

Memorandum:

AIRCRAFT PRODUCTION POLICY - MANUFACTURE IN AUSTRALIA  
OF LINCOLN AND TUDOR AIRCRAFT

Introduction:

1. In Minute No. 3156 dated November 11, 1943, War Cabinet authorised the development of the production of Lancaster aircraft in Australia at the rate of fifteen per month if such should become necessary, and to provide for the manufacture of fifty complete aircraft plus spares.

2. It was further decided in Minute No. 3156 that --

"the position in regard to Lancaster airframes is to be reviewed again at a later date in the light of the situation then obtaining and the progress of the present authorisation, etc."

3. Before arriving at the abovementioned decision, War Cabinet considered two alternative proposals as set out in War Cabinet Agendum No. 284/1943 + Supplement No. 2. Briefly, the proposals were --

Alternative (1) - An expenditure of £9,000,000

To cover the cost of establishing production at the rate of fifteen aircraft per month if such should become necessary, and provide for the manufacture of fifty complete aircraft plus spares.

Alternative (2) - An expenditure of £16,000,000

To cover the cost of establishing production at the rate of fifteen aircraft per month and provide for the manufacture of one hundred complete aircraft plus spares.

4. It was further stated in the abovementioned Agendum that --

"Alternative (1) will merely establish manufacturing capacity to produce the Lancaster and "prove" the capacity by producing what is virtually a pilot order."

5. Air Staff has now considered the extension of Lancaster production in Australia to one hundred complete aircraft plus spares as formerly

Note: The latest type of Lancaster is now known in England as the Lincoln I. This is the version to be manufactured in Australia where it will be known as the Lincoln XXX.

Recommendations by Air Staff:

6. For the reasons set out in Appendix "A", Air Staff is of the opinion that the placing of an order for 50 additional locally produced aircraft will permit the R.A.A.F. to achieve its aim in heavy offensive operations against the enemy, and at the same time provide the means of re-equipping a percentage of General Reconnaissance Bomber units with the more modern and more efficient Liberator type which would be released from Heavy Bomber squadrons upon their being equipped with Lincolns. In view of the above and the need for maintaining self-sufficiency in aircraft manufacture in Australia, the Air Board recommends that an order for an additional fifty Lincolns be placed with the Department of Aircraft Production.
7. Further, Air Staff is of the opinion that the inclusion into the Air Transport strength of one squadron equipped with Tudor transport aircraft would enable greater support to be given to units operating outside of Australia. With each forward move, the lines of communication between Australia and the forward bases in operations against the enemy are being considerably extended, and more reliance is being placed on air transportation than ever before to maintain forward units.
8. The availability of the Dakota C-47 aircraft from America with which the Transport Squadrons are now equipped has always been a doubtful problem, and the possibility that this type may later be unavailable strongly supports the production of transport aircraft in Australia.
9. Practically every Air Force in the field to-day has had experience in operating the heavy four engined transport type of aircraft, i.e. C-54

Transport organisation within the R.A.A.F. whose value to post-war civil aviation cannot possibly be overlooked.

10. Air Staff therefore recommend that an order be placed with the Department of Aircraft Production for the local manufacture of twenty-four Tudor aircraft with which to equip one Transport squadron and provide for the necessary maintenance reserve and wastage.

The views of the Department of Aircraft Production:

11. The Department of Aircraft Production states that there will be no difficulty in meeting the requirement for additional Lincoln aircraft, provided that an immediate decision be given. This decision should not be delayed; otherwise the production schedule included in paragraph (24) will be impossible of achievement and there will be a break in continuity of production.

12. It was pointed out in Agendum No. 284/1943 (Supplement No. 2) that alternative (1) providing for the manufacture of 50 Lancaster (Lincoln) aircraft did not make any provision for the procurement of materials beyond those necessary for the pilot order for 50 aircraft and that it would be essential for War Cabinet to review the project at such time as would ensure continuity in the supply of materials, particularly those required from overseas so as to obviate any interruption to production in the event of the manufacture of additional aircraft being authorised.

Present Stage of Production:

13. The efforts of the Beaufort Division are directed towards the delivery of the first Lincoln aircraft in January, 1946. In spite of the fact that the aircraft has been subject to major modifications to such an extent that the new name of "Lincoln" has been adopted for it, many of the major difficulties have been overcome, and from a review of the tooling achievement to date and other aspects of the manufacturing operations,

takes many months, it is necessary for manufacturing operations to be planned far ahead and the additional requirements of the Air Staff will enable the Beaufort Division to maintain itself as a manufacturing organisation, which it is claimed is vital in the interests of the future of the R.A.A.F.

Tudor Transports:

15. The manufacture of the Tudor II transport can be undertaken concurrently with the production of the Lincoln aircraft. The characteristics of the Tudor II have already been reported to War Cabinet in Agendum No. 589/1944.

16. The Director of the Beaufort Division has reported in his cablegram dated January 29, 1945 (Appendix "B") that the Tudor II is the outstanding British civil aircraft anywhere near a stage of production and that its construction is mainly based on that of the Lincoln, utilising its major components such as wings, centre plane, undercarriage, engines, etc., the principal difference being a re-designed fuselage. The components common to both types will, it is anticipated, be in production in Australia towards the end of this year.

17. While the Director of the Beaufort Division has based his recommendation on the suitability of this aircraft for civil purposes, the recommendation contained herein is for the manufacture of 24 aircraft of this type for use in the R.A.A.F. Transport Service. If this proposal is proceeded with the Commonwealth will, at the same time, be creating capacity for the manufacture of a type of transport that can be readily adapted for civil airline purposes.

18. The views of the Director-General of Civil Aviation are appended.

Comments of the Director-General of Civil Aviation:

19. From latest advices, the operating performance of the Tudor II is

operators in the immediate post-war period. The operating characteristics of the DC-4, the present model of which is equipped with Pratt and Whitney 2000 cubic inch radial engines, will be enhanced by the incorporation of four Merlin engines, as is proposed by Canada where the DC-4M is to be manufactured under licence from the Douglas Corporation. The Tudor II may therefore be regarded as a serious contender against the DC-4M, and indeed it is the only British aircraft likely to be available until the Brabazon and kindred types are in production some two to three years after the war with Germany ends.

20. The Tudor II is to replace the Lancastrian (civil type of Lancaster) on the Empire service between London and Sydney as soon as they are available, and will therefore be the standard type of aircraft used by B.O.A.C. and Q.E.A. on this service until 1947/48 at the earliest.

21. Of all the British civil types which might be manufactured in Australia, the Tudor II presents the best possibilities, since the Beaufort Division will be tooled up to manufacture the Lincoln on which the Tudor II is based, i.e. wings, empennage and undercarriage, etc. will be common to both types, requiring new tooling only for the civil type fuselage of the Tudor II.

22. The number of four-engine aircraft required for internal services is likely to be small, but the Tudor II can meet those requirements until better British civil types are available. For external services, however, a machine such as the Tudor II will be necessary.

23. The Department of Civil Aviation supports the proposal for the production of Tudor II military transports, since this proposal will pave the way for the later manufacture of other civil types in Australia.

Schedule for Lincoln and Tudor Production, both types concurrent:

January	1		1
February	3		3
March	6		6
April	10		10
May	16		16
June	24		24
July	33	1	34
August	43	3	46
September	56	5	61
October	69	7	76
November	82	9	91
December	95	11	106
<u>1947</u>			
January	100	13	113

continuing at  
the rate of  
2 per month

Availability of Engines:

25. The above schedule is dependent upon the availability of engines. A supply has been arranged for the first 50 aircraft and the Director of the Beaufort Division has investigated the availability of engines to meet the extended Lincoln programme as well as the requirements of the Tudor programme now recommended, with the result (vide cablegram from H.C.O., London 2263 dated February 24, 1945) that he has obtained an assurance that the British authorities will make the necessary engines available to meet the contemplated schedules. In this connection consideration will be given to the utilisation of locally produced Merlin engines as they become available.

Manpower:

26. There will be no additional manpower requirement.

Financial:

27. Lancaster Aircraft - 100 Number.

It was pointed out in Agendum No. 284/1943 (Supplement No. 2) that in respect of both alternatives (1) and (2) providing for 50 and 100 aircraft respectively, the capital expenditure would remain unchanged from the figure given in paragraph 24 of Supplement No. 1 to War Cabinet Agendum

- (a) making the best use of existing facilities;
- (b) establishing production capacity early;
- (c) attaining a reasonable rate of production; and
- (d) greater economy in production costs.

28. The cost of the Lancaster project, based on the production of 100 aircraft, was estimated at £15,423,450, made up as follows: -

(a) Establishment cost

	£	£
Buildings and services, machine tools, etc.	678,800	
Jigs, tools and fixtures	<u>1,932,150</u>	2,610,950

(b) Manufacturing Cost

(i) Estimated cost of manufacturing 100 airframes plus spare parts equivalent to 20 additional airframes

8,400,000

(ii) Estimated value of 400 Merlin engines and propellers plus 66 spare engines and propellers making a total of 466 engines and propellers

2,912,500

(iii) Estimated value of Appendix "A" equipment including spares

1,000,000

(iv) Estimated value of engine and propeller spares against a total of 400 engines and propellers

500,000

12,812,500

Total Cost

..

£15,423,450

Less amount authorised in War Cabinet

Minute No. 3156

..

..

9,023,450

Additional amount required

..

£6,400,000

(Note: This estimate does not take into account the amount of £50,000 provided under the authority of War Cabinet Minute No. 2958 to cover the cost of preliminary planning, despatch overseas of personnel to obtain technical data, etc.)

as well as the cost of additional tooling to be manufactured in Australia, can be met from the funds already provided for the cost of tooling the Lincoln aircraft. The cost of manufacturing the Tudor Transport has been assessed on a similar basis to the Lincoln, and the cost of the 24 aircraft recommended for manufacture is estimated at £3,080,000, as set out hereunder: -

Manufacturing Cost -

(i)	Estimated cost of manufacturing 24 airframes plus spare parts equivalent to five additional airframes	£ 2,030,000
(ii)	Estimated value of 96 Merlin engines and propellers, plus 16 spare engines and propellers, making a total of 112 engines and propellers	700,000
(iii)	Estimated value of Appendix "A" equipment including spares	250,000
(iv)	Estimated value of engine and propeller spares against a total of 96 engines and propellers	<u>100,000</u>
		<u>£3,080,000</u>

RECOMMENDATIONS:

30. It is recommended for approval: -

- (i) That authority be given for an extension of the Lincoln project to provide for the supply to the R.A.A.F. of 100 aircraft plus spares in terms of the recommendations contained in Agendum No. 284/1943 (Supplement No. 2) at an additional cost over that already authorised by War Cabinet Minute No. 3156 dated November 11, 1943 of £6,400,000.
- (ii) That authority be given for the placing of an order with the Department of Aircraft Production for the manufacture and supply of 24 Tudor II Transport aircraft plus spares at an estimated cost, as set out in paragraph 29 hereof, of £3,080,000.
- (iii) That funds to the extent of £9,480,000 be made available as required to meet the manufacturing programme as part of the development of the R.A.A.F. on the existing approved basis.

A.S. DRAKEFORD  
Minister for Air

1. Air Staff previously represented (October 22, 1943) that the R.A.A.F. as then constituted, was without long range General Reconnaissance and Heavy Bomber aircraft, that it consequently lacked striking power, and was therefore quite out of balance as a fighting service. Since that time allocations of Liberator aircraft from the United States have assisted considerably in filling the gap which the lack of such aircraft has caused in offensive operations directed against the enemy. The Air Staff is still desirous that the R.A.A.F. should continue to exert all possible effort against the Japanese and engage energetically in any offensive operations against the enemy's inner-most defences and home bases alongside other Allied Nations, and they are of the firm opinion that the Lincoln aircraft will assist to a great extent in achieving those aims.

2. In War Cabinet Agendum No. 284/1943 - Supplement No. 1 (October 22, 1943), the Air Staff also viewed with concern the very serious deficiency in the development programme which was becoming apparent by the failure to provide adequate replacements against future General Reconnaissance Bomber requirements, and whilst existing plans include re-equipping three of the existing General Reconnaissance Bomber Beaufort Squadrons with Liberator aircraft before the end of 1945, a serious deficiency will still exist as to the replacement aircraft for the six General Reconnaissance Bomber squadrons remaining at the end of 1945 equipped with Beaufort, Ventura and Mitchell aircraft.

3. The reason for this concern becomes more obvious when it is noted that -

- (a) The Beauforts have ceased production in Australia, and by the middle of 1946 can only be kept in service by extensive additional maintenance being carried out on aircraft which by that time will be obsolescent and will have completed a considerable number of operational flying hours.
- (b) The Ventura aircraft have ceased production in the United States and sufficient only are held in the R.A.A.F. to maintain the existing squadron until March, 1946, provided the present wastage rate is maintained.
- (c) The Mitchell aircraft production has already been scheduled to cease in the United States before the end of this year, and no firm allocation has been made to the R.A.A.F. after June, 1945.

4. The necessity to replace the abovementioned types must therefore be most apparent if the aims of Air Staff and the policy of the Government to maintain full offensive operations against the enemy are to be realised.

5. A further factor which is constantly being considered by Air Staff is the possibility of the cessation of production in the United States of Liberator aircraft before the end of 1945, and the R.A.A.F. Representative in Washington has advised that drastic production cuts are contemplated in that type on the cessation of hostilities in the European Theatre.

6. Although outside the province of the Air Staff's consideration.

Utilisation of Lincolns in the R.A.A.F.:

In War Cabinet Agendum No. 284/1943 - Supplement No. 2 (Appendix ) it was shown that Alternative No. 2 in providing for the production of one hundred aircraft would equip three squadrons, provide reserves, and at the same time permit the necessary increase in Operational Training commitments and wastage accruing therefrom. The estimate of the utilisation of the aircraft in that schedule was based on the strength of the squadron being eighteen aircraft. Later, after consideration, the Air Staff decided that the strength of Heavy Bomber and General Reconnaissance Heavy Bomber squadrons should be twelve aircraft, and accordingly Appendix "A" of War Cabinet Agendum No. 284/1943 - Supplement 2 - has been re-drafted in the light of this decision and is attached hereto as Appendix "C". Examination of this table will show that the availability of one hundred aircraft would allow four squadrons to be re-armed together with the necessary maintenance reserves, and at the same time provide for Operational training commitments and wastage thereto before the end of 1946.

Lincoln Aircraft in a very long range bombing force:

It is Air Staff's opinion that the Lancaster is a proven long range heavy bomber capable of carrying a substantial bomb load into the inner-most defences of enemy territory. The decision to build the latest Mark IV Lancaster (Lincoln) in Australia with its increased operational efficiency further enhances the value of this aircraft as a striking weapon. Air Staff believe that, with at least four squadrons of this type in the R.A.A.F. they would be able to maintain considerably more and effective contacts with the enemy, and to offer a substantial force in the final bombing of Japan. The inclusion of four Lincoln squadrons into the Heavy Bomber force would provide the most modern armament for existing Liberator Squadrons and would allow the Liberator squadrons to be thrown up, which are now adequately equipped with all the latest devices for General Reconnaissance as well as Heavy Bombing, to be employed in the re-equipping of some of the existing General Reconnaissance Bomber squadrons previously referred to, thereby providing more modern equipment as replacement for the Mitchell, Ventura and Beaufort aircraft. This would permit the R.A.A.F. to undertake reconnaissance to a greater depth into the enemy territory with a far larger bomb load than is now possible with such aircraft.

From: HIGH COMMISSIONER'S OFFICE, LONDON.

January 29, 1945

1120. URGENT.

H.8983 from Storey for McVey.

The Tudor II a 40/60 passenger transport aircraft, is about to enter production at A.V.Roe.

It is the outstanding British civil aircraft anywhere near the stage of production and uses Lincoln (Lancaster four) wings centre plane undercarriage engines etc. but has a new fuselage. The common components will be in production in Australia or will be available towards the end of this year. As complementary to Lincoln production in Australia it is ideal and presents a wonderful opportunity to manufacture at the same time in Australia the Lincoln Bomber and an outstanding passenger transport plane to carry from 40-60 passengers according to range.

The plane is suitable for most international as well as internal air routes. The Air Minister, Drakeford, has complete details. I am convinced that it is equal to the DC-4 and am confident that we can manufacture it at a cost considerably lower than the purchase price of the DC-4 and that the first Australian built prototype could be flying early in 1946.

As you know with existent orders we will have no work for the Beaufort Division after the middle of next year and in fact no work in some sections after the end of this year. An order for an additional 50 Lincolns and from 12-24 Tudor transport planes would ensure continuance of the organisation, would also make sufficient Lincolns available as replacements for Liberators during 1946 and would start Australia in the production of modern civil transport planes. A.V.Roe and the Ministry of Aircraft Production offer wholehearted co-operation and they believe that Australia and Britain working closely together on this programme can go a long way towards recovering the ground the Empire has lost in supplying British built civil aircraft.

The order for an additional 50 Lincolns will of course need consideration by the Air Staff and the War Cabinet but could you get approval now for me to order Tudor tooling to a value of £10,000 which is estimated to cover all major tooling costs from England. This is urgent because the tooling can be ordered at the same time as additional tooling being ordered by A.V. Roe.

This is an opportunity now to do something practical for the future of the Australian aircraft industry and for civil aviation and I strongly recommend that approval be granted to order the tooling requested. I also recommend that you initiate discussions with the Australian authorities concerned with a view to reaching a decision re Tudor manufacture so that early action may be taken if the decision is favourable to secure data and to negotiate a manufacturing licence. We are reliably informed that the Tudor II with delivery

## UTILISATION OF LANCASTER AIRCRAFT ON BASIS OF 12 U.E.

Estimated production	AVAILABILITY		Estimated Strength	Required for	DISPOSAL			Reserves	Total Monthly
	Estimated Waste- age Progressive Total	Estimated Strength			Monthly	Establishments Progressive			
1	-	1							
3	-	3							
6	-	6		Re-arm 1st squadron	12	12	6	18	18
10	1	9							
16	1	15							
24	2	22		O.T.U. (6)	6	18	7	7	7
34	3	31							
46	5	41		Re-arm 2nd squadron	12	30	13	18	18
61	7	54		Increase O.T.U. (12)	6	36	14	7	7
76	10	66		Re-arm 3rd squadron	12	48	20	18	18
91	14	77		Increase O.T.U. (18)	6	54	21	7	7
100	18	82		Re-arm 4th squadron	12	66	27	18	18