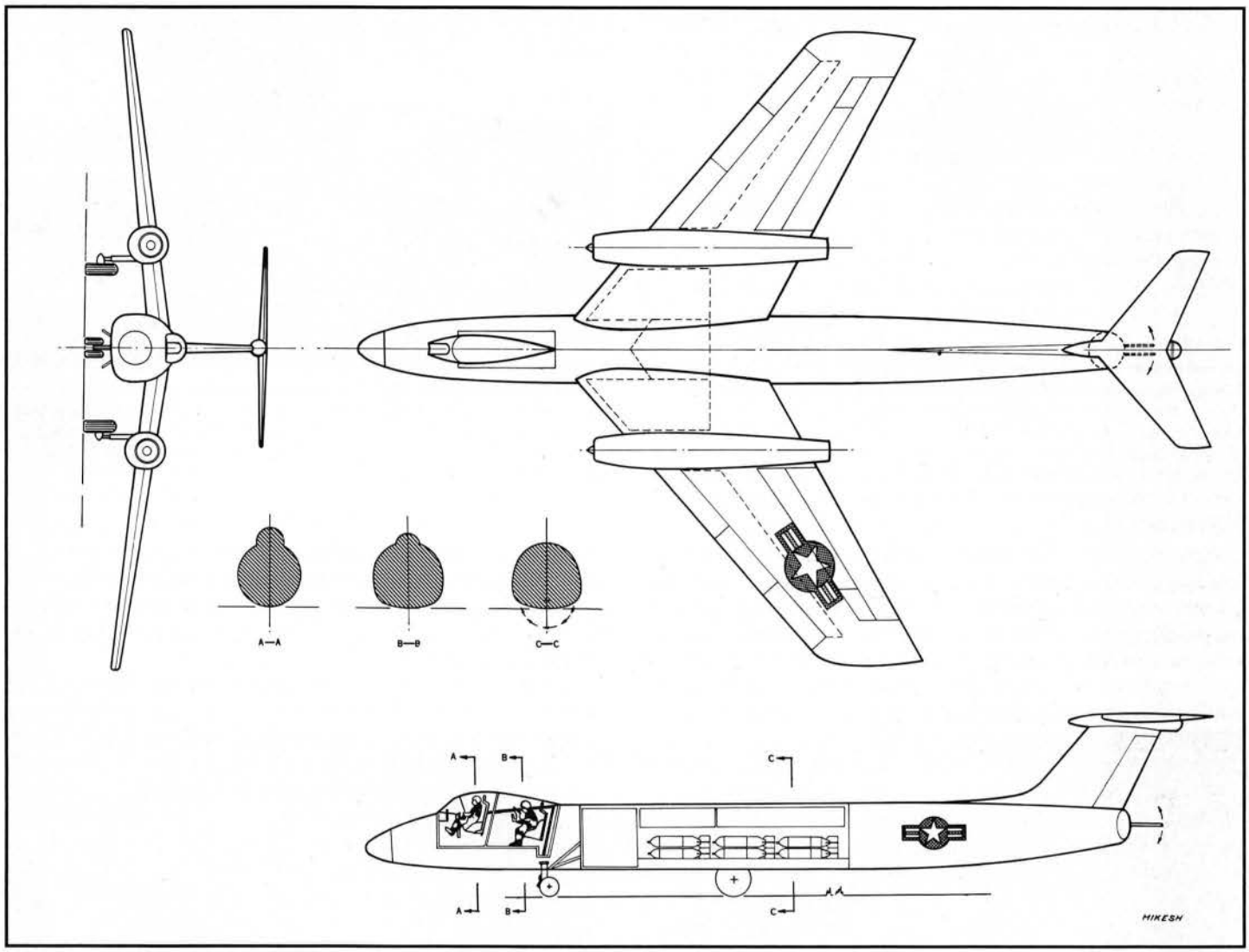


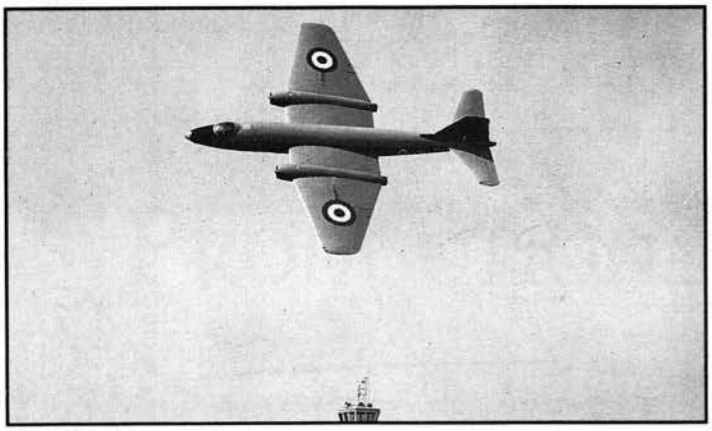
Diagram gives an idea of the extensive subcontracting planned for the B-57 as indicated by the shaded components. Nearly 60% of the plane by weight was to be built outside the Martin plant. Kaiser Metals fell short of its wing production and their work had to be accomplished by Martin. Hudson Motors built the aft fuselage and tail section. There were five subcontractors in all for these major components.



Proposed B-57B Super-Canberra was never built mainly because it was virtually a new design and was thought to have taken too long to put into production. Borrowing many features from Martin's own XB-51 as well as the Canberra, it promised much better speed and performance.

measurement standards to those of American standards and related equipment. This entailed a tremendous redrawing job, for the Americans used different gauge sheet metal standards, rivets, bolts and screws, and the best compromise had to be determined in each case. Manufacturing tolerances in production methods were also a major consideration. Instead of being required to hand-tailor details in assembly to ±.020, ±.005, the tolerances were increased to ±1/32in. This in no way affected the quality since outside mould lines were still maintained in final assembly. Aside from production method changes, there were inherent design changes that had to be made. To what limits this should be carried was a sensitive subject that persisted for many months, for prerequisites made upon the Air Material Command when accepting the Canberra for the USAF was that it would be built 'as is' with minor exceptions. Major changes would increase costs and extend production delivery schedules and the urgency created by the Korean War could not tolerate this. On the other hand, this 'no significant change' policy generated considerable doubt and apprehension among certain Air Force agencies, particularly the newly implemented Air Research and Development Command. Their mission conflicted with the selection criteria of the Canberra 'as is,' and although the research and development agency was responsible for the technical excellence of Air Force aircraft, its hands were tied in the case of the B-57. They determined that 'the Canberra fell far short of meeting existing USAF requirements and will require major redesigning to be brought up to what could be considered satisfactory." Thirty-five deficiencies were listed, but to stay within the guidelines of the purchase of the airplane, only six of these were corrected. Many felt and rightfully so – the aircraft's usefulness 'as is' within the USAF would be extremely limited and could only be considered an interim measure until a suitable design could replace it.

The Martin Company, at the request of the Wright Air Development Center, recognizing this frustration, which they too shared, offered to Headquarters USAF an entirely new design for a tactical bomber and night reconnaissance airplane. The new proposal was called the B-57B Super Canberra. In general, the new design was a combination of the best features of the XB-51 and the B-57A. Flight experience gained from the XB-51 provided a sound footing upon which Martin was able to develop this proposed high performance tactical bomber. Basically, the Super Canberra was a swept wing



Martin employees watch expectantly as English Electric test pilot Roland Beamont delivers the Canberra to Martin on March 6, 1951, where production will soon begin at this Baltimore plant. Martin had hoped to build their XB-51 for the Air Force but the Canberra contract was better than no contract at all. British markings stayed on this aircraft for the several months of test flying while it was on 'bail' to Martin. (Martin)

At a cost of $1,018,388, Martin purchased two Canberra B2s from English Electric, and the money was reimbursed to Martin by the USAF. WD932 had crashed by the time this transaction was completed and WD940 was the only one of the two to have its serial number 117352 applied to its fin. (Martin)

design, retaining low wing loading and embedded engine nacelles like that of the Canberra. Improved Sapphire engines with afterburners would provide a total of 21,700lb of thrust at take-off and a maximum speed of 630kts at sea level. Fuselage diameter was the same as the Canberra and its T-tail was a carryover from the XB-51. The crew of two sat in tandem under a single teardrop canopy, while photo reconnaissance and ECM missions could be accomplished with bomb bay package conversions.

Martin's engineering report of 14 September 1951 claimed that production airplanes of the Super Canberra could be available for service during the calendar year 1954. However, a new and unproven design is what the aircraft selection board wanted to avoid, and by November 1951, the Super Canberra proposal was rejected. In the meantime, flight studies continued with the Canberra that was on bail to the United States from the RAF. Following its arrival at Andrews AFB in February 1951 for the final evaluation and bomber selection, this Canberra B2, WD932, was flown to Langley AFB, VA, for members of Headquarters TAC to have a look at their future night intruder bomber. From there it went to Wright-Patterson to be inspected by AMC before being flown to the Martin factory at Baltimore.

The first step in re-marking the U.S. Government owned Canberra was to remove the RAF roundel and apply U.S. national insignia. This pattern is not a paint mask, but merely served as a guide around which to apply masking tape. (Martin)

Pat Tibbs made the delivery flight to Martin's Middle River, Maryland, facility where the B-57 would be built. Before leaving the plant for the pick-up of the airplane, Chet Pearson, president of the company, made these parting comments to his Chief of Flight Test. 'Pat, if you like the airplane at all, do a slow-roll or something across the field when you return. We all will be waiting. The morale is pretty low here for us, having designed our own plane, yet have to build a foreign design.'

Tibbs liked the airplane, and by the time he reached the Martin airport, he was confident of its feel and maneuverability. He gave the folks at Martin what they wanted – and then some. Ten feet off the deck, Pat brought the Canberra across the field at 400kts indicated. At the far end with the roar of sound that just reached the spectator's ears, he pulled it up steeply and went into an aileron roll. On its back during the roll, there was a sudden silence as both Avons flamed out – and for the next few minutes the Canberra was a high speed glider. Fortunately the light fuel load remaining gave Tibbs the time needed to get the first re-light at 800ft followed by the second, after which he gingerly brought the plane around to a conventional and graceful landing. Cool thinking, with a good working knowledge of the equipment, and having the situation always in hand is the prime ingredient of a competent test pilot like Tibbs. Few besides Tibbs were the wiser about what had just taken place and the people at Martin were a bit happier at building the English Canberra.

By June of that year, the need for a second Canberra was recognized, and approval was given by AMC to Martin for the purchase of the loaned aircraft at hand, and one yet to be delivered, at a reimbursable cost of $1,018,388 for the two. The arrival of the second Canberra B2, WD940, from its North Atlantic crossing on 31 August 1951, generated more interest than the earlier crossing of WD932. This second airplane established an official time record from Aldergrove to Gander of 4hr 18min which averaged 417kt.

Beamont, of English Electric, who had performed the flight demonstration at Andrews AFB six months earlier in WD932, was in command for this crossing. With Beamont were navigator D. A. Watson, and radio operator R. H. T. Rylands. On 4 September 1951, this second Canberra joined the first at Martin for the Combined Test Project Agreement between the USAF and the RAF which called for the exchange of aircraft development information.

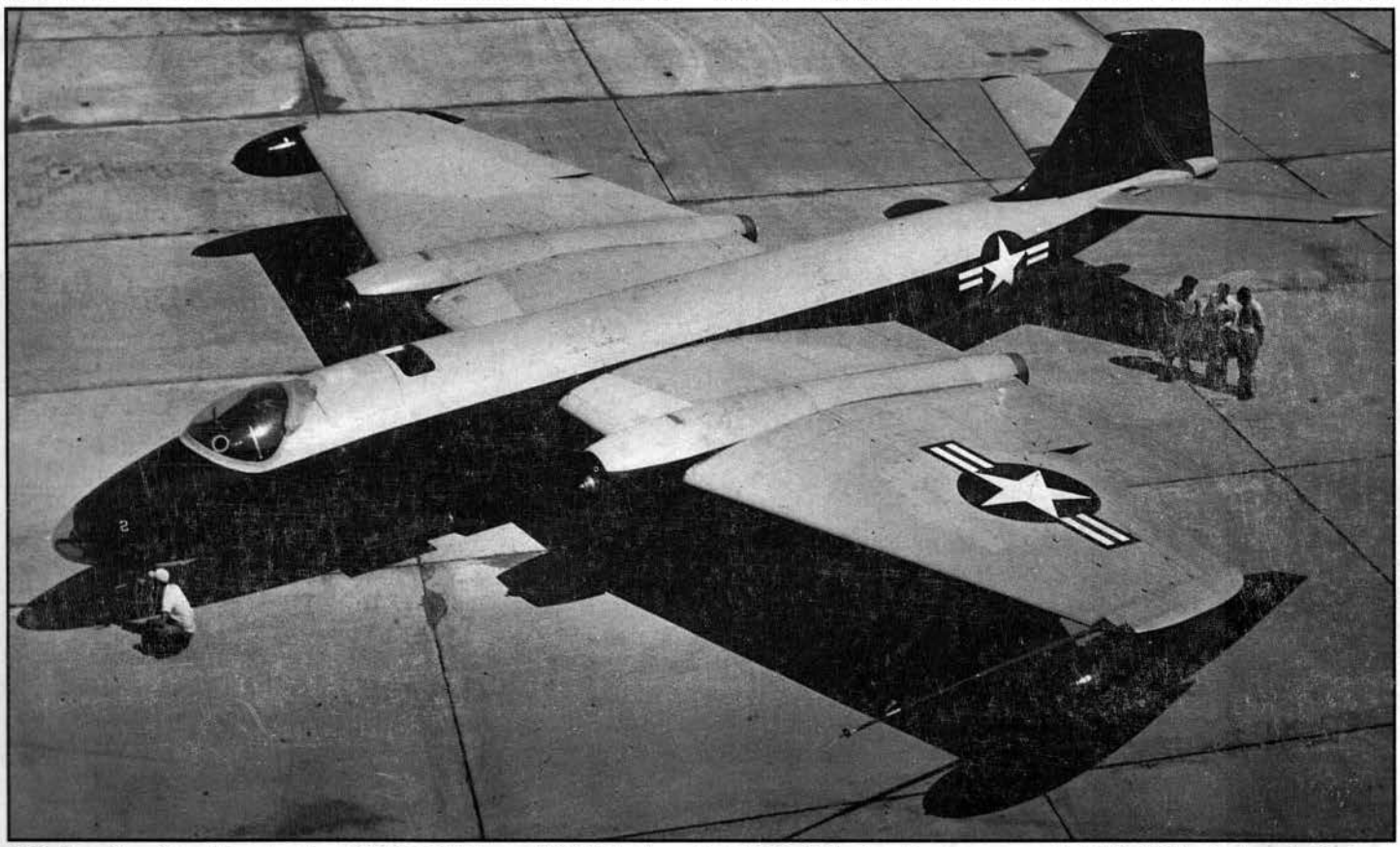
WD940 was the 12th production B2, and the 21st Canberra to fly. After nearly a year at Martin, WD940 had its insignia changed from that of the RAF to US markings, but retained its light gray upper surfaces and black lower surface camouflage. Across its tail was painted its 1951 assigned Air Force serial, consisting of the numbers '117352,' but it, like WD932 were directed to retain the identity of 'Canberra' and not classed as 'B-57'. Tests made with this Canberra were limited to four 48,000lb max gross weight take-offs to simulate the initial gross weight to be designed into the B-57A. These heavy-weight take-offs could not be performed on the first aircraft because of its wheel and brake limitations. When WD940 ended its last flight and was placed in storage, its total flying time was 33hr, of which Martin pilots flew it for only three of those hours. Eventually the landing gears were interchanged between the two airplanes so the earlier and more fully instrumented WD932 could handle the remainder of the flight test program.

Martin pilots flew the first Canberra, for 41hr out of its total 86hr as of 15 October 1951. It retained its RAF insignia throughout the test program and its Air Force serial number (51-17387) was never applied to its fin. The reason for the number not being applied was that it had not been assigned until after the plane had been destroyed and was then belatedly paid for.

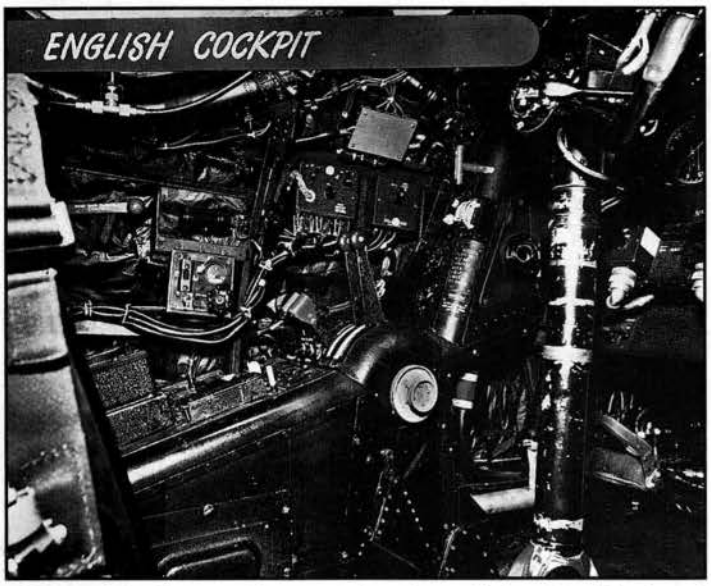
Tragedy struck the Canberra project when this airplane, WD932 crashed while on an evaluation flight just before Christmas 1951. On 21 December, during a tight turn analysis at 10,000ft, the left wing failed just outboard of the engine nacelle. The airplane crashed near Centreville, Maryland, on the Delmarva Peninsula, 25 miles south-east of the Martin factory. Both crew members ejected, but the engineer-observer's chute failed to open, and he was killed. Air Force test pilot Maj Harry N. Lister received minor injuries.

Investigation revealed that structural failure had occurred when the pilot was pulling 4.8Gs at 420kts at the aft C.G. limit of the aircraft as the test called for. Later investigation of the accident suggested through the process of elimination that improper fuel control consumption from the No's 1 and 2 tanks caused the C.G. to move aft at an alarming rate and was in fact far aft of the specified aft C.G. limit when the aircraft broke up. (The aircraft was stressed to an ultimate factor of 7-1/2G and reached this loading with some reserve during structural tests in England.)

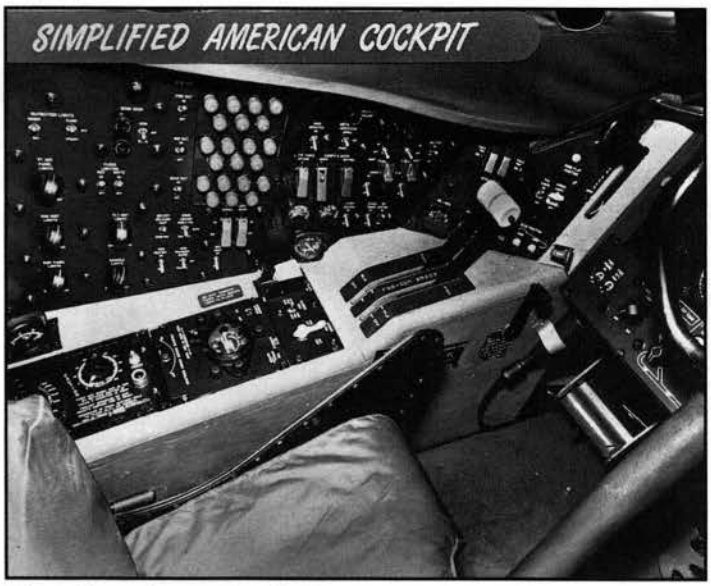
Naturally there was concern over this accident and structural failure back at Warton. Canberra test pilot Roland Beamont duplicated the flight to confirm the original test conditions while the investigation was underway. He reported that 'I re-proved this case at Warton a few weeks later in another production B2, WD958, to 5.2G at 450kts, before we knew the results of the analysis. Subsequent calculations showed that with incorrect fuel management on that fatal flight, the C.G. could have moved well aft of the aft limit



Rolled out from Martin's paint shop, RAF WD940 is now USAF Canberra 117352. B-57 designation was not used with British built aircraft. Probe on left wing tip is yaw indicator for flight evaluation only. Open hatch leads into upper electronic bay, forward of the main fuel cell. The number 2 painted on the nose was Martin-applied to distinguish between the two Canberras while both were at the Martin factory.



The British Canberra cockpit was to be adequately functional, but found to be quite cluttered by post war design standards. Lever on control column was brake handle.

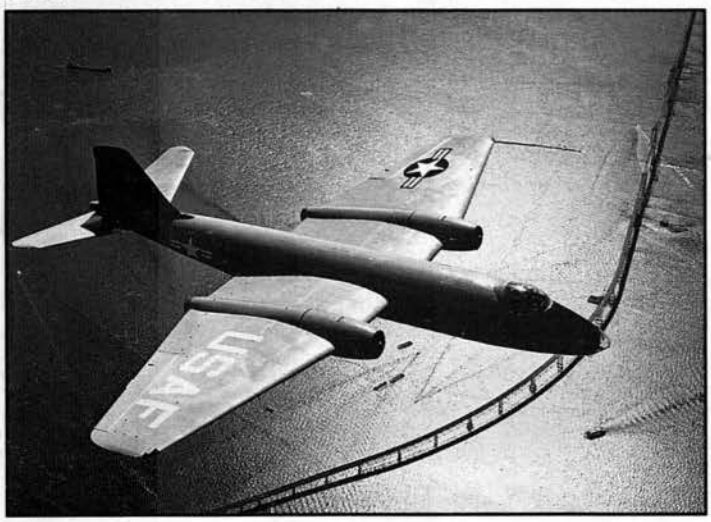


This is the mock-up cockpit for the American designed interior for the B-57B bomber version. Simplicity and well grouped systems controls was of prime concern in the design.

and when pulling the G-force tests, the aircraft could have pitched up to 6-1/2 to 7G.'

While the investigation into the cause of this accident was underway, it provided the leverage needed to make design changes in the B-57A design. There was little doubt, though unconfirmed, that escape from the aft navigator's station was critical as was suspected through this fatal accident. Neither crew member carried out the correct ejection procedure, which in this particular early aircraft was to manually blow the canopy and navigators hatch before seat ejection. Both the pilot and navigator ejected *through* the canopy and hatch respectively. Some opinions were that the engineer observer would have lived if he had not been knocked unconscious, since he died from drowning and his injuries were in fact quite minor.

In January 1952, the Commander of the Wright Air Development Center, Maj Gen F. R. Dent took a positive stand on the shortcomings of the Canberra design for use in the USAF. In a letter to his command headquarters, he noted no less than 31 design deficiencies, pointing out that if all could not be eliminated in the existing design there would have to be a major redesign of the airplane. To reinforce his stand, General Dent enclosed a document which the British Ministry of Supply sent to the English Electric Company. This contained a long list of flaws which had to be corrected before the Royal Air Force would accept the airplane. The general noted that the British deficiencies '. . . very closely correspond to those outlined by WADC in presentations prior to the Headquarters, USAF letter directing production of the B-57A.' Furthermore, the general continued, 'It appears inconsistent that we should ac-



This striking picture is of the re-marked English Electric Canberra to illustrate the new USAF bomber to be produced as the B-57 night intruder. The morning sun reflects on the Chesapeake Bay, and the nearly completed Bay Bridge in July 1952. The bridge dates the picture for this vital link to the Delmarva Peninsula which is now a double bridge system.

Sporting USAF markings, the former RAF Canberra WD940, was the holder of the record for an east-west transatlantic crossing – 4hr 19min, from Aldergrove, Northern Ireland, to Gander, Newfoundland, on 31 August 1951. Eventually this airplane was used by subcontractors for patterns.

The setting sun did not halt production of the B-57, spurred on by the war in Korea. Two work shifts were employed by Martin, until the first four bomb groups were outfitted. RB-57A in foreground is being towed to the paint shop for its coating of anti-searchlight black paint, while B-57A, ship No 5 (52-1422) at left, already has its markings and was left in natural finish. (Martin)

cept these same deficiencies in the production model of this airplane for use by the USAF.'

These are but a few examples of the problems that faced the Canberra in its conversion to the B-57. According to G.M. Hobday, previously mentioned in connection with the early design of the Canberra, these so called thirty-one design deficiencies were largely of a political nature aimed at curtailing the use and production of the aircraft for the USAF. The deficiencies in fact were very largely the differences between the 'MIL' SPEC and AP970, which were the respective technical requirements for the design of aircraft for the two air forces.

Hobday was in a good position for making these observations. He had been the resident advisor engineer to The Glenn L. Martin Company in Baltimore from July 1951 until August 1954 and the sole representative in the U.S. for English Electric in the redesign of the Canberra as the B-57.

Enlarging further on the political tangle that the Canberra/B-57 was caught-up with, Hobday offered this further explanation:

> 'I can quote to you at least two examples where redesign took place at great expense, and of course a waste of time which did nothing to improve the B-57 over the Canberra in any way whatsoever.
>
> 'The first of these was the re-design of the main wing spar to the fuselage attachment from a fatigue point of view. The British design stood the test of time and was a simple two-bolt affair. The USAF model, on the other hand complicated this attachment joint immensely and it became a four bolt affair.
>
> 'Secondly, there was the matter of flying control problems. The British aircraft had a simple push pull system which was designed to meet two requirements, that of stick force exerted by the pilot, and also one of stiffness. The American requirement was based purely and simply as a load produced by the pilot with no stiffness requirement whatsoever. Total re-design of the system using cables was undertaken for the B-57 to 'MIL'SPEC requirements. Now let me add this – I have never known any pilot, including many American exchange pilots, who have flown the British Canberra ever break the controls due to shear physical effort!'

The fate of this airplane was continually bombarded with political opposition from the original date of the decision to select the airplane through to its last production order. There was in both the Martin and British view a sizable degree of opposition both at the technical level at Wright Field and in many other quarters. The full potential of the aircraft production run once set and tooled up for fifteen hundred aircraft was never reached, largely as a result of this opposition.

6

DEVELOPING THE NIGHT INTRUDER

With further study of the problem facing the success of the B-57A as a successful night intruder bomber, AMC recognized that there did exist an incompatibility in producing the airplane 'as is.' Although production was already under way, Martin was asked to re-engineer the problem for consideration and approval. What resulted from this study was the B-57B, incorporating modifications to the basic Canberra design. This was a second use of the designation since the earlier concept of the 'Super Canberra' no longer existed.

On my first visit to the Martin plant to have a look at the mock-up of the newly designed nose for the B-57B, I felt immediately that this version of the Canberra was genuinely an American airplane. I remained skeptical of the wide chord, low aspect ratio wing which was not comparable to any other airplane of any other nation. The wing imbedded engine was not duplicated in any other American jet and we who were to fly the B-57 had some reservations about this. Engine failures and fires could cause disastrous wing structure damage, but very few aircraft were lost through causes that might be attributed to this design feature.

Tandem Canopy

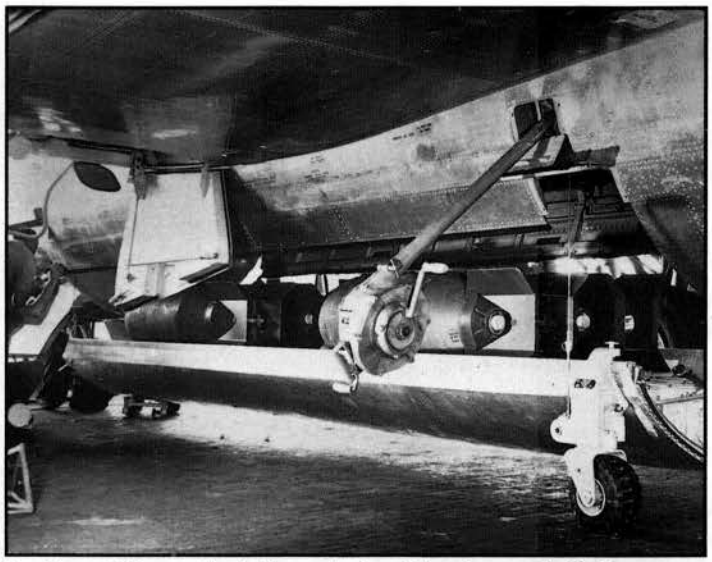
The new cockpit arrangement, though weighing 387lb more than the original, was a remarkable improvement for the pilot. (Little did I suspect then that I would spend over 2,000 flying hours under this type of canopy!) Visibility needed for the ground attack phase of the bomber mission was nearly unrestricted in all directions. Of equal importance, it moved the navigator from the deep compartment behind the pilot with only one small window on the port side, to a position where he could see out of the airplane.

This new canopy – formally requested of Martin in May 1952 – was essential to correct a deficiency that was overlooked when the Canberra design was first selected. The original double curved layers of glass would flex with changes in temperature and pressure, especially during the ground attack phase of the mission. It therefore became impossible to place a gunsight behind this canopy and have proper harmonization with the guns for acceptable accuracy. This sight had to be placed behind a flat glass panel.

The second British Canberra to be received, WD940, was used to work out these new bomber-version features. It was modified

Former Canberra WD940 was modified by Martin with this new tandem canopy for engineering study and was possibly used for flight evaluation. This led to the B-57B. The clear forward nose section was left unchanged for this evaluation. This elongated canopy adds even slimmer lines to the Canberra. (Martin)

Mock-up of Martin's redesigned nose section is evaluated closely by Wright Air Development personnel. This model became known as the B-57B, its cockpit reflecting American styling throughout. This redesign was necessary in order to provide a windshield with flat glass behind which to place a gunsight without having distortion due to temperature and pressure changes. (Martin)



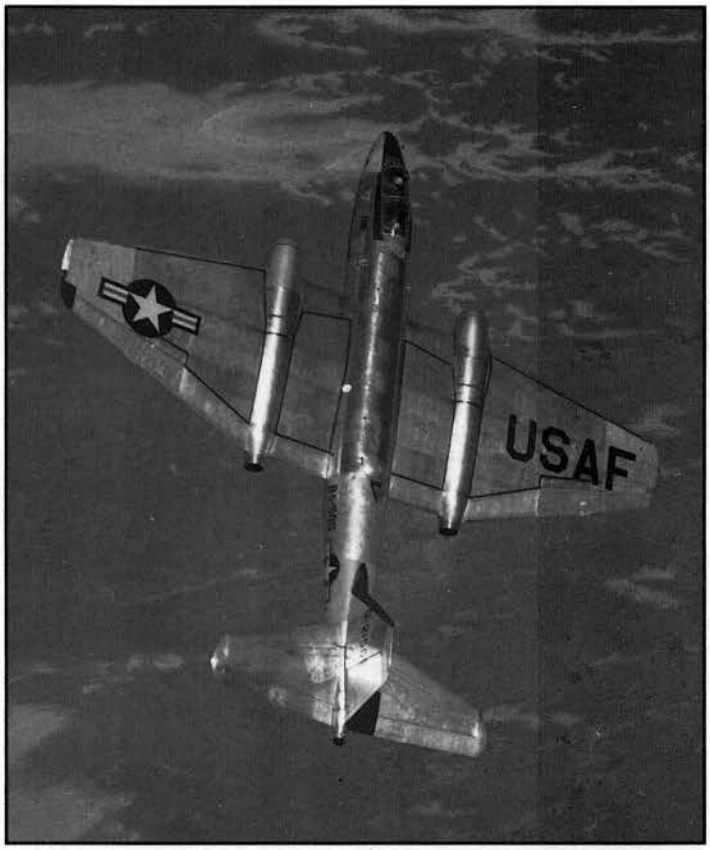
Bombs could be pre-loaded onto the bomb bay door and rolled to an awaiting B-57 for rapid turn-arounds when carrying complicated loads. Four hand-held hoists lift door in place for attaching to its pilot points in bomb bay on which the door rotates 180 degrees open and closed. Wheel dollies were then removed. (D. Anderton)

with this new cockpit arrangement which also required the moving of flight controls and pilot position from the off-set left of center, to the centerline location. If WD940 was ever flown in this configuration, it is not known. If it had, it did not make an impression on 'Pat' Tibbs who would have flown it after being modified. WD940 was then made available to sub-contractors for inspection of the components they were to make, and later was reported as being moved to the museum yard at Sampson AFB, Geneva, NY where it was later scrapped on 11 September 1956.

There is evidence indicating that this tandem canopy arrangement for the Canberra may not have been an entirely "Americanization" of the design. According to G.M. Hobday, English Electric advisory engineer to Martin for the conversion process, he had this statement to offer in this regard: 'The Night Intruder development which became the B-57B resulted from an in depth design and study by English Electric including wind tunnel work, which was cancelled by the British Government. I was in fact chief technician at the Acton/London Office of English Electric where the new cockpit was designed, immediately prior to going to Baltimore in 1951. The concept therefore was not exactly thought of in the USA.' Since the British concept was not fully developed to production, or now in physical evidence, the similarities, or dis-similarities of the two must remain a mater of conjecture.

Speed Brakes

The new 'B' model was to have another improvement feature – speed brakes at the waist position of the fuselage. It was learned from the earlier design, that although unusual, the finger-like spoilers, or wing dive brakes (as they were technically referred to) on the top and bottom of the outer wing panels did not provide sufficient drag for speed control. At the high operating altitudes, idle power settings retained a higher rpm with resultant high thrust in the thin atmosphere. Since cruising speed at high altitudes was equal to maximum allowable, reducing power and extending the wing



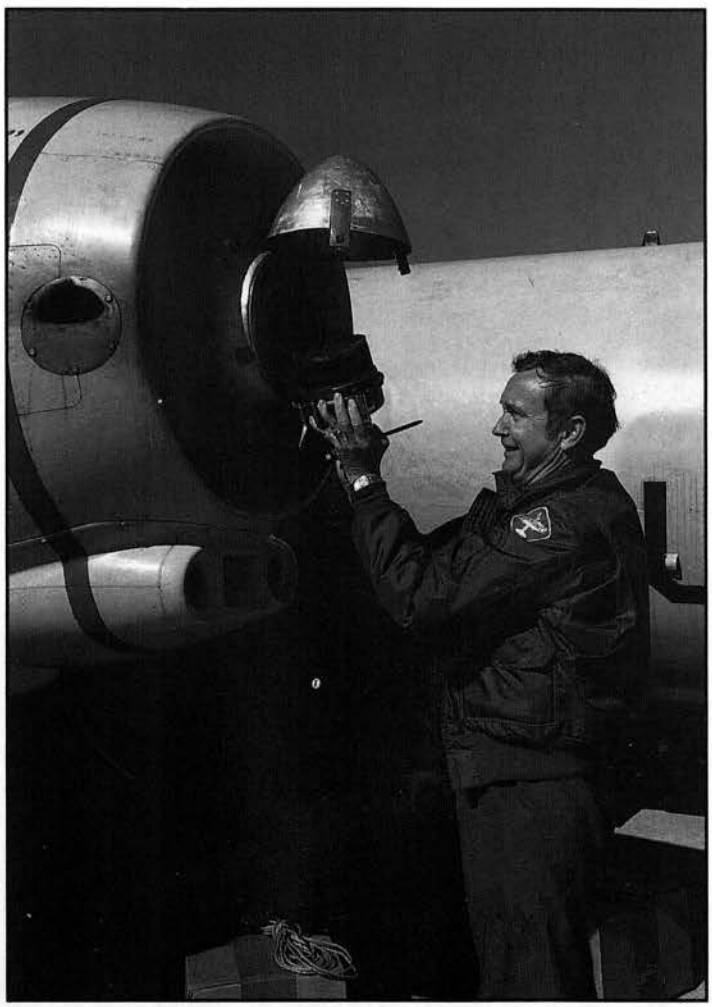
This dramatic picture was taken at near bomb release point in the LABS maneuver. When just past the vertical position the atomic special weapon was released and continued on its own to around 9,000ft before starting down toward the target. At release, the B-57 would continue in an Immelmann-turn and begin its escape before the bomb would detonate. B-57s were the most accurate and stable aircraft for this critical bomb delivery method.

OPPOSITE: The first B-57B shows off its new canopy and its improved cockpit vision becomes obvious. Windshield framing restriction to forward visibility was hardly noticeable. Overhead lines in rear canopy was antenna for ADF. When positioning the special ladder for crew access, it was aligned with the two 'U' shaped marks on the side of the fuselage. Flat black on leading edge surfaces was rubberized paint which resisted wind erosion. (USAF)

dive brakes, had only minimal effect. The let down from altitude became tedious and time consuming so as not to exceed the airspeed red-line. These wing dive brakes were retained and worked in conjunction with the controls for the fuselage speed brakes. In the ground attack role, the speed brakes would be very useful for controlling acceleration in diving passes.

Wing Guns

Modifications to the wing of the B-57B were necessary in order to house four .50 cal. forward firing machine guns in each wing. These were placed in a common gun bay in each wing outboard of the engine. The newest weapon at the time the 'B' model was being developed was the fully automatic, air-cooled, recoil-operated Browning M3 .50cal. machine gun, a variant of the M2 that was so widely used during World War II. The M3 had an increase rate of fire to 1,200 rounds per minute and was made to be more adaptable to lower temperatures because of the higher and colder atmospheres of which jet aircraft were to operate. In addition, each gun was electrically heated and pneumatically charged upon demand by the pilot while in flight.



The author removes the expended starter cartridge at the end of the delivery flight of 551 to the National Air and Space Museum. These cartridges were for a one time start and dependent upon good electrical contact points despite the dirt from the burning material that this system emitted.

Each of the eight machine guns had 300 round of ammunition for a total of 2,400 rounds for the airplane. Ammunition was fed to the gun in a disintegrating metallic link belt. Muzzle velocity was 2,900 feet per second. When considering an average single burst of 2-seconds, this would send 320 rounds into the target.

After the 83rd B-57B, 52-1575, the remaining bomber versions (which was the majority), were equipped with a total of four wing-mounted 20-mm M39 cannon in place of the eight .50 cal. machine guns. These were gas-operated, belt-fed, electrically-fired, percussion-charged weapons. This newest of the airborne weapon systems not only equipped B-57s, but F-86Hs, F-100s and F-101s as well. Machine gun equipped B-57Bs were not converted to the cannon weapons.

On cannon equipped B-57Bs, the guns were fixed to fire downward at 3 degrees 36 minutes from the flight path and converge at a point 3,250 feet in front of the airplane. The intent was designed for convoy strafing in a lesser dive angle than when guns were fixed directly forward. Each gun could fire 290 rounds of ammunition, totaling 1,160 rounds for the airplane. These guns had a rate of fire in excess of 1,500 rounds per minute, putting 200 rounds of this larger ammunition on a target in one 2-second burst. Usually the rounds were armor-piercing-incendiary (API). Each gun weighed 179lbs and was 72.4in long.

To ready the guns for firing, the armorer had to charge each gun separately three times prior to flight. This was normally done in the arming area near the takeoff end of the runway since the guns could not be charged in flight. One disconcerting aspect of the 20mm cannon system was the slight time delay after pressing the gun switch. The gun purge doors opened hydraulically when the gun switch was depressed before allowing the guns to fire. Initial reaction was that of having a gun malfunction.

Bomb Bay Door

A feature often overlooked in marking the success of the B-57 tactical bomber is its rotating bomb bay door. This one piece, 17ft long door was mounted on two pivot points. It could open in four seconds and close in six, making a 180deg turn. The bombs were attached directly to this door, and in the open position the bombs would be in an externally mounted position. This kept the bomb bay cavity sealed or closed, therefore causing no buffeting or pitch change generally associated with conventional bomb bays, and open doors that often affected bomb dropping accuracy. This eliminated any door opening speed restrictions, which was at 350kts for the British Canberra. Developed first on Martin's XB-51 and carried over to the B-57, this door innovation was invented and patented by two Martin Armament Engineers, Albert T. Woollens and Werner Buchal. In addition to its performance advantages; the removable doors could be pre-loaded at a remote site, then towed on its own detachable wheels to the airplane for a quick mission turn around. No one recalls this loading procedure being used when actually being prepared for combat missions in Vietnam. Presumably it was

The engine start of a B-57 was immediately obvious by 10 seconds of black smoke that belched from the starter exhaust of each engine. The right engine was started first to build-up hydraulic pressure so that the canopy could be closed to protect the crew from the left engine starter smoke. Clean burning starter cartridges were later developed. (USAF)

easier to manhandle loading the bombs with the door in place than interchanging the door.

Weapons Delivery

Features of this door contributed to the B-57 becoming the most accurate special weapon delivery aircraft through the 1960s for the unique bombing system called LABS (Low-Altitude Bombing System). With no speed restriction for opening the bomb bay, this allowed a high speed entry for the maneuver close to the ground (about 50ft) at 425kts. With the door already open, a 3.5G pull-up was made at the target, and the special weapon was automatically released at about the 110deg position of the loop. The bomb continued up to about 9,000ft while the airplane was going over the top at about 5,000ft. This 360deg vertical-maneuver could be completed or an Immelmann-turn made at the top, depending on which escape direction was desired away from the target. Gaining speed again on the downward side of the maneuver at full power, the B-57 would be a considerable distance from the target before bomb detonation. B-57s were more accurate than any other aircraft for this type of delivery.

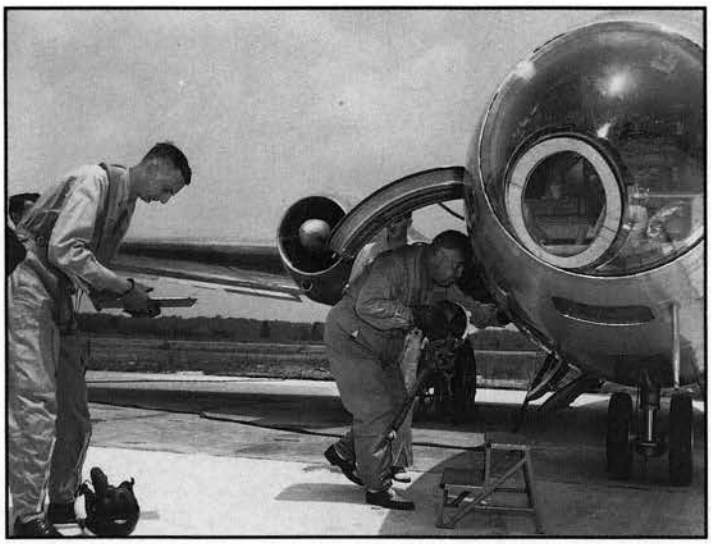
A Shoran bombing system operated by the navigator/bombardier was included, as well as a APW-11 Bombing-Aid Radar Guidance System for the pilot. For detection of other aircraft, an APS-54 Radar Warning System was included. This provided an audible warning to the pilot when an airborne interception was in a position to offer a potential threat to the airplane. Eight hard-points were added to the underside of the wings for bombs and rockets to be attached.

Other Features

Some of the features that were recommended early in the Canberra program that did not materialize were, wing surface and engine inlet anti-icing, anti-skid wheel brakes, drag chute for landing on short runways, power boost controls, center-line mounted wing tip tanks (similar in design to those on T-33s), and an AM-1 target avoidance warning radar which was an indicator that told the pilot when minimum pull-out altitude was reached. Only on very rare occasions did I have need for any of these features, and their absence did not detract from the effectiveness of the airplane.

Of interest also on all J65 engine equipped B-57s was the unique starting system that used an electrically ignited single-shot starter cartridge. When fired, it burned for 10sec, directing its force against a starter turbine. This turbine drove the engine through a clutch linkage system and brought the engine up to starting speed. During the process, early cartridges emitted a dense black smoke, indicating to the uninitiated that the airplane was on fire. More than one of us got hosed down by the unsuspecting fireguard during early days of operating the B-57. The purpose for this method of starting allowed airplanes to be dispersed in a combat situation, doing away with heavy ground powered starting units, difficult to transport and

For the production of the B-57, Martin moved back into their former government-owned World War II B-26 Marauder assembly plant No 2 across the road from their main facility. RB-57As are shown in various stages of production. Navy personnel served as purchaser and handled administrative matters for the US Government and USAF at the Martin plant. (Martin)

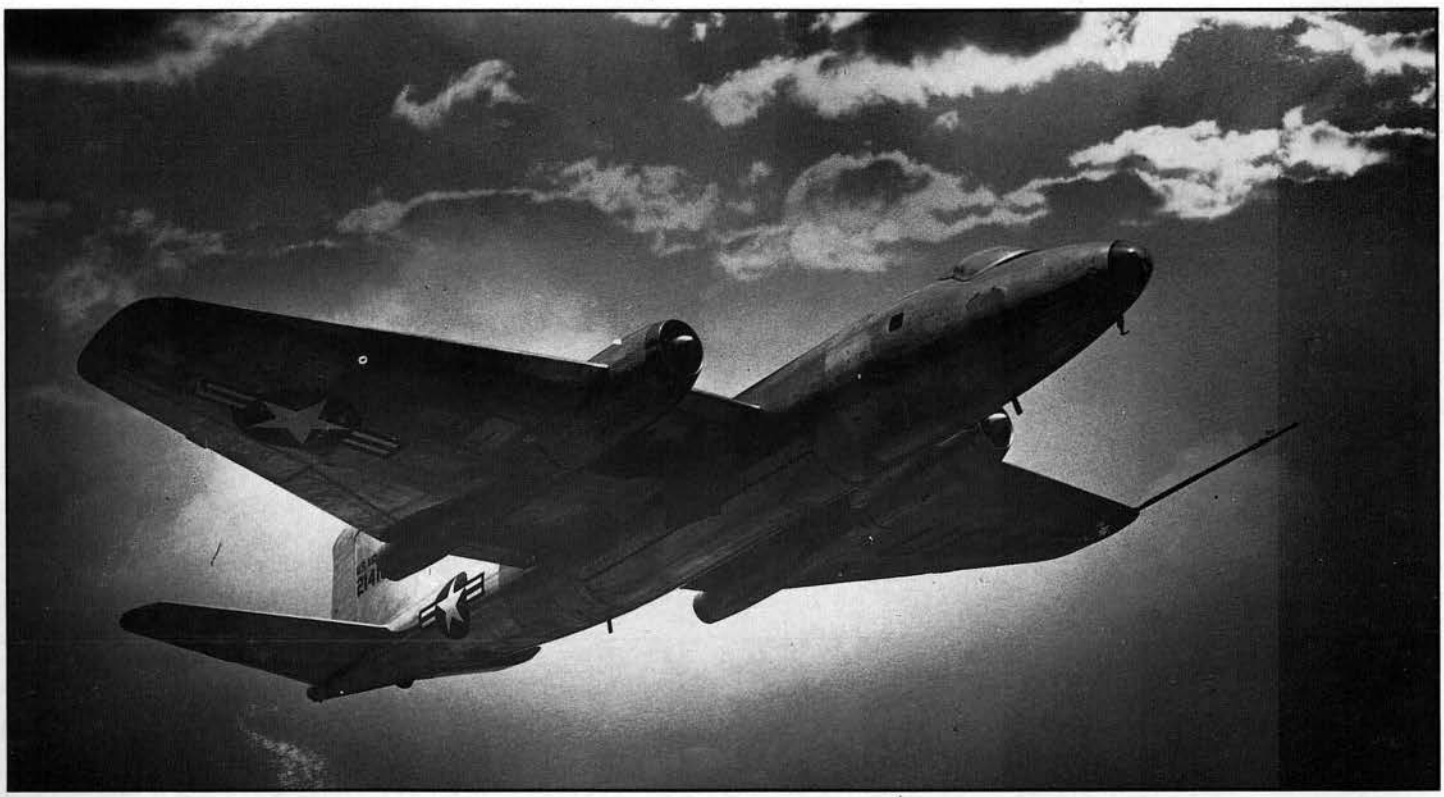


Martin's Chief of Flight Test, 'Pat' Tibbs, climbs aboard the first Martin built Canberra for test flight at the Baltimore Middle River facility. George Rodney at left went along as Engineering Recorder for the flight. 'First Flights' for Tibbs at Martin were nothing new. Flights of this nature went back to pre-World War II with Marylands, Baltimores, and every Martin type that followed. (O. Tibbs)

The smile on 'Pat' Tibbs' face is proof enough that the first flight of the Martin B-57A went well. One recommendation was to improve the air conditioning system for prolonged low altitude flight, as evidenced by Tibbs' sweat soaked flying suit. The large plastic canopy trapped radiant heat and there was only limited, unfelt, outside ventilation. (O. Tibbs)

maintain in out of the way places. What engineers overlooked however, was that the B-57 was designed with a liquid oxygen system. This system had to be recharged every 24hr or before each flight, and required a factory-like facility close at hand in which to generate the liquid oxygen.

The J65 Sapphire engine proved to be a very reliable engine for the B-57. In retrospect, however, some feel that this may not have been the best choice over that of the Rolls Royce Avon. The Avon proved its undoubted superiority and had greater power. Its method of starting by using smokeless cartridges from the beginning and the triple breach configuration was superior to the American system. The selection of the Sapphire may have been a matter of availability and on more favorable terms than the Avon.



The first B-57A breaks ground in the early morning sun as the wheels are almost fully retracted. Tibbs reported after this flight that the flying qualities of the Martin built B-57A were no different than that of the English Electric Canberra. First flight of the B-57A was 20 July 1953. (Martin)

Ship No 9, 426, the first RB-57A taxies out for acceptance flight in 1954. Last of the eight B-57As, 425, in silver finish behind, was instrumented for Shoran Bombing tests that were later conducted at Eglin AFB, Florida. None of the eight B-57As were considered combat aircraft. (Martin)

Production

When the design was approved for the B-57B night intruder configuration, the entire B-57 production schedule had to be revised. Since production was already underway for the B-57A, only eight would be completed, having slight alterations incorporated. No longer was this initial configuration expected to perform the bomber functions. Components that were already on the production line for others were converted to the reconnaissance craft as RB-57As. These were to be limited to 67 in all, and now, reconnaissance production by necessity, was ahead of the bomber version. In order to adjust for the added engineering and retooling costs for the bomber revision, the total quantity of aircraft for the fixed price contract for FY1952, was reduced from 250 to 177 which set the figure in August 1952 at 102 B-57Bs, including spare parts, a mobile training unit and 103 special weapons doors.

First Flight and Deliveries

The day every manufacturer awaits, finally arrived for the people at Martin on 20 July 1953. Just 28 months after the awarding of the Canberra contract, the first B-57A took to the air. 'Pat' Tibbs was at the controls and he later reported that the Martin airplane handled no differently than his earlier flights in the British Canberra.

PREVIOUS: A line-up of RB-57As on the ramp at the Martin factory in 1954 receive final adjustment before being turned over to the Air Force. Most of these pictured went to the 363rd TRG at Shaw AFB, SC. In 1970, the author flew ship No 18 in foreground, (52-1435) on its last flight to the salvage depot at Davis Monthan AFB, Arizona. Ending with 15 years of flying, the Canberra could not have performed better on that final flight! (Martin)

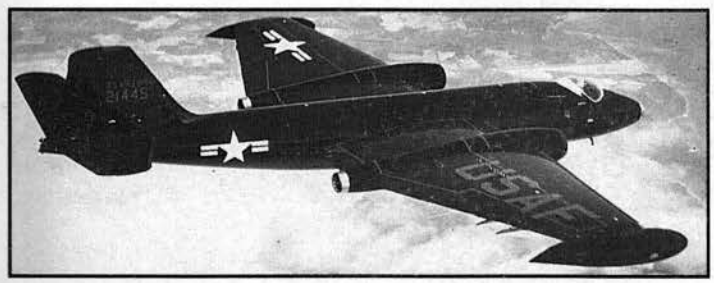
Before a gathering of top Air Force officials and some of the nation's leading industrialists, the first B-57 was officially turned over to the USAF on 20 August 1953. In attendance was USAF Chief of Staff General Nathan F. Twining who accepted the airplane after which Major Roy Seccomb made the first official USAF flight. This event was unusual in that it took place at evening twilight, in order that visitors might better visualize the mission of the B-57.

Getting the night intruder into production did not end here for this first airplane, as 52-1418 was not a combat machine due to recognized deficiencies in its design. Already there were three models of the B-57 following it down the production lines. Owing to the changes in production schedules it became a major problem to conclude a test program of 'debugging' before B-57s became operational. General Boyd, Commanding General of the Wright Air Development Center, let it be known to AMC that the B-57 situation was beginning to resemble the B-47, F-94C and F-89 programs, wherein these aircraft had been plagued by rashes of groundings, retrofittings, and openings of new modification centers. Generally speaking, Boyd continued, these situations could be expected when, '. . . an aircraft is accelerated to quantity production without adequate lead time for testing or correction of deficiencies brought out by development testing.'

As the schedule then stood, test agencies would receive RB-57As in November and December 1953, with deliveries to tactical units slated to start in December. Following this, B-57Bs were scheduled for test delivery in February and March 1954, with the start of deliveries to operational squadrons beginning in March. As a result of this time compression, experience gained from the test programs

Externally, the Martin built RB-57A showed no structural design changes to that of the British Canberra. The Martin-built Canberra contained their in-house devised rotating bomb bay door that eliminated buffeting when opened at high speeds over that of the clam-shell door type. Photo-flash bombs are shown attached to the door. (Martin)

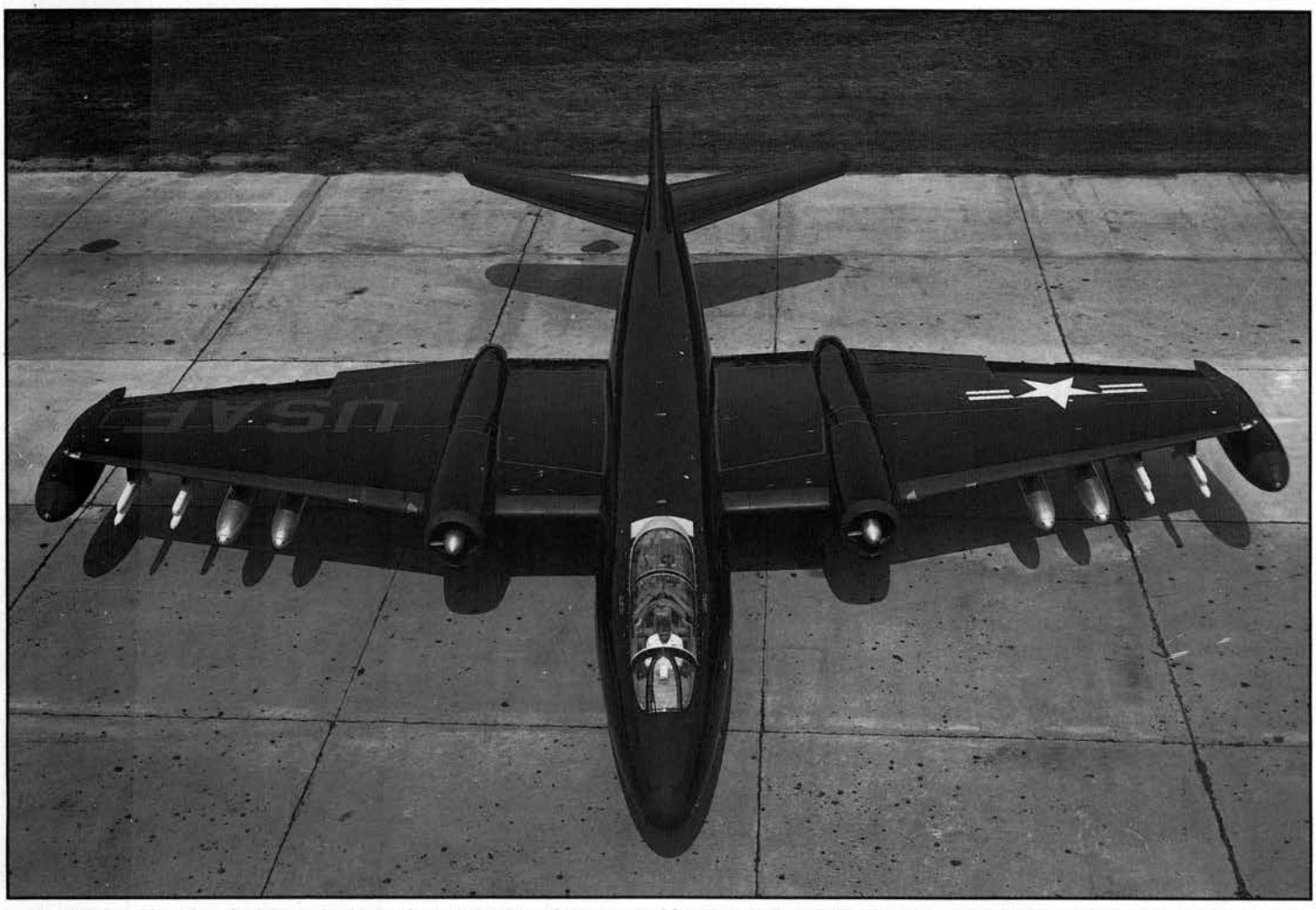
could not be incorporated into handbooks initially delivered to the using agencies. There was no 'XB-57' for these evaluations since the British version was already considered a proven design. The problem was somewhat resolved by its own accord in February 1954, when existing production schedules broke down because of Kaiser's inability to meet wing delivery schedules. To resolve the production problem, Martin assumed the unfulfilled contract and built the wing panels in their own facility. This provided some measure of relief to the research command testing agencies because



Externally, the Martin built RB-57A showed no structural design changes to that of the British Canberra. Common to both are the dive brakes, later called speed brakes, that are square channels and emerged vertically from the upper and lower surfaces of the wing. Those on the right wing can be seen extended through the U.S. (Martin)

arrival at peak production rate of 20 per month was postponed from January 1954 to one year later, and delivery of the first B-57B was changed from February to July 1954. Contributing to production set backs was the slow delivery of the J65-BW-1 engines from Buick. Due to the tedious conversion task to American standards, they initially failed to meet Air Force specifications. By 1954, many B-57s sat on Martin's ramp awaiting engines with which to fly. Production of the engine finally reverted back to Wright Aeronautical Corporation as the J65-W-1 (later became W-5).

Before the first contract for 177 Canberras was completed, other production contracts followed. These changed repeatedly in quantities, price, and additional equipment. The first contract for FY1953 stabilized at 138 B-57Bs and an equal number of special weapon doors, plus spare parts and ground handling equipment. By June 1955 however, this contract was again amended to include 38 B-57C dual control aircraft and 120 more B-57Bs. This latter figure was reduced in October 1955 to 100, and the remaining 20 airframes were to become the B-57D. A third production contract covered the RB-57D series with FY1953 funds. The fourth and last, new production contract covered 68 B-57Es with FY1955 funds and brought the final figure of Martin built Canberras to 403 in six production line varieties. All were completed by February 1957 – over a time span of just three and a half years between the first and



For nearly two decades, the Martin B-57 Canberra was the only jet tactical bomber in the USAF. There was no mistaking the Canberra for any other airplane. Its wide chord wing compared to its mere 64ft span was its most distinguishing feature. With the Martin modified nose departing from the British design, its tandem seating under one canopy made it distinctively American in design. Only the wing imbedded engines were a feature not practiced in U.S. jet design. (USAF)

Designed to meet the night mission requirements of the USAF, all RB-57As and B-57B/Cs were delivered in overall anti-searchlight semi-gloss black. All leading edges were painted with a rubberized flat black designed to prevent wind erosion of the paint. All other markings were insignia red.

This is the once very popular color poster print that illustrated the new USAF bomber. These posters were widely distributed by Martin as public relations for their new product.

the last roll-out. In the interim, Gen Boyd's warning about accelerated production before 'debugging' became a reality. There were the predicted periodic groundings after fatal accidents, one grounding lasting nearly four months while awaiting corrective fixes.

Named 'Canberra'

Throughout the life of the B-57, there was a reluctance by those associated with it to call it the Canberra – its true and rightful name. Perhaps the reason stems in differentiating between the British and American product, and Martin's frequent reference to the B-57 in their manuals and news releases as the 'night intruder', has led some to believe this was its actual name. Paragraph 17 of the Letter of Agreement between English Electric and Martin, clarifies this point:

> 'Martin shall name all aircraft manufactured by it under this Agreement "Canberra" in accordance with the usual practice of Martin with respect to other aircraft of its manufacture and shall use its best efforts to procure the agreement of the Government of the United States of America that the same name shall be used by the Government of the United States of America.'

A check with the Air Force as to the official USAF name they carry for the B-57 reveals the record to show 'Canberra' for all models. This stemmed from the British tradition of naming many of their aircraft after major cities. In this case, the Canberra was named after the capital city of the commonwealth of Australia.

The service life for the B-57 Canberra as a combat bomber has passed. In retrospect, the question may still remain; did the Americanization of the Canberra go into production with the least number of changes – as directed – so as not to change the inherent design of the airplane? Or, did the other faction win out to the point that the Martin built Canberra became a pure American airplane, far removed from the British design except for general basic lines? I like to believe that it was a near perfect compromise of the best features of the two. Unfortunately, the promised sensing equipment for the night intruder role did not become available until the final phase of the Vietnam War when it was finally introduced into the B-57G series. Consequently, for the night intruder mission during the first 16 years of its operational life with outdated equipment, the B-57 was little more than a faster B-26. It proved, however, to be an effective replacement airplane for the Invader as attested by the fact that it remained in combat for eight years and had a total military service life of thirty-years.

7

THE B-57 ENTERS SERVICE

The first of the Canberras from the production line were the eight B-57As. For the most part, these became the test air frames for not only evaluating stability and control, airframe structures, but systems such as Shoran bombing, navigation and radio systems to name a few. RB-57As were the next aircraft to follow, and units scheduled to receive the Canberras were anxious for them.

These all-black reconnaissance aircraft were dispersed initially to a number of organizations. The first tactical unit to receive the Canberra was the 363rd Tactical Reconnaissance Wing at Shaw AFB, South Carolina, receiving RB-57As as early as March 1954. Others wasted no time being ferried across the Atlantic to two or more reconnaissance units in Germany; mainly the 1st TRS of the 10th TRW at Spangdahlem AB and the 30th TRS of the 66th TRG at Simbach AB. Although it is not clear, it is possible that some of these airplanes augmented other reconnaissance units in this wing and group as well as other units in different parts of Europe.

A slight variation to the reconnaissance model sent to Ramstein, Germany, were RB-57A-1s. This designation was applied after the fact to ten modified RB-57As that had specially selected J65 engines and given the name "Heart Throb." These engines were trimmed for producing added thrust. According to MSgt Clyde Scarboro, stationed at Ramstein at the time, these engines carried the RB-57A-1s appreciably higher than others, a need apparently

The first unit to receive Canberras was the 363rd Tactical Reconnaissance Group at Shaw AFB, Sumter, SC. Their RB-57As were readily recognizable by their red and white checkerboard tails. This was the only reconnaissance Canberra unit of the Air Force stationed in the United States. (USAF)

These B-57Bs of the 345th Bomb Group are on the break for landing at their home base, Langley AFB, Virginia. Their red tail stripes denoted the 500th Bomb Squadron with the Air Apache insignia of the 345th Bomb Group made famous in the Pacific during World War II. The first B-57Bs were issued to this Group. (USAF)

This rare picture of a 66th Tactical Reconnaissance Wing Canberra shows the identifying unit markings. European based RB-57As generally were but one squadron assigned to a wing having other type aircraft. These European based squadrons were disbanded soon after forming and the aircraft returned to the U.S. for assignment mostly to Air National Guard Units. (Buchanan)

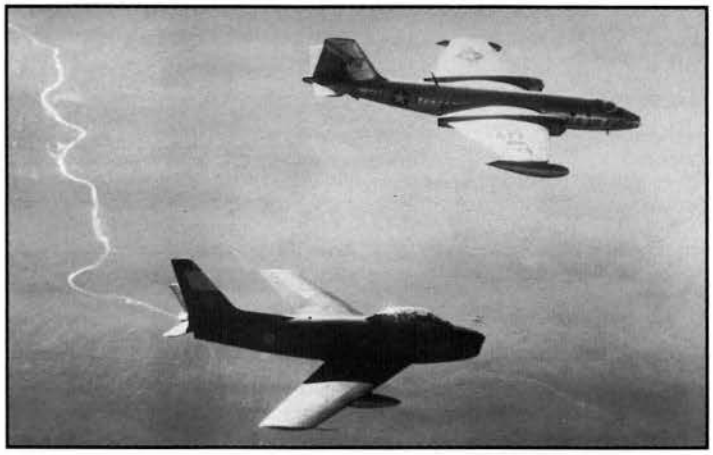
essential for special high altitude daytime photography over Hungary during the 1956 revolt. It was inferred that during this time while flying over Eastern Europe, one of the ten modified aircraft was shot down by a ground-to-air missile.

Little if anything has ever been printed about the RB-57A-1 version, probably because of secrecy at the time due to its increased mission capability. When these remaining nine aircraft ultimately reached the 154th TRS at Little Rock, Arkansas in 1961, Roger F. Taylor, a Master Sergeant at the time, was there to incorporate them into his unit. He was of the opinion that the -1s arrived from Europe and not Japan, yet numerous reassignments could account for this. He clearly recalls that as weight savings measures, they were without the heavy bomb bay door and that area was skinned over. The system operator/navigator seat was removed and the night photo flare racks were eliminated from the wings. These modifications had a profound effect on reaching higher altitudes. According to Taylor, to enable the pilot to perform all the reconnaissance duties without the assistance of the photo navigator, an optical viewfinder was installed in the nose of the plane. The clear plexiglass nose cone was replaced with an opaque fiberglass cone. This cone incorporated a small optical glass window for the viewfinder which allowed the pilot to see the terrain from about 30 degrees aft of vertical to about 15 degrees above the horizon. The viewfinder had an electrically rotatable reticle that gave the pilot drift indication as well as camera angle coverage.

Two reconnaissance units in Europe were equipped with RB-57As; the 10th TRW and the 66th TRW. This Canberra of the 66th, 52-1467, has 4-star studded tail and tip tank flash, and yellow fuselage bands. (S. Nicolaou)

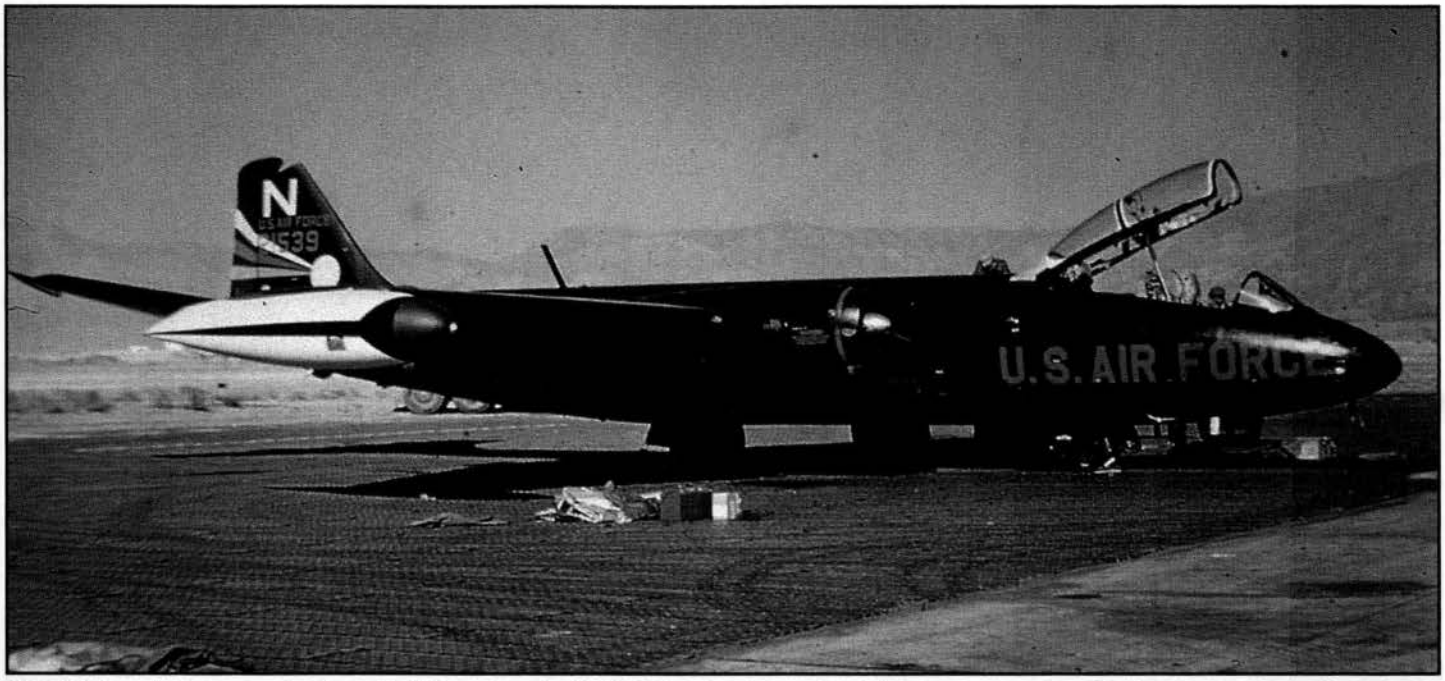
The thick wing of the Canberra offered another option to this reconnaissance model when assigned to the 154th TRS. MSgt Taylor developed an installation for all the RB-57A-1s by utilizing the area that formerly contained flare racks of the left wing in which to install a P-2 camera system. One of two cameras was a forward oblique, depressed from horizontal at 30 degrees, with the option of a 45 degree depression. The other camera was a left oblique, with options for 15, 30 and 45 degree depressions, as well as the capability of that camera to be used vertically. Taylor received the Air Force Commendation Medal for devising this installation, the first recipient of this type in the Air National Guard.

Other RB-57As crossed the Pacific and took up residence in Japan with the 6021st TRS for a year and a half, and later in the 6091st both located at Yokota AB. Among these airplanes were RB-57A-1s transferred from service in Europe. Also at the time was one special RB-57A, known by its code name "Switch Blade." Originally based at Rhine Main AB for reconnaissance along the Iron Curtain, it was flown to Yokota by its assigned pilot Jack Reedy for a look-see into North Korea and China. In one side of its fuselage was a roll-top desk type door as a port for the camera, an opening hardly detectable on the ground. This special camera had a 240" focal length and was built by Boston University. Able to see 300 miles if atmospheric conditions permitted, it produced a 9"x 18" format. This airplane and its camera was so closely monitored that its tail number and code was often changed. While at Yokota, 52-1459 being its true serial, it usually had a green "X" on its tail. It was also known to have been re-marked as 52-1618 by November 1963, 52-1423 in 1964, 52-1423 with a green "M", and 52-1421 again having its "X." These 6091st TRS Canberras played a vital role at a critical time in the Far East, eventually being augmented with RB-57Ds.



Air Force Canberras participated in many joint international exercises. A Sabre of the RCAF (or RAAF) flies wing on this RB-57A specially marked with yellow fuselage bands and tail flash for the exercise. (N. Taylor)

B-57Bs are prepared at the Martin plant, Baltimore, for their ferry flights to using organizations. Normally they were first flown to Warner-Robins AFB, Georgia where they were received by the Air Materiel Command there before being further assigned to bomber units. (USAF)



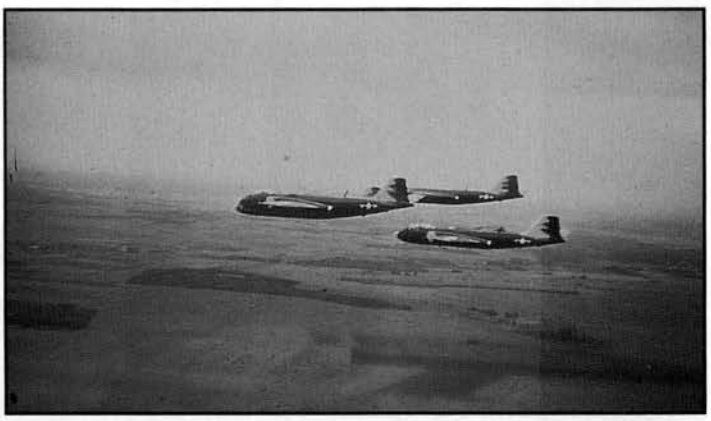
The 461st Bomb Group was the first to be fully equipped with the B-57B bomber version. They demonstrated mobility by two extensive unit movements throughout Central America and Europe. This view, taken at their home base, Hill AFB, Utah, shows a B-57B of the 766th Bomb Squadron with a white meteor as their color. (USAF)

The Michigan ANG received RB-57As at a very early time, their first coming direct from the factory beginning in May 1954. Those that followed came from resources from Germany, for those two units seemed short lived.

While Tactical Bomb Wings and Groups waited for the B-57B Night Intruder models to be completed and delivered, the 345th TBG became the first of the four Bombardment units to receive the Canberra. This was in the form of no less than five RB-57As, however, arriving singly at Langley AFB between June 22 and July 14, 1954. The 345th was not so designated until July 19, 1954, and therefore these assignments were to the 424th and 4400th Bombardment Squadrons of the 4400th Combat Crew Training Group at Langley, mainly for the purpose of proficiency training for maintenance crews. A few of the pilots were checked out before the airplanes were reassigned to the 363rd TRW at Shaw, or returned to the factory. The 345th became the first of the four tactical bomb groups to receive the B-57B bomber versions. It was the 461st Bomb Group (Tactical) that was the first to be fully equipped with the new bombers. After receiving their first B-57Bs in January 1955, at Hill AFB, Ogden, Utah, this unit moved to its new home at Blytheville AFB, Arkansas, over a period from July 1955 to April 1956. As part of the restructuring of the Air Force to 95 wings, the 38th Bomb Group (Tactical) was again activated on 1 January 1953 at Laon, France, with B-26s until these could be replaced with B-57Bs to support the European theater.

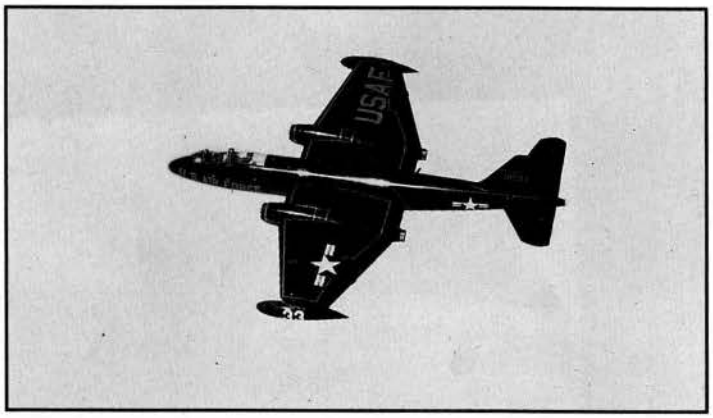
In the Far East, the 3rd Bomb Group (Tactical), which served continually in that theater from the beginning of World War II, turned in their B-26s for B-57s, and completed the four group build-up of Canberra night intruder bombers by 1957.

This in-flight view of a B-57B belonging to the 822nd Bomb Squadron, 38th Bomb Group, was taken some place over western Europe in November 1955. This was the only Bomb Group in Europe to be equipped with B-57B Canberras. (P. Pitt)



This flight of four B-57Bs is the aerial demonstration team called the 'Black Knights.' They were part of the 38th Bomb Group stationed at Laon, France. Precision aerial maneuvers performed with these bombers were thought not possible by many onlookers. They performed over many parts of Europe. (D. Menard)

This red meteor followed by yellow and white of the other two squadrons identified the 764th BS of the 461st BG. A yellow meteor followed by white and red identified the 765th BS.



The 3510th Combat Crew Training Wing at Randolph AFB, Texas, provided aircrew training for overseas units beginning in late 1954. Their aircraft were distinctive only by large ship numbers painted on their tip tanks. The 461st at Hill AFB, Utah, also utilized this training while the 345th trained their own crews at Langley AFB. (USAF)

To provide qualified pilots for these units to be re-equipped with B-57s, a transition school was formed at Randolph AFB, Texas, as part of the 3510th Combat Crew Training Wing. Many of the first B-57Bs and B-57C dual control models were initially assigned there beginning in November 1954. To be qualified for B-57 training, pilots needed 1,000 hours total time with twin-engine experience. At Randolph, 25 hours in the T-33 was part of the program to become jet qualified before transitioning to the B-57.

The 3rd Bomb Group in Japan and the 38th Bomb Group in France, each sent three groups of six pilots each for this training. Upon completion, they were to ferry new B-57s across the water to their home units. Pilots from the 461st Bomb Group at Hill AFB received this training also, while the 345th Bomb Group handled their own training at Langley. The training at Randolph, however, did not go as initially planned. Each class was to last for two months, but because of the frequent groundings of the B-57, these classes lasted anywhere from 6 to 13 months. This coupled with delayed production caused many graduates to be returned to their home stations, only to be sent back later when their aircraft were ready for pick-up.

Warner-Robins AFB, Georgia, was the pick-up point for the new airplanes awaiting overseas delivery. Aircraft were usually ferried in groups of four to six. For those crossing the Atlantic, crews from the gaining squadrons augmented ferry crews from the 1737th

On 9 January 1956, the first B-57s arrived at Johnson AB, Japan, for the 3rd Bomb Group. Their former B-26 crews were sent from Japan to Randolph AFB for training, then to ferry their new bombers to their home station in Japan. Frequent groundings of the Canberra in these early days heavily disrupted this scheduling.

Delivering the Canberras to the 3rd Bomb Wing at Johnson AB, Japan was a critical crossing for these airplanes. Departing McClellan AFB, California, for Hawaii, were flights over five hours with ferry tanks, and close to maximum endurance. Crossings were done in groups of four to five airplanes. Johnson AB near Tokyo is now Iruma AB, the HQ airfield for JASDF.

A new type of warrior arrives in Japan. Dressed in the traditional 'protective clothing' of the Samurai, a Japanese host greets the arrival of bomber pilot Ellis Bruch and the Canberra for the 3rd Bomb Group in 1957. Navigator Floyd Pond looks on from rear seat. D. Beggerly

Ferry Squadron at Dover AFB, Delaware. Routing to Europe was through Goose Bay, Labrador; Reykjavik, Iceland; Preswick, Scotland; on to Laon AB, France (B-57Bs) or Spangdahlem AB, Germany (RB-57As).

For aircraft going to Japan, newly trained crews from the 3rd Bomb Group had a lead pilot from the 4440th Ferry Squadron. After a local acceptance flight at Warner-Robins, the new airplanes were flown non-stop to McClellan AFB, Sacramento, California, so that a fuel consumption curve could be plotted before launching out over the Pacific. The crossing was critical due to limited fuel reserve on the longest leg from McClellan to Hickam AFB, Hawaii. Winds had to be just right, with no more than 40kts head wind component for the more than 5hr 30mins flight to Hawaii. An additional 558gal were carried in a ferry tank mounted on the bomb bay door, but more than one B-57 flamed out while taxying off the runway at Hawaii.

The one aircraft that was lost occurred during the initial movement of 56 Canberras to Japan, and that was 916 on 12 May 1957. At Ocean Station *November*, a Coast Guard weather ship mid-point between California and Hawaii, it was learned that Pete Cotellesse's airplane in Black Crow Delta flight of three had a fuel system malfunction which left insufficient fuel to reach land in either direction. The only recourse was for Pete and navigator Gayle P. Johnson to eject near the ship. On the first pass, Gayle was to go out, and on the second pass, Pete would go. Signals got crossed someway however. When Pete told Gayle to jettison the canopy (intending only to clear the cockpit of debris) he took this as the signal to 'go' which is normal procedure. He 'went out' – eight miles short of the ship! Gayle was in the water for nearly 40 minutes before rescuers located and got him on board, but the incident ended safely for both.

The air route across the Pacific after Hawaii was Johnston Atoll, Kwajalein, Guam, then direct to Johnson Air Base, Japan (now Iruma AB, near Tokyo). Each stop along the way was filled with its own and unusual experiences. One hairy incident stands out. Five B-57s were landing at Johnston Atoll, which by its size looked like an

Distinctive markings for Canberras assigned to the 3rd Bomb Wing in Japan consisted mainly of the Roman III on the tip tank with colors used to denote the different squadrons. This yellow marked B-57B belonged to the 8th Bomb Squadron. Fagen via D. Menard

Instrument panel of the B-57 was conveniently arranged. Flight instruments were grouped at center and left, and engine gauges were at right. Fuel control panel was laid out in schematic format, with engine fuel shut-off wafer switches already converted to toggle switches but not shown safety-wired to 'on' position in this picture. Stabilizer trim indicator above canopy switch at left. (D. Beggerly)

aircraft carrier in the Pacific. As number two aircraft was making his 'short field' approach to land, gusty winds at the shore line caused his left wing tank to drag on the coral overrun. This swung the airplane to the left nearly 45deg off the runway heading, directly toward the narrow passage between the fuel storage tanks and the control tower. As all others watched in dismay, the pilot, Bobby Presley, applied full power to the engines that were resting at idle for the landing. The left engine came up to speed first and violently swung the airplane back to the right. Just then the right engine surged to full power and stopped the turn and levelled the airplane on a near original heading. With the gyrations subsiding, Presley raised the gear and gingerly held 160kts as the airplane gradually climbed in a nose low attitude since the flaps were still in the down position. 'Get your flaps up Bobby! Get your flaps up!', yelled I. H. Young over the radio as Bobby passed the end of the runway. His reply, which expressed the tenseness of the situation and afterwards became a classic slogan within the group, was: 'everything is going so good *now*, I hate to change a thing!'

A rash of seemingly unexplained accidents plagued the early days of the B-57s which caused long and frequent periods of groundings. Crashes were far too frequent and early problems with the Canberra took the lives of many crew members. The most common and always fatal accident occurred when flying at high speed at a low level and the airplane would suddenly pitch-down into the ground. Runaway trim seemed the cause, but the reason could never be positively determined. As accidents persisted, with what seemed like increasing frequency, all tactically assigned B-57s were grounded again in May 1956, this time for a period of four months, one of the longest groundings of any Air Force airplane up to that time. One or more of nearly a dozen 'fixes' obviously corrected the pitch-down problem and no further accidents of this nature occurred.

The 'fix' most reassuring to B-57 pilots was that should a runaway nose down trim condition occur at maximum speed, 80lb of pull force – which was well within the bounds of any pilot striving for survival – could hold the nose up until speed was reduced to ease control pressure. Should the trim go to full nose up, this be-

This original B-57B cockpit configuration shows dive brake toggle switch under canopy ledge (arrowed), and stabilizer trim gauge on lower right side panel. Emergency hydraulic hand pump handle was normally stowed. This thruster type ejection seat was replaced in early 1970s. (USAF)

Most noticeable change over the years for the B-57 cockpit was the introduction of the Douglas ESAPAC rocket ejection seat. It could take the seat high enough for ground level escape provided there is sufficient forward speed for chute deployment. A heavy blade knife designed for the nearly impossible task of cutting through the canopy was on a holder below the windscreen.

came uncontrollable above 350kts, but the resultant climb and a power reduction would automatically reduce the speed to where it became controllable. The stabilizer trim gauge was moved to a conspicuous location where it could be monitored easily, and a switch was nearby to cut power to the trim motor.

As with any new airplane, there were many changes to be expected, and some may have already been forgotten – like cigarette ash trays installed in the cockpits when delivered! One of the earliest modifications was the repositioning of the dive brake switch which was hidden under the canopy rail and had to be held throughout the full travel of the 'boards'. This was soon changed to a two position switch easily actuated by the thumb on the right throttle. The canopy open-close switch at the left of the windscreen went through a number of changes from a push-pull to an up-down shielded switch. Few canopies came open and *off* in flight after that change.

The fuel control panel was simple but initially its simplicity created trouble. It resembled a schematic of the fuel system and positioning the control knobs set up the desired flow. However, all the knobs were of the same shape and size – including the engine fuel shut off and bypass switch. When different paint colors also failed to eliminate turning the wrong knobs, these two functions were changed to safety wired switches and a square pull-knob respectively.

We felt that the Canberra noticeably lacked adequate navigation aids in that they were initially equipped with only a radio compass. TACANs were finally added by 1959 and other improvements such as solid state UHF radios, IFF with altitude readout, VOR-ILS, etc, followed over the years. What we called the 'poor man's rudder boost' became installed in the 'Bs' and 'Cs' in 1960. These were not as effective as the full-time power rudder system manufactured into the 'Es', but when the pilot applied heavy rudder force as needed in asymmetrical power situations (single engine), hydraulic power assist supplemented pilot effort. This did not reduce safe single engine airspeed below 155kts however.

The FAA acquired two RB-57As for use in flight testing the high altitude jet route structure. N96 was formerly 52-1438, while N97 was 52-1447. This FAA Canberra N96 crashed in 1960 when the pilot had to eject when the control column inadvertently disengaged as part of the emergency ejection system.

Three B-57s of the 3rd BW in Japan make a formation turn above the Kanto Plains. When the 3rd assumed the nuclear strike mission in the Far East, their 70-83lbs of black paint that had not held up well in the first place, gave way to unpainted, more heat reflective natural metal skin.

Mount Fuji was always a favorite background for flying units stationed in Japan. In this view is 'Green Echo,' one of the B-57C dual trainers assigned to the Training Flight of the 3rd Bomb Wing.

As late in the life of the B-57 as 1972 to 1974, the original ballistic ejection seats with arm rests and actuating grip handles were exchanged for the Douglas ESCAPAC zero-zero rocket seat actuated by pulling a ring positioned between the legs or pulling a curtain down over the face. (These were included in the B-57G modifications in 1969.)

The most unusual handling feature of the British Canberra and early B-57s was that when lowering the landing flaps, the nose would come up, requiring push force on the control wheel instead of neutral or a slight back pressure to hold the nose up. This was soon corrected mechanically by what was called a 'bungee' – an electrically operated system that would apply 25lb of push force to the elevator control system when the flaps started to the down position. This artificial system in this modification made flap extension feel like that of most other airplanes.

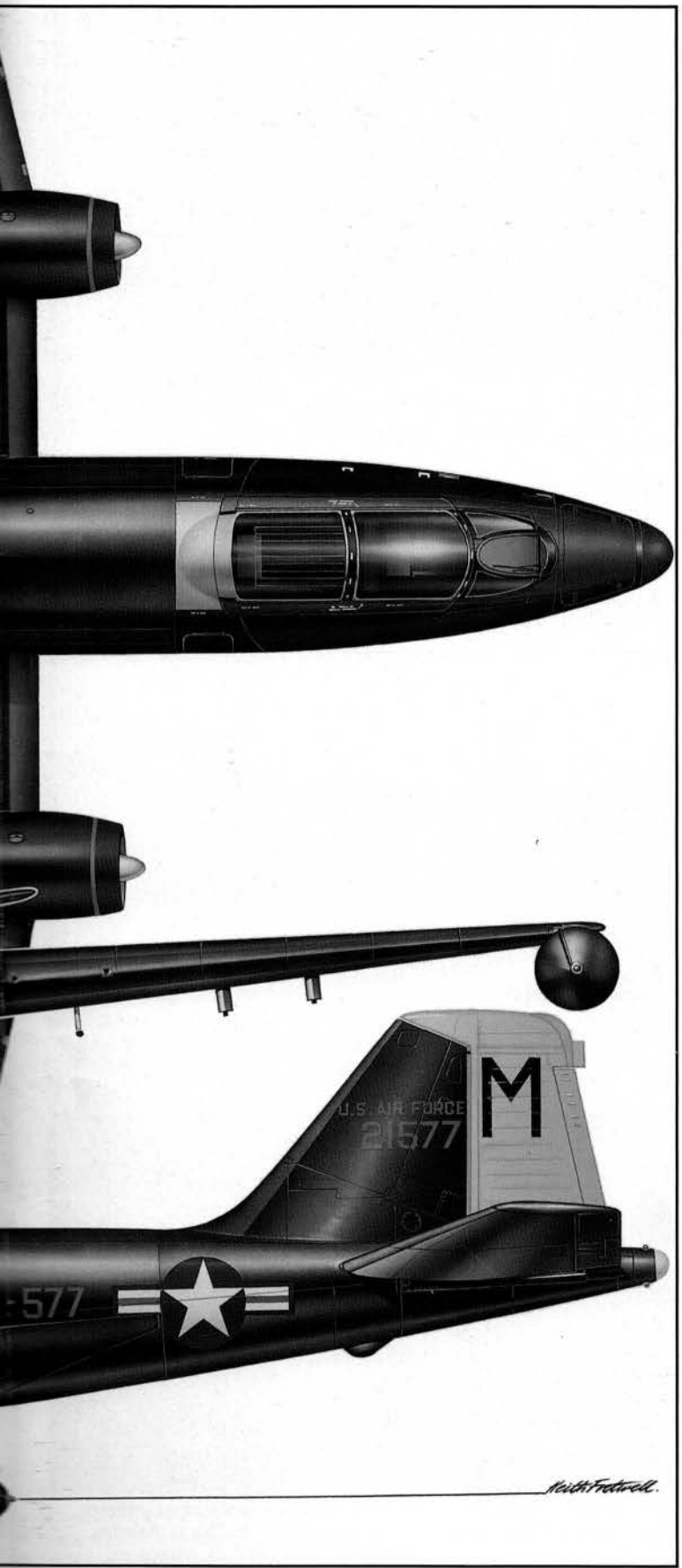
This crisp shot of the nose of B-57B 53-3867 shows many details of the freshly cleared skin of the factory applied black paint in 1959. The blue nose indicates that this Canberra belonged to the 90th Bomb Squadron of the 3rd Bomb Wing, Japan.

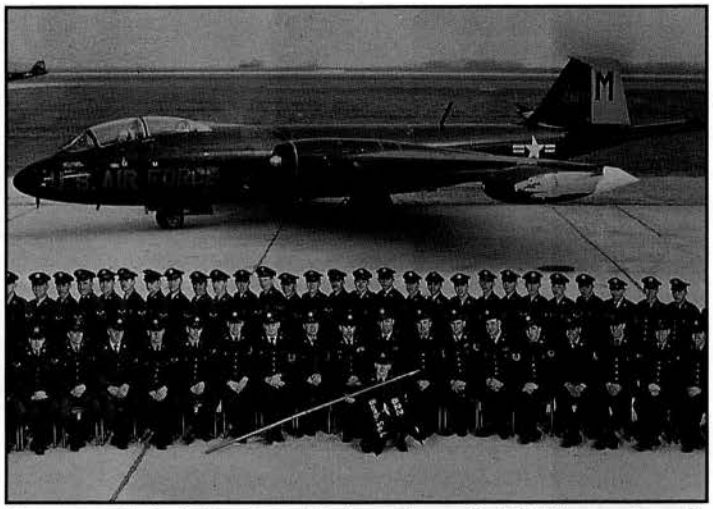
The control column automatically stowed as a part of the ejection sequence. This cleared the way for the pilot's knees as the seat carried him out of the airplane. I only know of one instance where the column inadvertently stowed, and it took some doing to talk the FAA pilot into leaving the airplane instead of trying to land it with the use of elevator trim alone.

There were all kinds of problems in the early days of the B-57 that caused in-flight emergencies: nose wheels came of, fuel tanks would not feed, causing extremely unbalanced conditions, and many more. In time however, these problems were corrected, and with experience we were better able to cope with unusual situations. The airplane soon lived up to its full expectations.

By the time the four bomb groups received their full inventory of new B-57s, a number of tactical developments and exercises were geared to these new jet bomber units. The first of these was Exercise Sagebrush in November 1956, which took place across the lower eastern portion of the US and involved both US Army and Air Force units. The 461st TBG and 363rd TRW were the ag-

OVERLEAF: This is a typical ramp view of 3rd Bomb Wing B-57 aircraft at Yokota AB, Japan around 1964. The 40th FIS and its alert hangars with F-102s is in the top of the picture at the south end of the base. The 3rd BW departed soon after this picture was taken, influenced by the Vietnam War.





Showing pride in their unit and their newly acquired B-57s, members of the 822nd Bomb Squadron, 38th Bomb Wing at Laon AB, France, pose for a formal picture in 1956. (D. Menard)

gressors and demonstrated the swift striking capability of jet strike force by achieving a quick victory. In 1957, 13 B-57s of the 461st made up Task Force 'Vista Able' for a goodwill flight to several Latin American countries extending as far south as Tulara, Peru. Again this same wing took part in 'Mobile Charlie', a deployment to support Exercise Counterpunch in Europe in 1957, aided by B-57 Canberras of the 38th Bomb Group at Laon AB, France.

It was on the return to the United States from 'Mobile Charlie' in Europe on 6 September that the 461st had a very close call. At the point of no return out of Keflavik AB, Iceland en route to Goose Bay, Labrador, 1Lt James E. Kater recognized a fuel system problem (in 53-3885) which made the wing tank fuel unusable.

Flight leader Capt Albert T. Keeler (in 53-3934) took the two ships to 45,000ft where lighter winds were reported. Keeler's navigator, Robert B. McMullen, who was the 764th Squadron navigator, coordinated with 1Lt Don H. Hall, Kater's navigator about the problem. McMullen gave Keeler assurance that Kater and Hall would probably be flamed out at the destination, but they could make it, establishing positive thinking in the flight. Hall calculated they would only have 600lb of usable fuel upon reaching land fall, but would have another 127nm to go to reach Goose Bay AB against 100 to 120kt headwinds. The flight was over the southern tip of Greenland, and to save fuel, Kater jettisoned his dry tip tanks. Air Sea Rescue was altered and a SA-16 Albatross followed the aircraft toward Goose Bay. When radar reported landfall, Kater shut one engine down to save fuel, placed the other at idle, and began his descent toward Goose through some cloud layers. Keeler hung on through the clouds, staying on Kater's wing to help work through the problem. This was not a new experience to Keeler, for two years before in May 1955 he made the first dual flame-out emergency landing for a B-57 at Scott AFB, Illinois. For this display of airmanship, he was awarded the Air Medal.

At 8,000ft altitude, GCA gave their position as 2 miles out. The F-89 positioned at 'high key', which Keeler had requested to give field location from above the undercast, reported that he was directly over the field. After Kater put the gear down, while still

LEFT: Courtesy of Aerospace Publishing, Ltd.

Mito Range was the frequent practice target for B-57s of the 3rd BW in Japan. This rare view shows 879 having just released a 28lb practice bomb in a glide bomb delivery from its spacious bomb bay. Rocket and gun passes, as well as skip bomb, LABS and Shoran drops were also practiced regularly. (R. Barnett)

A full generation of pilots flew USAF B-57s. Barbara Lynn Bruch, age 10, welcomes her daddy back to Japan from Korean deployment in 1958. Eighteen years later she married B-57 pilot, 1Lt Timothy Killeen, a member of her father's unit, the 4677th DSES while at Hill AFB, Utah. (E. Bruch)

having power with which to do so, the two aircraft began a 360 degree gliding turn to lose about 4,000ft of altitude. During this descending turn, Kater and Hall lost their last engine to fuel starvation. As they rolled out of the circle, they broke through the bottom of the clouds at 4,000ft, with the landing runway directly beneath them! This was a perfect position to begin a second 360 degree turn, gauging every degree of bank for the touch-down point. Kater frantically hand pumped the flaps and dive brakes down to kill off excess altitude while turning base and final. With this double engine flame out, he touched down at about the 2,000ft marker. Pilot skill coupled with the teamwork displayed by Air Rescue Service, Goose RAPCON, element leader Al Keeler and other Goose agencies were directly responsible for the *save* of a valuable aircraft and possibly the lives of two crew members. Kater and Hall were awarded the Air Medal for this action.

On 2 April 1964, the 3rd Bomb Wing no longer had a nuclear strike commitment and returned all its forces to its home at Yokota AB, Japan. The return of 20 airplanes filled the ramp to overflowing with a full wing complement of B-57s. Wives and friends met the B-57 crews at their planes for this highly celebrated event.

The 'Pickle Barrel' trophy was the focal point of esprit de corps for the 3rd Bomb Wing, being awarded to the squadron having the highest overall B-57 weapon delivery rating during a quarterly period. As the 3rd BW deactivated in 1964, Lt Col Fred Grindle, CO of the 8th Bomb Squadron, accepts again the coveted award for his squadron. To his left are Carl Bratten, and toasting is 'Bear' Barnett, both killed in the 8th BS after it deployed to SEA. At right is Operations Officer Howard O'Neil, destined to drop the first live ordnance on an enemy from a USAF jet bomber while CO of the 13th TBS. To his right is author Bob Mikesh, pilot of winning crew of the 8th. The 'Pickle Barrel' stayed with B-57 units throughout the war in SEA and was retired to the Air Force Museum from Ubon when the 13th TBS was deactivated in 1972.

After three short years with these B-57s in tactical bomb groups, the units were programmed to be phased out. The 38th was the first to begin by ferrying their aircraft back to the U.S. in early 1958. Soon afterwards, as of 1 April 1958, the 461st at Blytheville was also deactivated. No sooner had the B-57 bomber force been removed from Europe, however, than a threat to peace developed in Lebanon. To provide a show of force, B-57s from the 345th Bomb Group at Langley were deployed within a three hour notice in July 1958, for Turkey, as part of Composite Air Strike Force 'Bravo.' Once in place at Incirlik Air Base, Turkey, nothing happened, but they remained there over three months, and ready for any action.

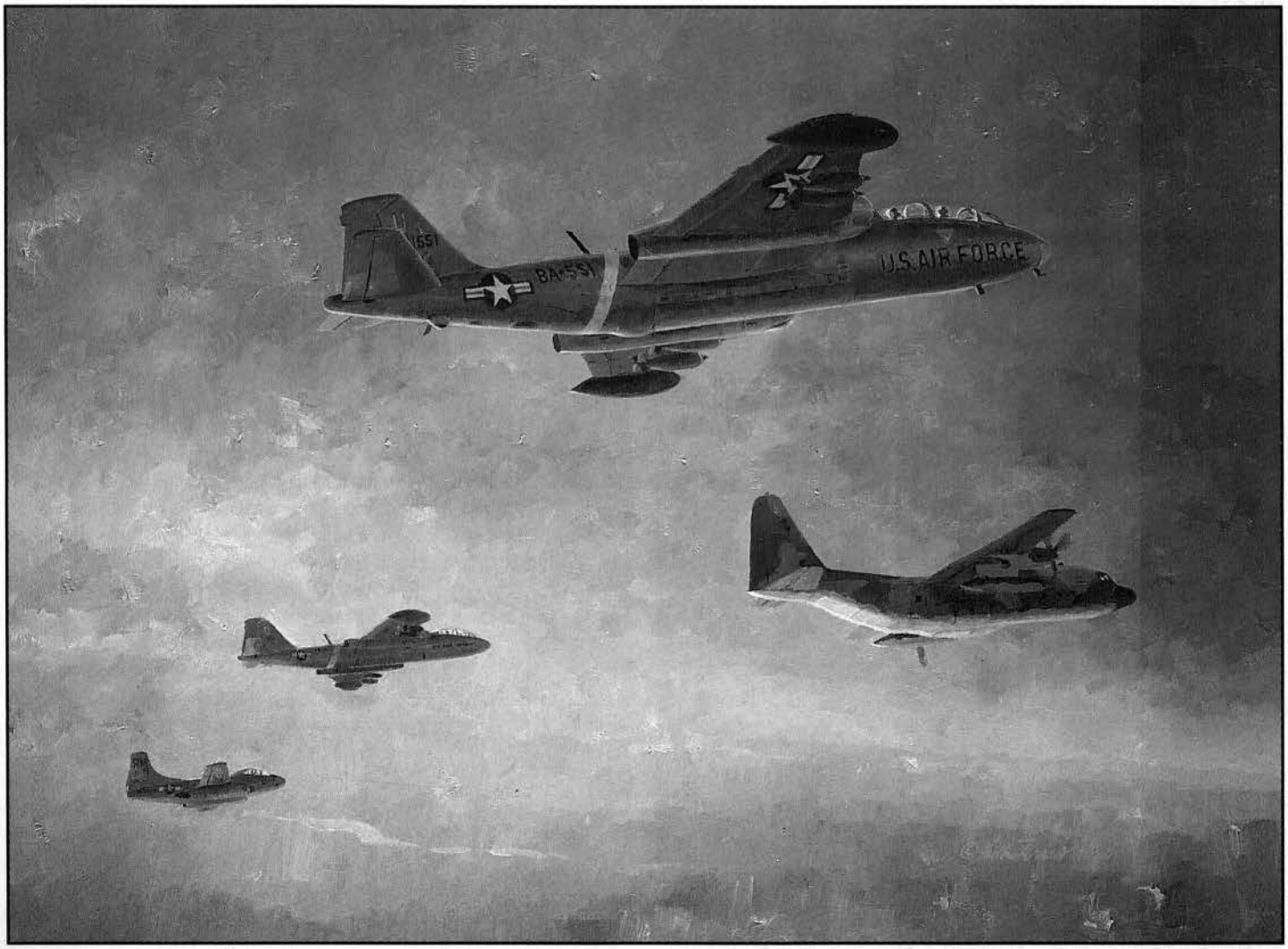
On the other side of the world, another crisis erupted in the Taiwan Straits. Again the 345th was called upon for support, and 12 or more B-57s were deployed to Okinawa on 29 August 1958. Although B-57s of the 3rd Bomb Wing were close at hand in Japan, world tension kept them tied to their assigned strategic targets in that part of the world. For this time period, the strength of two squadrons of Canberras from the same 345th Bomb Group in the U.S. were sent off in opposite directions on tactical operations and nearly met on the other side of the world. When the dust settled, the 345th was disbanded on 25 June 1959, leaving only the 3rd Bomb Wing to survive for nearly another five years as the only tactical bomber wing within the USAF. Its existence seemed essential, however, as its primary mission was a SIOP (Single Integrated Operations Plan) commitment for 'Quick Strikes' against strategic targets on the mainland of China, North Korea and Russia. Since nuclear weapons could not be maintained in Japan, the 3rd Bomb Wing set up a rotation of aircrews to stand alert at Kunsan, (K-8) Korea, with nuclear armed B-57s which were ready to be launched against preplanned targets, and to be airborne within 15min notice. At first, alerts lasted for a month at a time as each of the three squadrons took a turn, but soon changed to a two week crew by crew rotation. This continued for an agonizing period from August 1958 to 2 April 1964. Approximately one-third of the wing was at Kunsan all the time, which meant for the air and ground crews, one-third of their time was spent away from their families living in Japan. I know, for I had my share of deployments to 'Pad C' at K-8 for the last year of this period.

10

NIGHT INTRUDER MISSIONS

While B-57s proved their worth as excellent close air support aircraft during the day, it soon became evident during this time period that it was the most suited aircraft for the night interdiction role. Enemy supply lines flourished under cover of darkness and in March 1965, B-57 night missions out of Bien Hoa began with a determination to slow this traffic. In anticipation of this, the two B-57, squadrons had begun night flying training at Clark at the turn of the year.

The first night missions were led by Capt Fred Huber of the 13th, over a free strike area 68 miles south of Da Nang. The technique was for the lead aircraft to locate the target area and drop parachute flares for illumination. The second aircraft then made regular ordnance passes with bombs and guns. Later, at the direction of 2nd Air Division, Maj Howard "Howie" O'Neal experimented by using a C-130 as the flare ship which gave freedom for both B-57s to work the target. Night attack training of this type



This was a strange mix of aircraft on a very coordinated night mission attack. Ably portrayed in "Night Intruders" by Keith Ferris in this painting, the C-130 used night sensors to search for ground targets. Once identified, the C-130 dropped flares, and the B-57s made their attacks. The Marine EF-10B kept electronic surveillance over possible enemy missile attacks. (© 1980 K. Ferris)

Like clockwork, another Canberra leaves Bien Hoa to seek out the enemy and unleash its deadly load. This airplane was armed with four M39 20mm cannon with 290 rounds totalling 1,160 for the airplane. Earlier aircraft from 52-1493 thru' 575 were equipped with eight M3 .50cal machine guns of 300 rounds each, totaling 2,400 rounds for each aircraft. (USAF)

continued in-country through the rest of March and into mid-April. By the time the B-57 crews ware trained and ready for night intruder work along the supply routes in Laos, a well coordinated system had been worked out. Although not all night missions were flown in identical fashion, one in particular proved very effective. Two B-57s would depart Bien Hoa climbing to 30,000ft on a route that would take them to a predetermined location, usually a TACAN fix or a prominent geographical location, generally across the Laotian border. Approaching this location, it was not difficult for the lead bomber pilot to sight the rhythmic flash of the rotating red beacon on top of the C-130 flare ship. Called 'Blind Bat', this C-130 would be circling at 15,000ft where a most unusual formation would form. The two B-57s would join on the C-130, one on each side, remaining slightly high so as to maintain position by the white lights displayed only on the top of the aircraft. The red beacon would now be turned off. Below and slightly to the side was a strange friend to this incongruous formation; a Marine EF-10B Douglas Skyknight. This two-place twin-jet straight wing fighter even predated the Canberras, and a squadron was stationed at Da Nang. They were an excellent airplane for the purpose. Protecting this air strike team, they jammed radar controlled AA and detected hot missile sites that might be preparing to launch. One B-57 pilot recalls that a twin-engine Grumman S-2 Tracker filled the space of the EF-10B on at least one occasion. As if this ware not enough, an RB-57E from the 'Patricia Lynn' unit at Tan Son Nhut joined in a trail position behind the C-130. This aircraft equipped for night photography would take real-time photographs to record the night's accomplishments. After the first few weeks of this night operation, the 'Patrica Lynn' accompaniment was discontinued.

The B-57 proved to be the best airplane in SEA for night intruder missions the purpose for which it was selected 14 years before. Good visibility from the cockpit without structural hindrances was a marked feature. It could be slowed in flight sufficiently for the crew to have time to pick out targets and line-up on an attack run. Good loiter time and large bomb loads were also important assets.

Once joined, the formation proceeded to a point on the vital highway network, dubbed the 'Ho Chi Minh Trail' that fed the enemy to the south. The mission was to destroy any truck convoys that might be sighted as they carried supplies on their southern