

The Avro Lincoln in Australia.

By David Eyre and Brian White.

The Avro Type 694 Lincoln was said to be designed in anticipation of the Air Ministry specification B.14/43, which required a heavy bomber capable of operating at altitudes up to and including 35,000 feet, utilising two-speed-two stage Merlin engines, a larger bomb carrying capacity, an all up weight of up to 75,000 lbs., and a longer range than that offered by the earlier Marks of Lancaster. Better characteristics at height, in particular between 20,000 and 30,000 feet were also required where an ability to change height quickly was deemed necessary for evasive action against high flying enemy fighters, and against new forms of anti-aircraft attack.

A modification of the Lancaster was proposed to cover the specification and it was to be designated the Type 683 Lancaster Mark. 4. (An article on the Avro Lancaster in Australia appeared in this Journal in June 1964.)

The modifications originally intended were for a better performance, heavier armament, and very long range capability etc., but as these modifications were so numerous, Avro decided to issue a new designation to cover the aircraft, the Type 694 Lincoln. Mr. Roy Chadwick, the Avro Chief Designer paid great attention to detail design with a view to ensuring the design of an airframe with the best possible distribution of material on a strength/weight basis.

The prototype Lincoln B.1, PW925, flew unarmed from Ringway Airport, Manchester, on June 9th 1944, in the hands of Capt. H.A. Brown. This aircraft was later fitted with a Martin dorsal turret, but the next three prototypes and all production aircraft had a Bristol dorsal turret. Most of these turrets were eventually removed.

By progressive loading the all up weight of the aircraft was increased and it passed official trials at a gross weight of 82,000 lbs. The standard bomb-bay and Avro bomb gear catered for a wide variety of bombs including and adaptation of the largest of all, the ten ton "Grand Slam".

It was considered that the Lincoln would be suitable for operations in the Pacific theatre during the latter stages of the War, however due to early production delays between the Lincoln and later and/or special versions of the Lancaster, it did not enter service with the R.A.F. until September 1945.

The capitulation of Japan during September 1945 precluded the use of these aircraft in this theatre, and the Lincoln was used for bomber training, long range navigational training, armament trials and general aeronautical research. A number were used for world flights, amongst these being the flight of 617 Squadron, RAF to the U.S.A. and 97 Squadron, RAF, to Singapore in 1948. Although Lincolns entered service too late to see action during World War Two, they were used successfully against the Mau-Mau terrorists in Kenya and the Communist bandits in Malaya. Lincolns took part in the Berlin Airlift, one aircraft, RF345, being shot down by a MiG-15. In the mid fifties the Lincolns were withdrawn from front-line service with the R.A.F. but they continued to fly with Signals Command, in various training roles and as flying test beds. A number were sent to Australia for special tests and details appear later in this article.

In 1943 it was planned to build the Lancaster Mark 3 at the Beaufort Division of the Dept. of Aircraft Production, but this was changed in 1944 to the Mark 4.

Front Cover : Lincoln B.30 A73-20 Still in the SWPA markings and carrying the aircraft code letter 'V' of the Lincoln Development (LD) Flight which was responsible for compiling data on the Lincoln under Australian conditions. Photograph taken while on a navigation exercise circa 1947. Clive A. Lynch photograph.

Inside Cover, top : The same aircraft on the tarmac at Laverton, taken from the control tower to show the wing planform. Clive A. Lynch photograph.

Inside Cover, lower : Aircraft of No. 1 Squadron over Sydney during July 1958 when they were touring the capital cities on their return from Malaya. P.J. Ricketts photo.

Drawings were dispatched from the U.K. to begin production of the Lincoln. On May 11th 1943, Lancaster ED930 (later A66-1) arrived in Australia as a pattern aircraft but it was decided to build the Mark 4 variant, this being the Lincoln.

Actual construction of the Lincolns, initially designated B.Mark 30, was undertaken by the Government Aircraft Factory at Fisherman's Bend in Victoria. The designation B.30 was allocated to the Australian built machine to differentiate it from those built by Avro and Armstrong-Whitworth in the U.K. and those intended to be built by Victory Aircraft in Canada.

The first five Australian B.30's (A73-1 to A73-5) were assembled from components shipped from the U.K. The first Lincoln completed, A73-1, was first flown on March 12th 1946, at Fisherman's Bend, and was handed over to the RAAF on May 24th 1946. The first fully Australian aircraft, A73-6, was delivered to the RAAF on November 25th 1946, and the last Lincoln built, A73-73 being handed over on September 29th 1953.

It was originally intended that 85 Lincolns would be built in Australia and orders were in hand for the 85, but this was subsequently reduced to 73. Of these, 54 were Lincoln B.Mark 30 and 30 were Lincoln B.Mark 30A. The Lincoln was powered by four 1,750 hp Rolls Royce Merlin 66 and 85 engines built by the Engine Division of the Commonwealth Aircraft Corporation, the Merlin 66's being fitted outboard and the Merlin 85's inboard. When four Merlin 102's were fitted, the Lincoln became the B.Mark 30A.

The first production Lincolns were phased into No. 82 Bomber Wing at Amberley, in Queensland, to replace the Consolidated Liberators which equipped No.s 12, 21 and 23 Squadrons. In February 1948 these units were renumbered No.s 1, 2 and 6 Squadrons respectively. A fourth Lincoln squadron was formed on March 17th 1949, when 10 Squadron was reformed at Townsville, Qld., as a General Reconnaissance squadron. No. 1 Squadron later became a component part of No. 90 Composite Wing when it went to Malaya.

In 1949 fourteen Lincolns were modified as Long Range Navigation (LRN) aircraft for special duties. The modifications included the fitment of radio, radar equipment instrumentation, and an extra crew station aft of the mid-upper turret. The prototype for this conversion was A73-38, and other aircraft which were modified were A73-31 to 34, 36, 37, 39, 40, and 42 to 46.

On April 11th 1950, a Lincoln flew to the U.K. on exchange duties, being piloted by Flt. Lt. (later Sqdn. Ldr.) N. Nichol, and this aircraft, A73-46, was shown at the S.B.A.C. show at Farnborough that year. The exchange was for a period of six months and a Lincoln B.2, of the R.A.F. operated with No. 82 Wing for the same period. Another Lincoln, A73-15, was modified to a long range navigation trainer for the Air Navigation School at Sale. The aircraft had its turrets faired over.

During 1951 a major redesign to convert twenty Mark 30 Lincolns for General Reconnaissance duties was undertaken by the Government Aircraft Factory. Those converted were attached to No. 10 Squadron at Garbutt (Townsville). These were designated Mark 31, and were known as the "long nose" version. The prototype for this conversion was A73-48. The modification consisted of a 6' 6" extension to the forward fuselage inserted between the cockpit and the front turret, to house radar equipment and two operators. This increased the crew of the aircraft from seven to nine. The Lincolns modified to Mark 31 status were :- A73- 28, 48, 55, 56, 57 and 59 to 73. The overall length was thus increased to 84' 9 $\frac{1}{2}$ " and because of the additional equipment, the empty weight was increased to 44,900 lbs.

At a later stage it was decided to convert ten of the Mark 31's for Maritime Reconnaissance duties and a number of aircraft were modified to accommodate submarine location and detection gear. Eight Lincoln's were converted by the Government Aircraft Factory, Fisherman's Bend, these being A73-55, 57, 60, 61, 62, 65, 66 and 68. A further two were converted to this configuration by the RAAF, these being A73-28 and 67.

During 1961 all Lincolns in service with the RAAF were grounded and most were

flown to Archerfield where they were cut up and melted down. A number were purchased by Mr. P. Hookway and cut up at Townsville. These are believed to have included A73-61, 62, 66, 67 and 68. The sole Lincoln still in existence is A73-55, which is, at the date of writing (January 1968) standing engineless in the open on the south side of Amberley Air Force Base. The cockpit section of A73-27, which was used for fire-fighting practice at Mascot, was salvaged and is now in the collection of the Camden Museum of Aviation.

The last flight of a Lincoln was A73-65, on June 14th 1961, when it flew from Townsville to Darwin where it was used for fire-fighting practice.

Service Use: The following is a list of squadrons and units which operated the Lincolns.

No.1 Squadron. This squadron reformed at Amberley in 1948, being equipped with Mark 30's., moving to Tengah, Singapore on July 17th 1950. During the time they were stationed there, some 3000 sorties were made against the terrorists. A number of Lincolns serving with 1 Squadron were equipped with four rocket stubs under each wing. The squadron returned to Australia in July 1958 after an eight year stay in Singapore, being replaced in Malaya the Australian built Canberra B.20's. No. 1 Squadron was the last to operate Lincolns.

It was originally known as No. 12 Squadron, being part of No. 82(Bomber)Wing. Equipped with Lincolns it was redesignated 1 Squadron, still as part of 82 Wing. In Malaya 1 Squadron was part of 90 Composite Wing, the other part being 38 Squadron equipped with Dakotas. At various times the following Lincolns served with this Squadron: A73-12, 15, 19, 21, 23, 24, 26, 29 to 34, 36 to 43, 46, 50 and 53.

No.s 2 and 6 Squadrons. These squadrons were equipped with Mark 30's at Amberley until the Lincolns were replaced by Canberras during 1955. No. 2 Squadron was the first to receive Lincolns, followed by No. 6 Squadron, both squadrons being part of 82 Wing. Aircraft allotted as unit equipment appear in RAAF records as being attached to the Wing rather than the individual squadron. Aircraft used included A73-1, 3 to 7, 9 to 19, 21 to 47, 49 to 54, 56 and 58 to 61.

No. 10 Squadron. This unit was stationed at Townsville, reforming during March 1949 to be equipped with Mark 30's. The squadron was re-allotted to General Reconnaissance duties in 1951, later converting to the Maritime Reconnaissance Mark 31, which were in service until December 1961. During January to April 1962, 10 Squadron took delivery of Lockheed P2V-7 Neptune's from the U.S.A. and the Lincolns were withdrawn from service.

At various times the following aircraft flew with the squadron :- A73-3 to 6, 10, 12, 16, 17, 23, 26, 27, 28, 42, 43, 46 to 49, 56, 59 to 64, and 66 to 70. A number of aircraft from this squadron were stationed at Darwin for some time, and these were known as the 10 Squadron Detachment. Aircraft serving with the Detachment included A73-10, 12, 16, 17, 23, 27, 28, 30, 49, 60, 61, and 62.

No. 11 Squadron. Post war this squadron was stationed at Rathmines, NSW, and was equipped with Catalinas. It later moved to Western Australia where it was stationed at Pearce. In 1950 the squadron received Lincoln B.30's for use until the first of the P2V-5 Neptunes arrived from the U.S.A. In 1954 11 Squadron was transferred to Richmond, NSW. The Lincolns were only an interim aircraft pending the squadron's re-equipment with the Neptune. Lincolns in use were A73-26, 27, 28, 30 and 58.

Aircraft Research and Development Unit (ARDU)

This unit carried out research and used the following Lincolns for this purpose. A73-2, 3, 5, 6, 12, 13, 16, 20, 23, 29, 34, 41, 60, 73. RE259, RE339, RF403, RE418, RE423, RA638, RA640, and RA644.

A.R.D.U. Trials Flight (A.T.F.) and Air Trial Unit (A.T.U.)

No. 1 A.T.U. at Woomera and No. 2 A.T.U. at Edinburgh.

Weapons Research Establishment (W.R.E.)

The W.R.E. was the controlling body for the A.T.U. units, which used aircraft

specifically modified for the particular test. These included :-

RE339 - Fitted with Bristol Theseus 21's outboard. Tallboy and other special stores dropping.

RF403 - Armstrong Siddeley Python's outboard and Merlins inboard. This aircraft carried out high altitude bombing trials at Woomera and was scrapped at Tocumwal, NSW, in 1958.

RA648 - Named "Atlas", it was used for experiments under Far East conditions. Other aircraft used were - RA640, RA644, RE259, RE418, RE423 and A73-73.

Maralinga Trials Group. Not much has been released about this group, however it is known that Lincolns were used by this Group during British "A" bomb tests, and that two Lincolns used by the Group were A73-14 and A73-20.

No.1 Aircraft Depot (1.A.D.) This unit accepted nearly all Lincolns from the Government Aircraft Factory on their completion for acceptance tests prior to being allotted to the squadrons. It also carried out overhauls for A.R.D.U. and East Sale.

No. 3 Aircraft Depot (3 A.D.) This unit carried out overhauls for 82 Bomber Wing.

Air Armament School (A.A.S.), School of Air Navigation (S.A.N.) and the School of Photography (S.O.P.) These three units, stationed at East Sale, Vic, used Lincolns, as required, from Maintenance Squadron (MAINSQN) East Sale pool of aircraft for their courses.

A.A.S. used the type for training gunners and for fighter affiliation, together with armament staff officer's courses. Lincolns A73-8, 15, 19, 21, 25, 29, 30 and 33, were used at various times. One of these carried the name "Gundawarra" under the cockpit.

S.A.N. used Lincolns for training navigators for both navigation and bomb-aiming, and together with A.A.S., for the training of navigators for gunnery control duties. Lincolns used were :- A73-8, 19, 24, and 29.

S.O.P. This unit occasionally used Lincolns from MAINSQN for training photographic sorties, vertical photography, producing mosaics, feature line overlaps and pinpoints.

Australian Joint Anti-Submarine School (A.J.A.S.S.) used Lincoln A73-68 for anti-submarine warfare training.

Crew Conversion Unit (C.C.U.) converted aircrews to the Lincoln. They used A73-9, 10, 11, and 13 at various times.

Colour Schemes : When originally delivered, the first Lincolns including A73-6, had a natural metal all-over finish with World War Two Pacific area roundels - blue/white, and blue/white fin flashes. The propellor spinners were painted and there was an anti-dazzle patch on the nose. Squadron markings were painted on the tails (lettering above the fin flash) but these quickly wore thin and were not replaced.

After a while all aircraft were painted silver over-all. Squadron markings were:-

No.1 Squadron Lincoln B.30. Blue propellor spinners with the squadron crest under the cockpit. Also under the cockpits of those Lincolns that were used in Malaya, were small bombs indicating the number of operations flown. Red bombs indicated day sorties and black night strikes.

No.2 Squadron Lincoln B.30. Yellow propellor spinners.

No.6 Squadron Lincoln B.30. Red propellor spinners.

No.10 Squadron Lincoln MR.31. Blue propellor spinners.

No.11 Squadron Lincoln B.30. Black propellor spinners.

Operations in Malaya.

When Communist terrorists started attacking villages and small towns in Malaya not long after the end of the War, the Malayan Government asked the British Government for help to combat these forces. A number of British squadrons were sent to Malaya these being equipped with Seafires and Fireflies from H.M.S. "Triumph" which co-operated with Singapore based Beaufighters, Tempests, Spitfires, Harvards and Sunderlands in bombing and leaflet dropping operations. Leaflets in Chinese, Tamil

and Malay were dropped throughout the campaign also.

At the time, events in Malaya were daily proving their increasing seriousness. What was at first thought to be a small local spell of banditry turned out to be an insidious well planned and financed campaign against the established Government in Malaya. Australia realised the threat to her security that Communist success in the Far East constituted and in June 1950, the Australian Government offered to send No. 38 Transport Squadron (with Dakotas) for supply dropping and troop transport. This squadron was detached from No.86 Wing at Richmond. It was also agreed to provide assistance by servicing R.A.F. aircraft in Australia. These offers were accepted and on June 18th 1951, 38 Squadron commanded by Sqdn. Leader A.H. Birch left Darwin arriving in Malaya on the 19th, the squadron being operational ten days later.

Because of the increased terrorist activities in Malaya, the British Government decided to send a squadron of Lincolns, 57 Squadron RAF departing from Waddington, Lines, during March 1950. On the 27th they made their first attack in the Bahan district of Negri Sembilan which was known to be sheltering a large concentration on bandits. There was difficult weather at the scene of the attack and on this occasion, it was reported, that this did not upset the accuracy of the strike which was carried out in conjunction with Bristol Brigands.

The Australian Government then decided to send a bomber squadron to Malaya and the Lincolns of No. 1 Squadron (part of 82 Bomber Wing) flew to Tengah, Singapore, the first Lincoln arriving on July 16th 1950. No.1 Squadron then became part of No. 90 Composite Wing, the other part being the 38 Squadron Dakotas. No. 1 Squadron was operational by July 26th and made two airstrikes on that date.

From July 1950 to March 1951 the squadron made 155 attacks, 37 of them at night, dropping 1,236 five hundred pound bombs, 3,195 one thousand pound bombs, and firing nearly 250,000 rounds of ammunition in strafing attacks. A total of 1,254 hours were flown in that period and the operational target figure was exceeded.

During December 1950 to January 1951 the strength of 90 Wing was reduced slightly by the detachment of some of the Dakotas and personnel to augment the RAAF Composite Wing in Korea. The Australian squadrons operated on a rotational crew system, new crews from Amberley replacing the old, thus the number of experienced bomber crews was increased. In July 1951 the RAF Lincoln Squadron, No.57, was withdrawn from Malaya, leaving the Australian Squadron as the only heavy bomber squadron in Malaya.

By June 1951 No.1 Squadron had dropped 5,000,000 pounds of bombs on jungle hide-outs frequented by insurgents. Martial law was never proclaimed in Malaya and the action against the bandits was considered to be a police action. It was controlled by a civil authority and carried out by armed forces including the British Army, Royal Navy Units, Gurkha and Malayan Regiments aided by No.90 Wing RAAF, which, in 1951, was commanded by Group Capt. F. Headlam.

In the first year of operations 744 operational sorties were flown totalling 3,303 hours flying. The main work of the Lincolns was the bombing and strafing of bandit hideouts hidden away in the jungle fringes or near rubber estates and railway lines, which the bandits frequently sabotaged, causing derailments. The Lincolns also bombed at night and the technique was to follow directional searchlights operated by the Army ground forces.

No. 1 Squadron operated from Tengah Station, inland on Singapore Island, and the Dakotas of 38 Squadron from Changi, closer to the sea.

For the Lincolns the worst problem was the weather. At times the aircraft bombed from as low as 3,500 feet, well below the safe level of 6,000 to 8,000 feet. During January 1951 the Lincolns were unable to fly on most days after 11.00 am due to the weather conditions, but never-the-less, continued to provide heavy support for ground operations.

Jungle bombing was found to be very difficult. There were no targets in the accepted sense, no easily seen concentration of troops, no clusters of buildings etc., more often than not the target was simply a stretch of jungle indistinguishable

from any other part of the dense under-growth which covered most of Malaya. Despite these difficulties, 1 Squadron achieved a high degree of accuracy. Most of the bombing was done in support of ground troops, who, having detected a terrorist encampment or concentration would call for Lincoln support. Frequently targets were attacked less than 1,000 yards in front of the infantry, sometimes as close as 500 yards. Bombing called for extreme accuracy to avoid damage to civilian property and injury to troops who in many cases, stood ready to follow up the bombing.

Material damage caused by air strikes was found to be negligible. The type of Atap hut camp used by the bandits was easily constructed and repaired. Never-the-less the effect on the morale of the bandits was considered to be marked as they could only shelter from the bombs, rocket projectiles and cannon-fire until the strike was over. It is noted that a number of the Lincolns were fitted with stubs for four rockets under each wing.

The bomber crews did not see the result of their bombing apart from puffs of smoke which billowed out from the jungle after the bombing run. Captured bandits admitted that the bombing had made life difficult and most unpleasant. They told their captors stories of being harried from place to place with little time to grow food or organise raids on villages in search of supplies before more attacks came. The presence of the bombers is reported to have lifted the morale of the civilian population, especially the white managers of the tin mines and rubber plantations.

Crews found it very frustrating not knowing the precise effect that their bombing had, but occasionally information filtered back to the squadron indicating the results that had been obtained. An example is when the Lincolns struck a target in Saba and a month and a half later, received a report on the bombing and follow up. This report was as follows :-

"Ambush parties on the rubber edge killed one insurgent shortly after the bombing by No.1 Squadron, when a party of bandits attempted to escape into the jungle. A week later five more were killed in the adjacent area belonging to a platoon of No. 28 Company, which was known to have been in the area bombed by the Lincolns. During and after the strike, five cases of enemy parties appearing in the rubber were reported to the police by tappers. There has been a marked decrease in rubber slashing because No. 28 Company vacated the area shortly after the bombing. Undoubtedly this was the most effective strike so far carried out in the Saba district. The weight of bombs dropped by the Lincolns was sufficient to effect the complete migration of an enemy unit."

There were no airborne tactical air controllers in the Malayan operations as was the case in the Korean Campaign. In Malaya, all air strikes were pre-briefed on the ground. Requests for bomber or fighter bomber strikes originated from patrols, companies or battalions when they tracked down a band of insurgents and could pin-point their position. The request was relayed through Army signal channels to Joint Operations Control at Advanced Air Headquarters, Kuala Lumpur, where the request was studied and either rejected or approved. If approved orders were sent on to the squadron to carry out the strike. The Army Liaison Officer (Capt. T. Hill of the Shropshire Light Infantry in August 1951) briefed the assigned crews on the purpose of the operation, explaining what had been found, where the target was, and what the Army unit on the ground proposed to do once the strike had been made.

Some details of operations were released during 1953. The report went on to say:- "The AOC Malaya, Air Vice Marshal F.R.W. Scherger, RAAF, and his SASO, Group Capt. A.V. Bax were kind enough to bring us up to date on the anti-bandit operations. The Air Vice Marshal impressed us on the difficulty of getting definite identifiable and markable targets. Precision in pin-pointing objectives and placing the bombs there-on was an immediate aim. It was imperative not to flush the quarry from the camps before bombing started, so Hornets and Vampires were being used to pin them down while the Lincolns were making their runs, and while the troops were closing in."

Later some details were given of a typical bombing operation which took place during February 1953. This is "journalistically" given as follows :-

"From our midnight slumbers in the moonlit Changi mess, we were roused by a gentle hand and a soft voice promising a bandit strike tomorrow. Morning broke tranquilly (except for a barrage of Chinese New Year firecrackers) and we set out for Tengah. We met the Station Commander, Group Capt. C.M. Champion de Crespigny, his Wing Commander Flying, Wing Cmdr. M.W.B. Knight DFC and Wing Cmdr. N.T. Quinn DFC, RAAF. Officer Commanding No.1 Squadron RAAF, before being conducted to the operations room. There, Major Varwell the G.L.O. briefed us on the anti-bandit operation in which we were to participate. He related how three of some newly ambushed bandits had been killed, one had been wounded and one had escaped. The wounded man was proving co-operative in helping to pin-point the bandit's camp, with its armoury and printing press, and for fear that the escapee should "blow the gaff" and cause his colleagues to flee, it was proposed to attack that morning. Two Companies of the Cameronians were ready to close in on the encampment.

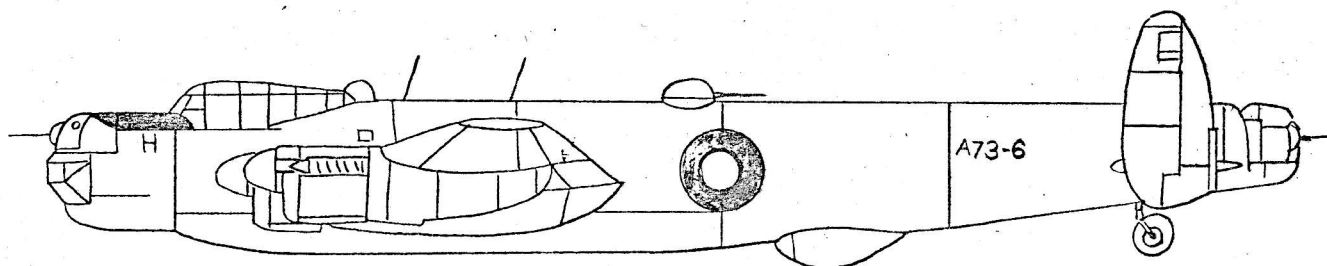
Our pilot was Sqdn. Ldr. D.C. Harvey, RAAF, the aircraft, a Lincoln B.30, A73-33, with a load of eighteen 500 pound bombs. There was no time to follow Wing Cmdr. Knight's advice not to be modest, but to strip except for over-alls, and we went aboard in khaki drill. Within minutes the four Lincolns detailed for the strike had bunched at the head of the runway. They were away in short order and at plus seven boost and 160 knots our own aircraft was closing on Wing Cmdr. Quinn's, with the swamplands, plantations and "ulu" streaming below. We glimpsed some Hornets drawing ahead to port, but soon lost sight of them behind curtains of rain. An hour or so out we picked up a smoke signal of the Cameronians. It had been the Wingco's intention that the two Lincolns with 1,000 lb bombs should open the proceedings, but the cloud base was below their safety height, so his and our own aircraft went in first.

The detonations of the closely spaced bombs reached up and hit our Lincoln before it could draw away in a steep turn. The Hornets followed us in, with smoke trailing from their cannon ports and rockets snaking out from under their wings. Orbiting, we looked down into the trees which had been shattered by the air-bursts of our bombs, and we smelt the acrid explosive. Then our Lincoln dropped low over the tree tops for her first strafing run. Under our nose, almost, the muzzles of the forward guns swung into view, and one by one the turrets set the floor shuddering as the gunners poured 20-mil among the trees.."

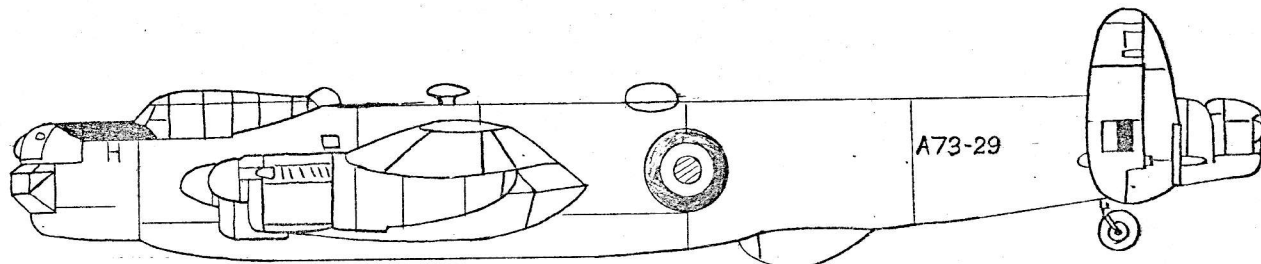
After lunch the Group Capt. drove us over to H.Q. Malaya, and in the Advanced Air Headquarters operations room we saw how the Duty G.2 (Air), Duty Squadron Leader Operations, and Duty Intelligence Officer sit together in direct contact with the Army and with the RAF. Major William and Sqdn. Ldr. Hancock found time to ascertain the results of our Lincoln strike some days before. It appeared that the captured Communist terrorist had been unable to identify the site of his headquarters and our bombs had struck 500 to 1,000 yards wide. They had, however, caused the C.T.'s to split up after which they had been twice bombed again. As a result of the operations five had been killed and five surrendered..."

In common with the Dakotas of 38 Squadron, the Lincolns achieved a very high rate of serviceability, this being 85%. In September 1957, No.1 Squadron received its Squadron Standard. This was awarded by the Queen and was presented by Air Marshal the Earl of Bandon, the AOC MC Far East Air Force. The Squadron also received the Gloucester Cup in 1951 and 1955. In the Malayan tour of duty, members of the Squadron were awarded; six DFC's, three Bars to the DFC, an OBE, a DFM, four BEM's, and fifteen Mentioned in Despatches.

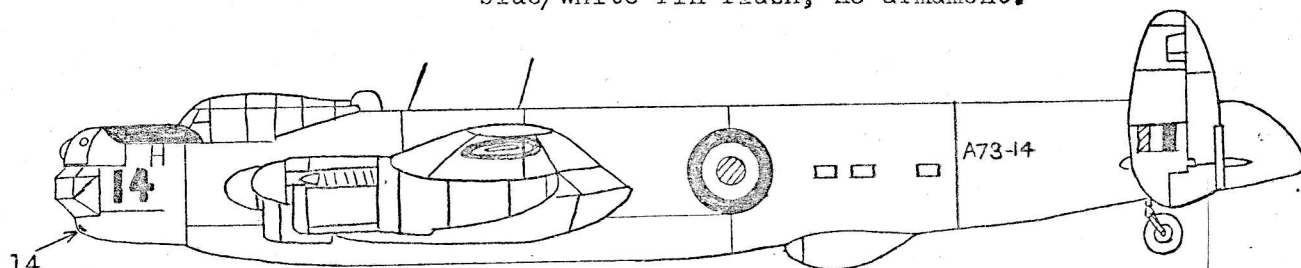
No.1 Squadron dropped 85% of all bombs dropped in Malaya, five times more than any other squadron there. Reports state that during this period terrorist numbers dropped from 11,500 active members to fewer than 1,000 men. During the period of eight years that it operated in Malaya, 1 Squadron carried out over 3,000 sorties dropped 33 million pounds of bombs (15,000 tons) and millions of leaflets. The squadron sustained no casualties in its operations but Flt. Lt. K.I. Foster (a rear gunner) of Preston, Qld., gained a DFC on August 13th 1950 for extinguishing a fire caused by a hung-up parachute flare in A73-36 whilst engaged on night bombing. This



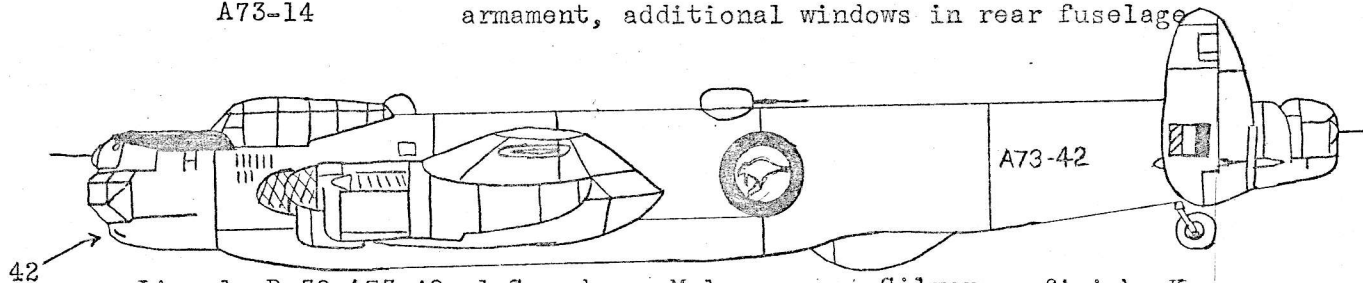
1947. Lincoln B.30 A73-6 Natural metal finish, blue and white roundels, no fin flash.



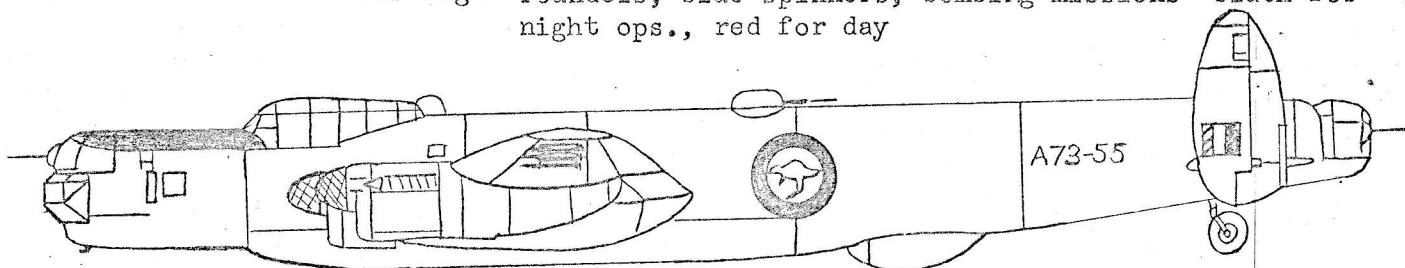
Lincoln B.30 A73-29 Silver finish, standard post war roundel, blue/white fin flash, no armament.



Lincoln B.30 (VIP) A73-14 Silver finish, standard markings, no armament, additional windows in rear fuselage



Lincoln B.30 A73-42 1 Squadron, Malaya. Silver finish, Kangaroo fuselage roundels, blue spinners, bombing missions -black for night ops., red for day



Lincoln MR.31 A73-55 10 Squadron, Garbutt. Silver finish, Kangaroo fuselage roundels, blue spinners, rocket stubs

fire could well have cost the aircraft and crew.

In 1958 1 Squadron ceased duties in Malaya and returned to Australia where the Lincolns were replaced with Australian built Canberra's. No.1 was the last squadron to use Lincolns in the bomber role and upon their withdrawal, they were cut up and melted down.

On their return, the five Lincolns, after landing at Darwin on Monday, July 6th, 1958, flew as a farewell salute over the various capital cities. Perth was visited on July 8th, Adelaide on the 10th, followed by Melbourne, Launceston, Hobart, Canberra Sydney and Brisbane before making their final landing at Amberley, Qld on July 17th. On this flight, the five Lincolns, led by Wing Cmdr. K.V. Robertson (carrying fifty crew members and groundstaff) symbolised all the men who served in the Squadron during three wars.

The only Lincolns to suffer mishap while operating in Malaya with 1 Squadron were as follows :-

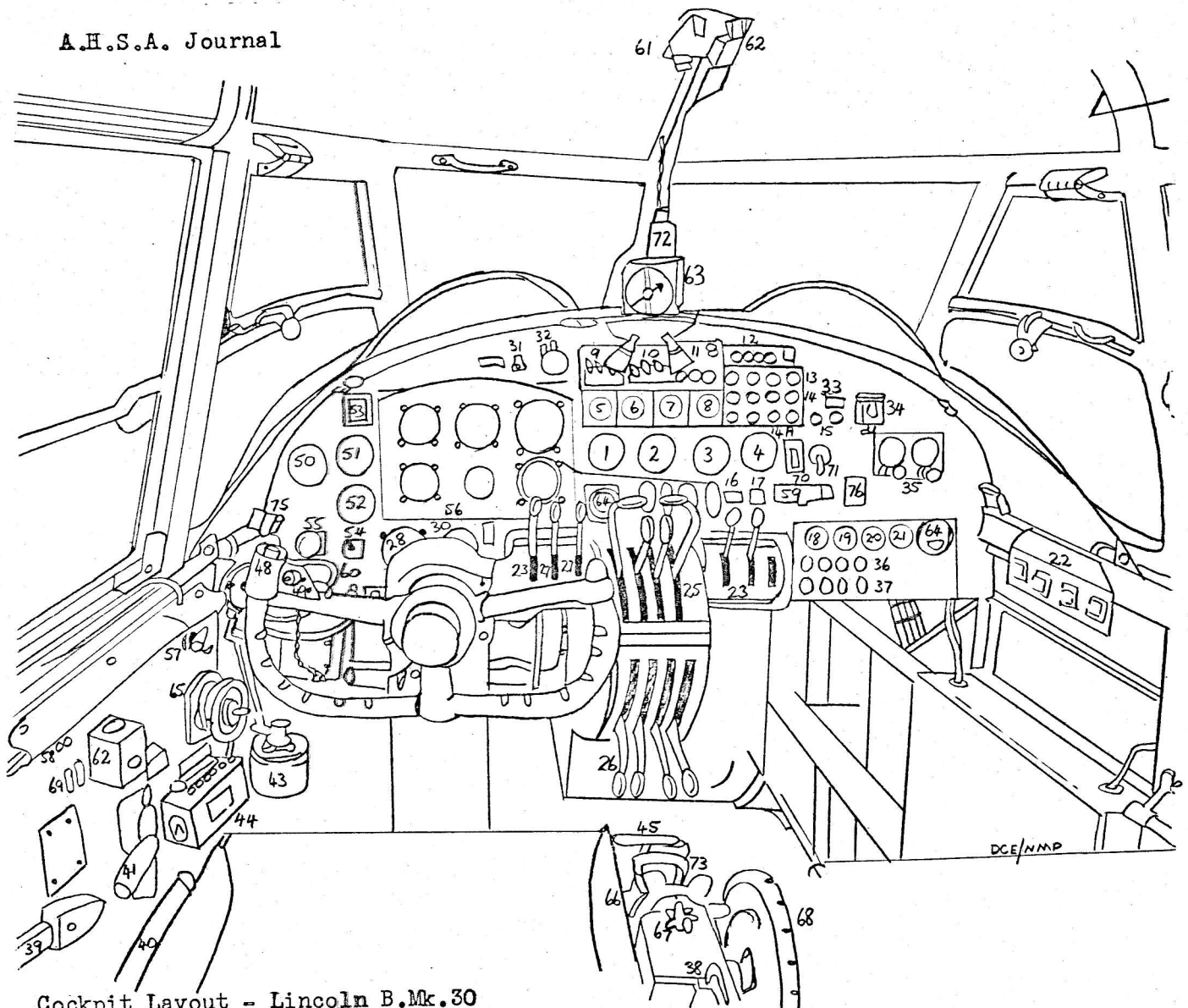
- A73-36 had a fire on board (as recorded above) but this was soon put out and not much damage was occasioned to the aircraft.
- A73-39 This aircraft overshot the runway at Singapore on November 30th, 1951 and was damaged beyond repair.
- A73-40 ditched in the sea 400 yards off the west coast of Johore whilst being piloted by Sqdn. Ldr. Eric Goldner on February 1st 1951 and was lost.

Special Purpose Lincolns.

- A73-13 These two aircraft were used by ARDU for special tests. Both had the mid-upper turrets faired in and the H2S blisters removed. A73-20 was used for rain making experiments in 1958, being flown by Sqdn. Ldr. N. Nichol. A nose probe was fitted and special equipment installed in the bomb bay.
- A73-2 This Lincoln was used by the School of Air Navigation (SAN). In December 1946 it carried out a navigational aerial survey during which it made three parallel flights across Australia at an altitude of 20,000 feet, twelve miles apart and a distance of 1,120 miles, photographing an area of 45,000 square miles, this area being the Woomera Rocket Range. The pilot was Wing Cmdr. D.R. Cuming. In March 1947 it flew a 2,500 mile survey flight to Macquarie Island, Antarctica, for meteorological, photographic and test purposes, to gather information for a forthcoming expedition. Photographic equipment included a Tri-Met K.17 camera set up in the nose. This was the furthest south an Australian aircraft had flown up to that time. This aircraft also flew four of the then famous "single heading" flights across Australia. It was named "Nyhuan", a name taken from the East Gippsland Aborigine dialect which was given to the scout whose job it was to pioneer the route ahead of his tribe, meaning in effect "pathfinder". It appeared on each side of the cockpit in black lettering. This aircraft was fitted with more navigational equipment than any other aircraft ever to be taken on the strength of the RAAF. It was eventually scrapped but part of the fuselage (from the mid-upper turret to just forward of the tail plane) was salvaged and used in 1961-2 as a target storage hut at the Woomera Rifle Range. The other SAN aircraft carried the name "Brenool" which was derived from an aboriginal name meaning traveller. This appeared in the same position as Nyhuan.
- A73-15 These aircraft were converted to VIP transports by the fitting of fuselage windows and seats etc, for the accommodation of passengers.
- A73-34 Flown by Wing Cmdr. G.H. Shields it was fitted with Cosmic-ray recording equipment for scientific purposes during the International Geophysical Year.

Several Lincolns ended their careers being used for fire fighting practice :-

- | | | |
|--------------------------------|--------------------|-------------------|
| Point Cook - A73-10 and A73-13 | East Sale - A73-58 | Wagga - A73-22 |
| Mascot - A73-27 and A73-45 | Amberley - A73-25 | Darwin - A73-65 |
| Eagle Farm - A73-50 | Richmond - A73-36 | Edinburgh - RA640 |



Cockpit Layout - Lincoln B.Mk.30

- | | |
|--|---------------------------------------|
| 1,2,3,4. Engine RPM Indicators | 29. Landing gear position indicator |
| 5,6,7,8. Boost Gauges | 30. Triple air pressure gauge |
| 11. Supercharger M.S. Auto Switch, Warning Lamps, and push to test button. | 31. Camera warning lamp |
| 12. Slow Running cut-off switches | 32. Watch holder |
| 13. Starting push buttons | 33. Bomb jettison handle |
| 14. Booster coil push buttons | 34. Containers jettison push button. |
| 14A. Engine priming push buttons | 35. Oxygen flow and contents gauge |
| 15. Priming master switch & warning lamp | 36. Fire warning lamps (4) |
| 16. Air cleaner switch | 37. Fire extinguisher push buttons(4) |
| 17. Hot & cold air intake switch | 38. Landing gear control lever |
| 18,19,20,21. Feathering push buttons | 39. Bomb door lever |
| 22. Radiator shutter control over-ride switches. | 40. Seat adjusting lever |
| 23. Master fuel cocks - starboard | 41. Fuel jettison handle |
| 24. Oil pressure gauges | 42. Volume controller |
| 25. Throttle control levers | 43. Windscreen de-icing pump |
| 26. Propellor control levers | 44. Transmitter/receiver controller |
| 27. Master fuel cocks - port | 45. Glider release handle |
| 28. Boost cut-out control | 46. Air pressure and trim gauge |
| | 47. Brake lever parking catch |
| | 46A. Brake lever |

- | | |
|--|-------------------------------------|
| 48. Bomb release button on control column | 62. U.V. lighting switches |
| 49. Press to transmit push button | 63. D.R. compass repeater |
| 50. Time clock | 64. Flap position indicator |
| 51. Radio Compass | 65. Azimuth control |
| 52. Pressure gauge | 66. Aileron trim tab control wheel |
| 53. ASI correction card holder | 67. Rudder trim tab control wheel |
| 54. Downward ID lamp colour selection switch | 68. Elevator trim tab control wheel |
| 55. Magnetic compass lamp switch | 69. Distress switch |
| 56. Instrument panel | 70. Suction gauge |
| 57. Call lamp and push button | 71. Vacuum change over switch |
| 58. Isolation switch for Nav's telephone | 72. Selector switch |
| 59. Destructor on-off switches | 73. Flap control handle |
| 60. Magnetic compass | 74. Clutch lever |
| 61. Repeater compass lamp switch | 76. Destructor on-off switches. |

A number of Lincolns had accidents whilst in service, the details of these are :-

- A73-1 Damaged in a taxiing accident on April 19th 1948
- A73-8 Damaged in taxiing accident on April 19th 1948. Force landed at East Sale on November 25th 1948.
- A73-11 Aircraft stalled at approximately 300 feet over the north-east corner of Amberley aerodrome, February 17th 1948, crashed and burst into flames killing all seventeen on board. It was after this crash that instructions were given directing that Lincolns were not to fly with any more than eleven persons on board as stowage space was available for only eleven parachutes.
- A73-16 On June 14th 1953, A73-16 landed at Cloncurry due to a hydraulic failure. It was feared that the undercarriage would collapse and the aircraft was not moved but was left parked extremely close to the runway intersection. A73-51 was bringing up technicians from Amberley to repair A73-16 and whilst making its night landing, A73-51 hit the port outer engine of A73-16. Both aircraft were extensively damaged and were converted to components.
- A73-31 Crashed at Amberley on April 9th 1953 and was converted to components.
- A73-35 Crashed at Amberley on March 10th 1949. The airframe was converted to Instructional Airframe No. 1.
- A73-43 Aircraft damaged by cyclone while in a hangar at Townsville, March 9th 1956. It was converted to components.
- A73-44 Crashed eleven miles south-west of Amberley on March 7th 1950. All crew killed.
- A73-46 10 Squadron. Crashed on landing through overshooting and burnt at Townsville, April 23rd 1957. Remainder converted to components.
- A73-47 Severe gales caused extensive damage to the aircraft on June 13th 1957, the airframe being converted to components.
- A73-54 Severe storms at Amberley on February 3rd 1957 extensively damaged the aircraft. It was converted to components.
- A73-63 10 Squadron. Crashed on take off from Townsville, March 12th 1953 and burnt.
- A73-69 The fuselage was damaged on January 18th 1956 and it was converted to components.
- A73-70 was severely damaged by a cyclone at Townsville on March 6th 1956 and the aircraft was converted to components.
- RE418 was damaged on landing on November 28th 1952 whilst with the ARDU Trials Flight.

SPECIFICATIONS

Type. Four engined heavy bomber of all metal construction.

Power. Four 1,750 hp C.A.C. built Rolls Royce Merlin 66, 85 or 102 engines.

Crew. Seven, (nine in MR.31) Front gunner/bomb aimer, pilot, flight engineer/co-pilot, navigator, wireless operator, dorsal and rear gunners. (two radar operators in MR.31)

Dimensions. Span-120feet

Length (B.30) 78' 3 $\frac{1}{2}$ "

Height (top of rudder) 20' 3"

(MR.31) 84' 9 $\frac{1}{2}$ "

Weights. Empty - 37,702 lbs. Gross (B.30) - 82,000 lbs.
 Performance. Maximum speed - 310 mph at 18,300 feet.
 Range in still air at 20,000 ft. (no allowances and at max. weak mixture power) Average speed 215 mph Range 4000 miles
 Average speed 260 mph Range 3250 miles.
 Stalling speed (flaps and u/c down) 75 mph.
 Armament. Twin 0.50-inch Browning Machine guns in Boulton Paul Type F nose turret, remotely controlled from bomb aimers seat with Mark IIIM periscope sight.
 Two 20-mm Hispano Mark IV or V cannon in Bristol B.17 Mark 1 dorsal turret.
 Twin 0.50-inch Browning machine guns in Boulton Paul Type D in rear turret controlled by a radar scanner in extreme tail of aircraft.
 Maximum bomb load - 22,000 lbs., consisting of -
 14 x 250 lb. or 500 lb. bombs
 or 6 x 500 lb. anti-submarine bombs
 or 6 x 1,000 or 2,000 lb. bombs and 1 x 4,000 lbs.
 Fuel. 3,580 Imperial gallons

Bomb loads and ranges for a gross weight of 82,000 lbs.

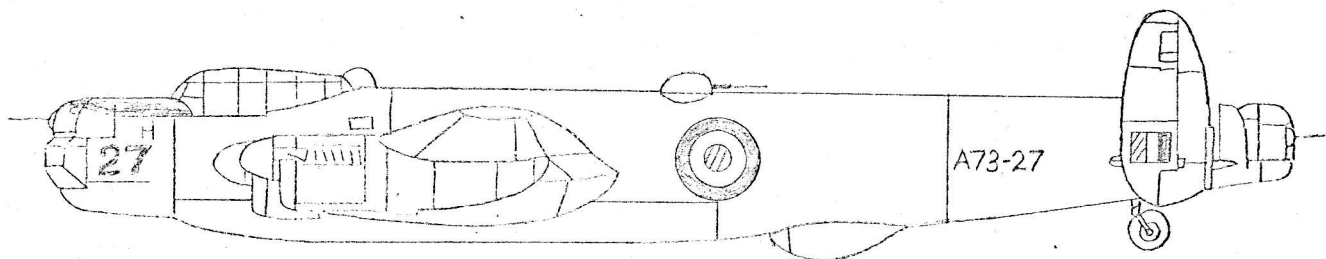
At 15,000 feet	Most economical	Max. weak mixture cruising
Average speed	- 200 mph	- 253 mph
Bombs 14,000 lb	2,800 miles	2,270 miles
9,000 lb	3,580 miles	2,910 miles
6,000 lb	4,000 miles	3,260 miles
4,000 lb	4,290 miles	3,480 miles
3,000 lb	4,450 miles	3,610 miles
At 20,000 feet	Most economical	Max weak mixture cruising
Average speed	- 215 mph	- 260 mph
Bombs 14,000 lb	2,640 miles	2,240 miles
9,000 lb	3,390 miles	2,870 miles
6,000 lb	3,800 miles	3,210 miles
4,000 lb	4,050 miles	3,430 miles
3,000 lb	4,200 miles	3,560 miles

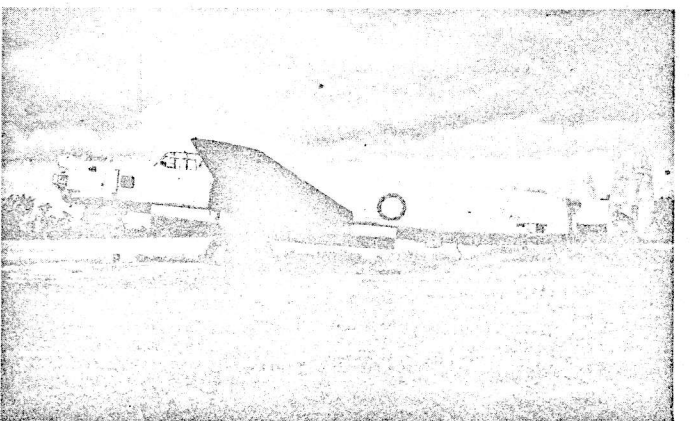
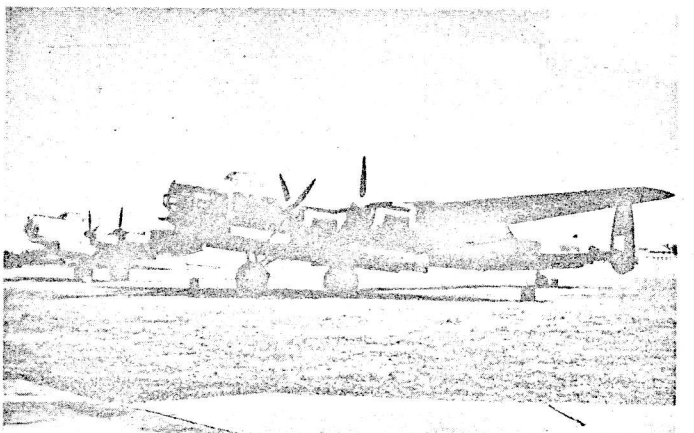
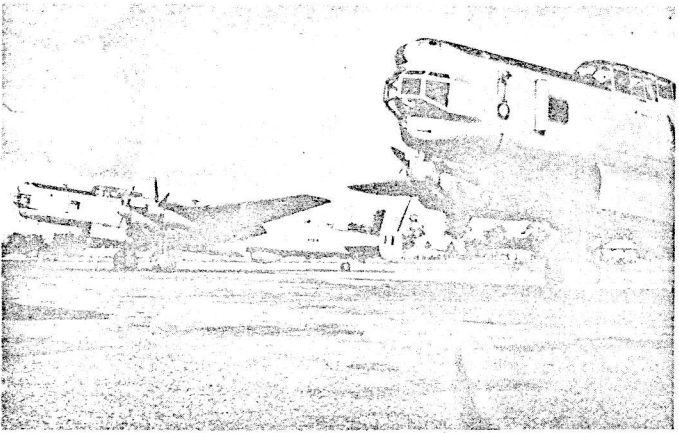
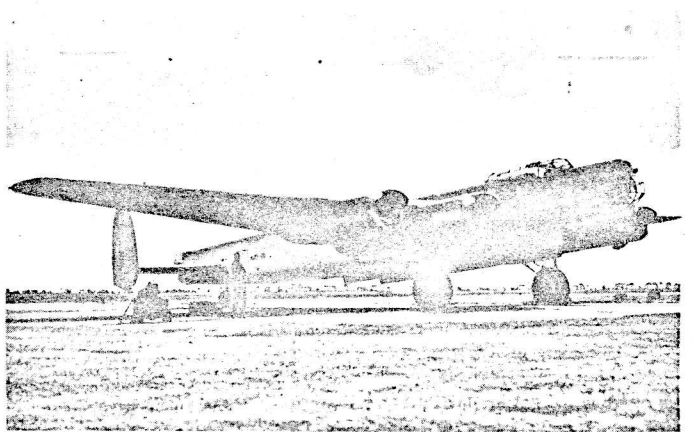
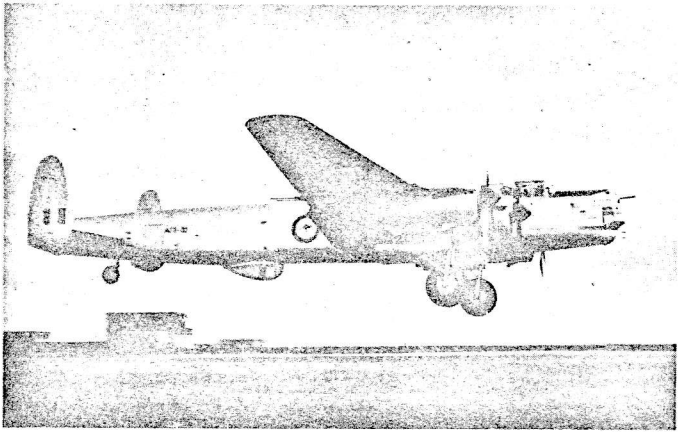
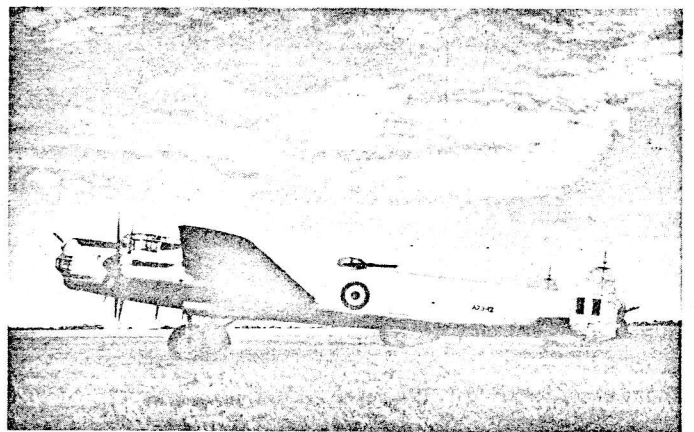
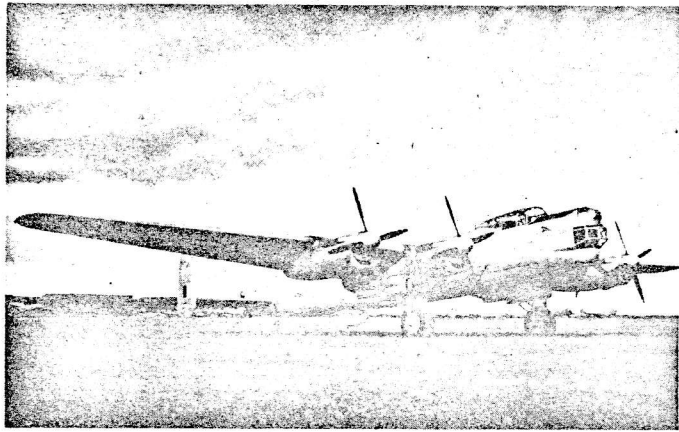
All calculations based on still air conditions with no allowances.

The authors wish to acknowledge the help and co-operation from -

- Mr. West of the Government Aircraft Factory
- Mr. McFarlane of the Department of Air, Canberra.
- Mr. N. B. Wiltshire of Air Britain
- Armstrong Whitworth Division of Hawker Siddley Aviation.

References :- Janes all the World's Aircraft Sydney Morning Herald(newspaper)
 Air Forces of the World (Green) Aircraft (periodical)
 Aircraft of the World (Green) R.A.A.F. News (periodical)
 Jet Aircraft of the World (Green) Flight 29.5.53 (periodical)
 Aircraft of the RAF 1912-1956 Wings 1950-1 (periodical)
 The Aeroplane 18.1.46 (periodical) The Bulletin 1.4.58 (periodical)





Left side reading down : A73-1, The first Australian assembled Lincoln. In SWPA markings at 1 APU Laverton 1946. (2) A73-32 about to touch down at Laverton after flying over Melbourne with other aircraft of 1 Squadron. (3) A73-61 and 65, MR31's at Darwin December 1960 during Exercise High Noon, the last major exercise in which Lincolns participated (six from 10 Sqdn.) (4) Lincoln fuselages at a scrapyard at St. Marys, NSW. Right side reading down : (5) A73-12 after acceptance by the RAAF at No. 1 APU Laverton, 1949. (6) A73-13, a B.30A of ARDU, Laverton, during ground running tests, August 1958 (7) Lincoln B.2 (RF423) and B.30 A73-13 at Laverton September 1955. RF423 was one of ten English built Lincolns used on special trials at Woomera. (8) The last Australian built Lincoln in existence is A73-55 shown here at Amberley during 1967. Credits: Clive A. Lynch - 1, 2, 3, 5, 6, 7. P. J. Ricketts - 4 and 8.

The Avro Lincoln in Australia.

Since this article was published (January-February 1968) additional information has been received by the Editor. Firstly some excellent material on the various Marks built and the types of engines used has been sent in by A.J. Charnley, who was associated with the Lincoln for its life in Australian service. The second contributor was Trevor Boughton, who supplied information on the atomic tests, research and rainmaking Lincolns.

Mark Numbers

- (B) Mk. 30 A73-1 to A73-10. Aircraft A73-1 to A73-5 were Assistance Contract aircraft imported as components and unassembled parts. Engines - Rolls Royce Merlin 85B. Maximum All Up Weight - 70,000 lbs.
- (B) Mk. 30 A73-11 to A73-25. Additional stringers added in the fuselage roof, strengthened main undercarriage, stringer wheels and tyres introduced. Engines - R.R. Merlin 85B. Maximum A.U.W. - 75,000 lbs.
- (B) Mk. 30A A73-26 to A73-50 R.R. Merlin 85B
 A73-51 to A73-66 C.A.C. Merlin 102
 A73-67 to A73-73 R.R. Merlin 85B
 Stronger top and bottom booms fitted to centre section rear spar, front spar webs reinforced in main undercarriage bays and strengthened skins fitted at wing cutouts. Maximum A.U.W. - 82,000 lbs.
- (GR) Mk. 31 A73-48 (Prototype) Conversions from (B)Mk.30 aircraft. Front fuselage section 6 ft. 6 in. long added to provide accommodation for 4 crew members. (Tactical navigator and 3 sonobuoy operators) Major changes to weapon carriage and pyrotechnic systems to permit air to sea operations. A.S.V. Radar introduced, fuel capacity increased by addition of two jettisonable fuel tanks in the bomb bay, provision made for carriage of airborne lifeboat, improved auto pilot fitted, low altitude bomb sight introduced. Maximum A.U.W. - 82,000 lbs.
- (MR) Mk. 31 A73-28, 55, 57, Modifications introduced to improve operational efficiency including night operations.
 A73-60 to A73-62
 A73-65 to A73-68
- (MR) Mk. 32 Design studies only - 1952
 Would have carried Radar and Magnetic Anomaly Detection (M.A.D.) equipment in similar installations to the Lockheed Neptune aircraft.
- (B) - Bomber
 (GR) - General Reconnaissance
 (MR) - Maritime Reconnaissance

Engines.

The engines used in Lincoln aircraft were fitted in Rolls Royce Type MH Power Plants which were interchangeable between engine positions. Auxiliary equipment was mounted on gear boxes located aft of the engine fire-proof bulkheads and shaft driven from power take off pads at the rear of the engine.

This arrangement made the ancilliary system self contained and enabled the power plant to be changed without disturbing them.

Type MH Power Plants were originally designed for the Merlin 85 and 68 engines destined for use in the Lancaster Mk. IV and V (later to be known as Lincoln B.1 and B.II). Routine inspection and maintenance of engines was possible without removal of

the cowls. The side panels (10 swg. thick) formed servicing platforms when opened.

Australian Lincolns were fitted with English made Merlin 66 and 85B engines, and C.A.C. manufactured Merlin 102 engines. In service the Merlin 85B cylinder block studs elongated (stretched) necessitating removals for modification. The subsequent shortage of Merlin 85B engines was overcome by utilising Merlin 66 engines salvaged from Supermarine Spitfire (LF) Mk.VIII aircraft which were in RAAF storage. As these engines had no provision for shaft drive to the engine gear boxes they were fitted in outboard positions only; the generators normally mounted on the gear boxes were fitted to the engine generator drive pads.

C.A.C. made Merlin 102 engines were introduced at Lincoln A73-51. The Merlin 85B was reintroduced at A73-67 but was fitted to power plants originally intended for Merlin 102 engines. Thus, in service, a mixture of engine fitments was possible. However the Merlin 102 was, where possible, reserved for use in Lincoln Mk.31 aircraft as its reliability was better than that of the Merlin 85B or 66.

Engine power -	Merlin 66	1,580 hp
	Merlin 85B	1,680 hp
	Merlin 102	1,650 hp

The reference to Rocket Stubs on No.1 Squadron aircraft is queried. Some Mk.31 aircraft were fitted with rails for rocket flares but the installation was not satisfactory and so full fitment was not proceeded with. Fitment to Mk. 30/30A is suspect.

The Type 'F' turret was fitted with a reflector gunsight and not a periscopic sight.

A73-1, when delivered to the RAAF, bore instrument panel instruction labels identifying the aircraft as a Lancaster Mk.IV. These were later changed to read Lincoln XXX (not Lincoln 30). This aircraft was also fitted with a Martin 250 CE 2 x .50" mid upper gun turret and a Fraser Nash 2 x .50" rear turret - these were later changed to Bristol B17 and Boulton Paul Type D respectively.

Atomic Explosions

As indicated on P.6 (Jan-Feb 68 issue) little is known about the roles performed by the Lincoln during the British Atomic tests conducted in Australia between October 3 1952 and October 22 1956 (Operations HARE, TOTEM, MOSAIC and BUFFALO). Newspaper (1) reports indicate that seven Lincolns from Amberley was used to patrol the test area and to track the radio-active cloud of Operation HARE (Monte Bello Islands on October 3, 1952) and one escorted a Boeing B-29 into Darwin on October 6, 1952 following an engine failure while on a flight over the Coral Sea. Two Lincolns flew through the cloud of the second explosion of Operation MOSAIC (Monte Bello Islands on June 19 1956) and were later flown to Amberley to allow any radio-activity to decay. (2) On June 19, 1958 a Lincoln from No. 10 (MR) Squadron dropped specially constructed steel containers into the Coral Sea about 400 miles east of Bundaberg, Qld. The containers housed concentrated soapy water that had been used to wash down aircraft that had flown through atomic test clouds.

- (1) - Age, Melbourne. Page 4, September 26, 1952
- (2) - Statement by Minister for Air on June 19, 1958 and reported in the Daily Telegraph, Sydney, page 7, and the Age, Melbourne, page 5 on June 20, 1958.

Scientific Research.

The Lincoln was used for a number of tasks by the Aircraft Research and Development Unit and included the following three :-

Flight to Antarctic. A73-2 on charge to No.1 Aircraft Performance Unit (later to become the Aircraft Research and Development Unit on Sept. 9, 1947) at Point Cook, Vic. flew to Macquarie Island on March, 1947 where a number of oblique photographs were taken. The other two purposes of the flight were to determine the suitability of Lincoln aircraft for flights in the southern latitudes and to collect meteorological data. A crew of nine was aboard for the 14 hour 35 minute flight :- the pilots being

Wing Cmdr. G.D. Marshall, Sqdn. Ldr. D.R. Cuming AFC, and Sqdn. Ldr. G.H.L. Shiells DFC. On May 28th, 1947 the aircraft was transferred to the Air Navigation School at East Sale, Vic., where it became the flagship and was named 'Nyhuan'.

On March 14th, 1947, a weather reconnaissance flight was made by the Convair Liberator A72-381 (Flt. Lt. C.E. Wright) to a point 850 miles due south of Melbourne. Data obtained was used for the following day's Lincoln flight. Wing Cmdr. Marshall made a further flight to Macquarie Island in August 1948 in the Catalina A24-104 to transport a diesel mechanic, Mr. F. Keating, who was to replace the original mechanic for that expedition.

Cosmic Ray Flights. A73-34 made a number of flights for cosmic ray studies as part of Australia's contribution to the International Geophysical Year in 1957. On May 24th, 1957, the aircraft was flown to Hobart where the research equipment was installed by the staff of the University of Tasmania, under the leadership of Dr. A.G. Fenton. One member of the research staff, Mr. R.J. Storey, accompanied the equipment on all flights. A test flight around Victoria was made on June 4th, 1957 and in July, a flight to Japan, via Townsville, Momote and Guam was started with Wing Cmdr. G.H.L. Shiells (now Commanding Officer of ARDU) as pilot. On the return trip engine trouble delayed the aircraft at Momote and it reached Laverton on August 6th, 1957. Wing Cmdr. Shiells also piloted the aircraft on July 21/22nd, 1957, in a flight to latitude 56° South. (3) A73-13 had cosmic ray equipment installed during the period May-July 1958, but no details are available of its activities.

(3) - Age (Melbourne) June 1 and August 22nd, 1957.

Rain Making. The CSIRO has played a prominent role in rainmaking research and during the fifties used a number of RAAF aircraft. During 1957-58 they conducted numerous experiments using ARDU Detachment B aircraft, based at Richmond, NSW. Among these, A73-29 was used for such varied duties as measuring meteorite dust density and freezing nuclei; carrying electrostatic cloud seeding equipment in the bomb bay to 'shock' the clouds into precipitation; measuring the water surface temperatures with infra-red equipment; for sawdust and carbon black dropping tests from the flare chute in the rear turret. For these operations, the pilots were generally Sqdn. Ldr. W.N. Nichol or Flt. Lt. J.H. Cooney, while CSIRO technical officers who accompanied the equipment were usually Messers. Telfors and Tapp.

A73-29 was at Laverton for the 1958 Air Force Week display and two modifications were readily apparent - substitution of a Vampire sliding canopy with a flat front panel on the fuselage and a tube protruding through the glazed panel in the left hand portion of the nose.

Building Programme Designation.

The programme at the Beaufort Division (later Government Aircraft Factory) was, for internal recording purposes, allotted the reference - BD-45, with A and B suffixes to denote the Mark III and Mark IV versions. (BD-45, i.e. Beaufort Division - 1945).

Additional Odd Notes.

The information in the section on Scientific Research was provided by the Officer in Charge of the RAAF War History Section, while based in Melbourne.

The last Lincoln, A73-55, which was mentioned in the January-February issue as still being at RAAF Base Amberley, has disappeared from there, and it is assumed that it has been broken up for scrap. Confirmation would be welcome.

Below is a drawing of the modifications carried out on A73-2. It should be noted that the bomb-bay doors shown in the Jan-Feb issue as being bulged, should actually be as shown below - ie, without the bulge.

