

"A man is
great by
deeds, not by
birth"

-Chanakya

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**International networks and aircraft manufacture in late-colonial
India:
Hindustan Aircraft Limited, 1940-47**

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IIMK WORKING PAPER

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Abstract

This paper examines the beginnings of aircraft manufacture and maintenance in India through a study of Hindustan Aircraft Limited (est. 1940). Promoted by industrialist Walchand Hirachand, HAL was set up with the help of capital (initially fifty per cent) from the Mysore Government, which also provided land and other facilities for the company's factory in Bangalore.

Historians of science and technology have yet to study in depth the early history of this specialised industry in India. Further, scholars of 1940s India have, following the point of view of actors like Walchand, seen the aircraft industry primarily as an example of colonial imperatives subjugating indigenous entrepreneurship and skill. This is in line with the larger historiography, which often sees S&T in India as being either 'colonial' or 'nationalist'. However, recent work by historians has begun to emphasise the need to understand Indian S&T as an integral part of broader, often extra-imperial, networks.

This paper will further develop this historiographical approach by placing the technical practitioners of HAL centre stage. The plant in Bangalore was commissioned by a team of American engineers under W.D. Pawley, who would arrange for manufacturing licences, machinery and materials through his American company, Intercontinent Corporation. These American experts supervised a team of Indian engineers and technicians; the factory was run by the US Army during the latter years of World War II. Using a variety of sources (including the biography of Walchand Hirachand; official records and correspondence in the British Library, and printed material in the Karnataka State Archives), this paper examines the politics surrounding the founding of HAL, and the training and recruitment of its technical experts. It argues that at a time when colonial institutions were still geared primarily towards teaching civil engineering, American (and British) collaboration, Indian capital, the policies of the princely state of Mysore, and German expertise played an important role in the birth and development of aircraft manufacturing in India.

International networks and aircraft manufacture in late-colonial India: Hindustan Aircraft Limited, 1940-47¹

Introduction

This paper examines the beginnings of aircraft manufacture and maintenance in India through the early history of Hindustan Aircraft Limited (est. 1940). Promoted by industrialist Walchand Hirachand and his associates, HAL was set up with the assistance of the Mysore Government, which provided half of the initial capital, land, and other facilities for the company's factory in Bangalore. The company, which was acquired by the Government of India soon afterwards, played a crucial role in the assembly and repair of warplanes during World War II, when it was temporarily managed by the US Army. Its successor company continues to be India's premier producer of military aircraft.

There is as yet no detailed historical study that examines the founding and development of Hindustan Aircraft, although the broad timeline of events in the company's early years has been described in passing by historians of science and business in India.² They have tended, following the point of view of actors like Walchand,³ to see HAL primarily as an instance of colonial imperatives subjugating indigenous industrial entrepreneurship. J.N. Sinha talks of 'the cold response' of the colonial government to Indian proposals to build an aircraft

¹ A version of this paper was presented at the Annual Meeting of the Society for the History of Technology (SHOT), October 2015, at Albuquerque, USA. I would like to thank Urvi Ganatra (then a postgraduate student at IIM Kozhikode) for research assistance. I would also like to thank the administrators of the project 'ENGIND: Engineers and Society in Colonial and Postcolonial India' supported by the French National Research Agency (ANR), for enabling research which has also enriched the present study. Finally, I thank IIM Kozhikode for institutional support.

² Jagdish N. Sinha, *Science, War and Imperialism: India in the Second World War* (Leiden: Brill, 2008), pp. 108-111; Rajat K. Ray, *Industrialization in India: Growth and Conflict in the Private Corporate Sector 1914-47* (New Delhi: Oxford University Press, 1982 [1979]), pp. 255-6. Gita Piramal, *Business Legends* (Penguin, Kindle Edition, 2010) deals with the HAL story in a brief chapter (Chapter 9), but only until 1942, when Walchand's interests were bought out by the colonial government.

³ See Walchand's official biography: G.D. Khanolkar, *Walchand Hirachand: Man, his times and achievements* (Bombay: Ratanchand Hirachand, 2007 [1969]).

industry,⁴ while R.K. Ray remarks that ‘the Government of India not only refused to extend any assistance at all, but positively sought to obstruct Walchand’s strenuous efforts’, and that in general, India during World War II ‘really missed splendid opportunities of initiating heavy industries on a large scale.’ He concedes, however, that the main objective of colonial policy in these years was not the wilful suppression of Indian industries, but the achievement of ‘the maximum efficiency of war production on a world-wide basis through proper international division of labour’ (it was more efficient, from an imperial point of view, to produce ‘heavy armaments’ in the UK, USA, Australia and Canada).⁵

Recent work in the history of technology underscores the need to understand Indian science and technology not merely through the lenses of ‘colonial’ and ‘national’ science but also as part of broader, extra-imperial networks and against the backdrop of international politics.⁶ This paper extends this historiographical emphasis by examining wartime files in the India Office Records, the aeronautical industry press, and biographical accounts of key actors. It highlights the role of multiple actors in the early history of the Hindustan Aircraft factory: the governments of India (colonial and postcolonial), Mysore, and Britain; the United States Army Air Force during World War II; Germans and German-trained experts, particularly in the postwar period; and American business interests.

The British government, the GOI, and proposals for an aircraft factory

The main promoter of the company that became Hindustan Aircraft, Walchand Hirachand (1882-1953), hailed from a Jain family settled in Sholapur. Walchand began his career as a construction contractor and soon developed a marked enthusiasm for starting industrial enterprises. By the 1930s, he had acquired a reputation for risk-taking and diversified into shipping and sugar manufacture. It was in that decade that he began making serious efforts to inaugurate automobile and aircraft manufacture in India.⁷

⁴ Sinha, *Science, War and Imperialism*, p. 111. Of HAL and other ventures, Dietmar Rothermund writes that ‘[t]he British ... were not inclined to support the growth of new industries that would compete with them after the war [World War II].’ Dietmar Rothermund, *An Economic History of India: From pre-colonial times to 1991* (2nd edition, New York: Routledge, 2003), Section 9.2.

⁵ Rajat K. Ray, *Industrialization in India*, pp. 255 and 256.

⁶ Ross Bassett, ‘MIT-Trained Swadeshis: MIT and Indian Nationalism, 1880–1947’, *Osiris*, Vol. 24, No. 1 (2009), pp. 212-230; Ross Bassett, ‘Aligning India in the Cold War Era: Indian Technical Elites, the Indian Institute of Technology at Kanpur, and Computing in India and the United States’, *Technology and Culture*, Vol. 50, No. 4 (October 2009), pp. 783-810; A. Ramnath, ‘Engineers in India: Industrialisation, Indianisation and the State, 1900-47’, PhD thesis (Imperial College London, 2012), Chapters 1 and 6; Jahnavi Phalkey, ‘Introduction’ (‘Focus: Science, History and Modern India’), *Isis*, Vol. 104, No. 2 (June 2013), pp. 330-6.

⁷ Khanolkar, *Walchand Hirachand*; R.K. Ray, *Industrialization in India*, pp. 176 and 280-1.

According to the standard narrative of the birth of the aircraft project, Walchand's interest in opening an aircraft factory in India was first kindled in October 1939, when he happened to meet a prominent American executive, William D. Pawley, on a flight from San Francisco to Hong Kong. Pawley (1896–1977), who would later become an influential diplomat, was at this time the president of Intercontinent Corporation, New York, and Director of the Central Aircraft Manufacturing Company in Kuomintang China, which was building planes for the Chinese national government.⁸ Walchand promptly asked Pawley if he was willing to help open a factory in India, and cabled the colonial government with a proposal to sell them aircraft required in the war that had just broken out in Europe, if the government would provide the necessary help. His repeated messages to the Commander-in-Chief were met with a deafening silence, and although he finally received a reply from Sir A. Ramaswamy Mudaliar, the Commerce Member of the Governor General's council, the latter, like the 'lethargic' government he represented, dragged his feet for several months. It was only in mid-1940 that Walchand, then in Simla on other business, managed to bring his proposal for aircraft manufacture to the attention of officials in the Supply Department and the Communication and Transport Department. By this time the war in Europe had progressed, France falling to Nazi Germany, and the British government conceded it was no longer in a position to supply fighters to India in the event of an aerial battle there. China, too, was in need of aircraft in the face of Japanese aggression. Pawley was invited to India, and came in July 1940 along with a senior engineer, McCarthy, Jr., his legal adviser and manager, George Sellett, and his brother, E.P. Pawley to participate in talks with Walchand and the Government. A few days later, the government had agreed provisionally to the proposed factory, and placed a tentative order worth \$10 million for trainers, fighters and bombers along with spare parts (pending approval from London).⁹

But a close study of the correspondence between Simla and London suggests that this picture of a slumbering government is not entirely accurate. It does seem plausible that the Walchand-Pawley scheme got lost in the thickets of government bureaucracy for a few months. But the government was quite cognizant of the need to consider aircraft production. As early as September 1939, a month before Walchand's initial cables, the Viceroy (Linlithgow) had initiated a discussion on whether aircraft could be produced in India. The government did not initially think it practicable, but shortly thereafter, a group of Calcutta-

⁸ Khanolkar, *Walchand Hirachand*, p. 345; Anthony R. Carrozza, *William D. Pawley: The extraordinary life of the adventurer, entrepreneur, and diplomat who cofounded the Flying Tigers* (Dulles, VA: Potomac Books, 2012).

⁹ Khanolkar, *Walchand Hirachand*, pp. 347-52, quoted text from p. 348.

based businessmen had come forward with a proposal for aircraft manufacture, and both colonial and 'home' governments (henceforth GOI and HMG respectively) set about evaluating it carefully.¹⁰ In fact this group had sent their representative, a British businessman named Robert Renwick, to put the proposal directly to the Air Ministry in the UK, asking for financial assistance from HMG. The proposal was considered by the Supply Committee,¹¹ and A.H. Self of the Air Ministry requested F. Tymm, Director of Civil Aviation in India, to investigate the proposal informally and talk with the backers of the scheme. The Ministry was not in favour of HMG investing capital, as it was unlikely that the scheme 'would enable India to contribute towards the present war effort in the manufacture of all-metal aircraft'. In the long term, though, the proposal had possible advantages, particularly in its potential to provide '[military] aircraft for the Far and Middle East' by utilising Indian resources and labour. In addition, civil aviation in India was likely to grow, so 'there would seem to be a considerable commercial incentive for the creation of an indigenous aircraft industry on a long term basis, and the Government of India would, no doubt, wish to consider the possibility of encouraging an enterprise of this nature.'¹² Tymm, along with the Chief Inspector of Aircraft, proceeded to Calcutta. There they met the putative promoters of the factory, which included the heads or officials of the Indian Jute Mills Association, the Tata Iron and Steel Company, the Indian Iron and Steel Company, Braithwaite, Jessop, and the Aluminium Manufacturing Company. They also 'made a preliminary technical survey of the resources available' for composite and all-metal planes respectively, concluding 'that the resources of India both for the production of special metals and in machining ... are greater than was supposed.'

Tymm felt that as the utility of the proposed factory to the war effort was not guaranteed, the scheme should be evaluated at least partly 'on the strategic and national advantages to be derived from the permanent establishment of the industry and its associated industries through the medium of the war impetus.' It was with this in mind that its backers wanted to manufacture not just airframes but aero engines; the machinery for the latter could be put to other uses in peace-time.¹³ In April 1940, as a more detailed follow-up, the GOI's

¹⁰ Economic and Overseas Department, India Office, No. 1879/40, 'Possibility of the establishment of an aeroplane manufacturing industry in India. Views of the Government of India, following an investigation conducted by the Director of Civil Aviation', in IOR/L/E/8/1711 (India Office Records, British Library, London). All subsequent official letters, telegrams and memoranda cited below are from this file (IOR/L/E/8/1711) unless otherwise specified.

¹¹ A.M.D.P., '188th Progress Meeting. Proposals to Manufacture Aircraft and Train Pilots in India', Copy, Secret, 11 November 1939, in E&O No. 1879/40.

¹² [A.H. Self/ Air Ministry] to F. Tymm, 5 December 1939, in E&O No. 1879/40.

¹³ F. Tymm, 'Aircraft Construction in India. Note by the Director of Civil Aviation (India)', 25 January 1940.

Department of Supply requested the 'Air Ministry to send a small expert commission to India to make a rapid investigation of the facilities available'.¹⁴

If the GOI seemed cautiously optimistic, the Secretary of State for India, Leo Amery, was positively enthusiastic about the prospect of building aircraft in India. According to a draft note prepared by his office to be forwarded to the Air Ministry,

Mr. Amery is of the opinion that the proposal should be considered on the assumption that the war may last for several years ... In view of this possibility, and of the likelihood of a universal expansion of air services, both military and civil, ... the question should, in his opinion, be studied from the point of view of considering a bold programme of all metal construction, including engine construction. The possibility of the use of plastic construction might also be investigated.¹⁵

Amery's enthusiasm was not shared by William Maxwell Aitken, the Baron Beaverbrook, whom Churchill, the incoming Prime Minister, appointed head of the newly established Ministry of Aircraft Production (MAP) in May 1940.¹⁶ Beaverbrook, of course, was charged with increasing the number of planes available to Britain, and was not inclined to do anything that he thought might endanger that goal. In June, as France was being overrun, Amery wired Linlithgow that 'Lord Beaverbrook ... cannot spare anyone for technical mission [which the GOI had requested] at this moment'.¹⁷ Amery and Beaverbrook, 'Leo' and 'Max' to each other, were to be involved in an epistolary tug-of-war over the next couple of months.

Meanwhile, even as Churchill declared in the House of Commons that the 'Battle of France' would be followed by a 'Battle of Britain', observers on the subcontinent began to worry about India's preparedness to repulse attacks, especially from the air. Consequently, the GOI, feeling the pressure of 'the tide of public opinion', was in dire need of aircraft, 'if only because of their reassuring effect'.¹⁸ The situation thus had two related aspects: India needed aircraft from a strategic point of view; and the GOI needed, in order to maintain its political legitimacy, to appear responsive to Indians' demands, one of which was to produce aircraft in India.¹⁹

¹⁴ [Wood?], Secretary to the Government of India, to Under Secretary of State for India, London, No. 12122, 8 April 1940, in E&O No. 1879/40.

¹⁵ Enclosure 'A', in E&O No. 1879/40.

¹⁶ D. George Boyce, 'Aitken, William Maxwell, first Baron Beaverbrook (1879-1964)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edition, Jan 2011 (<http://www.oxforddnb.com/view/article/30358>, accessed 21 Sep 2015).

¹⁷ Draft telegram, Secretary of State to Viceroy, 6 June 1940.

¹⁸ Extract from private letter, Linlithgow to Amery, 6 June 1940.

¹⁹ Extract from private letter, Linlithgow to Amery, 13 June, 1940.

It was in this climate that the Walchand-Pawley proposal caught the GOI's attention. On 6 July, shortly after the Simla meeting with Walchand, Pawley, and their associates, the GOI's Department of Supply sent a telegram to the Secretary of State in the India Office giving him details of the scheme. A new, preferably private, company was to be established by Walchand, with Pawley in charge of running the factory and arranging for materials and technicians, mainly from the USA.

What predisposed the GOI to support this scheme when it had other options, like the Calcutta proposal with high-profile supporters? It is very likely that they were swayed by two factors. First, progress on the latter had hit a roadblock as the requested experts from Britain were not forthcoming; second, the presence of Pawley lent the new scheme an air of concreteness. He, unlike the Calcutta promoters, had built aircraft before. The GOI reported that they were 'favourably impressed by Pawley, whose actual performances [in China] under conditions of greater difficulty than exist in India are most impressive'. Further, there was the prospect of relatively quick results: Pawley's contacts with the Curtiss Corporation (for whom he was the sales agent in China) meant he could get components for assembly in the near future. There was also the question of his CAMCO plant in China, which had been relocated a number of times for strategic reasons and was currently at Loiwing near the Burmese border. The prospect of Japanese air raids and of the closure of the Burma Road (through which materials shipped from America were transported to Loiwing) added another angle: in the event of the factory having to be abandoned, its machinery and technicians could be shifted wholesale to the new site in India.²⁰

The official telegram of 6 July was accompanied by a 'Private and Personal' one from Viceroy Linlithgow to Secretary of State Amery. In it Linlithgow indicated that internal political considerations were playing as heavily on his mind as the threat of external aggression.

The whole of India is teed up for proposal of this kind: the feeling that we can, and demand that we should, embark on aircraft manufacture are very strong, and nothing will so strike the imagination of India and inspire confidence ... to pursue war to a victorious conclusion. Conversely, any reluctance or delay in pursuing this proposal, of soundness and practicability of which we are ourselves convinced, would have serious political repercussions ... *Walchand is an astute publicist* and would see to it that worst possible construction would be put on refusal to proceed with this venture by wholly Indian Company.²¹

²⁰ Decypher, Telegram 2394, GOI, Dept. of Supply to Secretary of State for India, 6 July 1940. Also see Carrozza, *William D. Pawley*.

²¹ Telegram, Viceroy to Secretary of State, 7 July 1940. Emphasis mine.

On 11 July a meeting took place at the India Office to discuss the Walchand-Pawley proposal. It was attended by W.D. Croft, R.S. Brown and E.W.R. Lumby of the India Office, D.T. Monteath of the Burma Office, Wing Commander Hammond and Flight Lieutenant Allen of the Air Ministry, and J.A. O'Brien, Chief Inspector of Aircraft in the Indian Civil Aviation Directorate.²² The MAP declined to send a representative, saying it was not interested in a manufacturing scheme that would only bear fruit in the long term,²³ and it was known from Amery's discussions with Beaverbrook that the latter would not countenance a factory that might divert to India any Britain-bound American materials or machinery for the construction of bombers or fighters. He did not, however, mind if India bought materials for trainers from the USA.²⁴ Meanwhile, at the meeting, Monteath of the Burma Office suggested that an independent opinion be sought in America to judge whether Pawley would indeed be able to get the required material from the USA as he had claimed he could.²⁵ In the days that followed, Amery exchanged messages with one William Robinson, who had been connected with the inauguration of aircraft production in Australia. Robinson assured him that he thought the Walchand-Pawley scheme practicable and on the whole 'very attractive'.²⁶ (Not that this would, in the opinion of one India Office functionary, persuade the MAP. 'I suppose Ld. Beaverbrook is impervious to any one else's opinion.')²⁷

Meanwhile, Amery prepared to inform the GOI that they could go ahead with the proposed factory, as long as they stuck to trainers (unless it became an absolute necessity to produce bombers or fighters).²⁸ But now Beaverbrook objected to this too. 'My dear Leo,' he wrote, '... It is true that we are not purchasing trainer aircraft. But any interference would not only put up prices, but would also disturb the organisation we have built up.'²⁹ Amery stood his ground, arguing that India buying 'a few trainer engines which you do not want, through

²² 'Note of a meeting held at the India Office on the 11th July 1940, to consider the Government of India's telegram No. 2394 of July 6th concerning a proposal for the manufacture of aircraft in India'.

²³ *Ibid.* and G. Simmons, MAP, to E.W.R. Lumby, India Office, 10 July 1940.

²⁴ A note by 'M.J.C.' [most likely M.J. Clauson of the India Office] dated 19 July further qualified this.

Beaverbrook, he suggested, was not in favour of India making trainers either, but did not have the *locus standi* to prevent it, because his Ministry was not engaged in buying trainers in the USA.

²⁵ 'Note of a meeting held at the India Office on the 11th July 1940'

²⁶ Various letters and telegrams, June-August 1940. Quoted phrase from telegram, Robinson to Amery, [1?] August 1940.

²⁷ W.D. [Croft], handwritten intra-departmental memo, 1 August [1940].

²⁸ (Draft) telegram, Secretary of State to Supply Department, GOI, c. 16 July 1940.

²⁹ Max [Beaverbrook] to Amery, 15 July 1940.

an organisation which is already buying for China' could hardly affect the MAP's operations. 'My lamb really cannot muddy the water which your big, bad wolf is drinking upstream!'³⁰

From India Linlithgow and his government began to send Amery strongly worded telegrams arguing for the scheme to go ahead as originally envisaged – i.e., it should be allowed to make not only trainers but also bombers and fighters. Further arguments were added in support of starting a factory. For instance, it was suggested that it could perform a useful additional function as a centre for the repair of military planes. Further, the Viceroy would soon be confronted more directly with Indian opinion when his Council was enlarged (in the autumn of 1940), adding a number of 'non-official' members (which would mean Indian politicians).³¹ In view of the GOI's clear stance, Amery approached Arthur Greenwood, Chairman of the Production Council, to break the deadlock.³² Greenwood, in turn, advised Amery to take the matter up with the War Cabinet.³³

The War Cabinet took up the question on 4 September 1940.³⁴ The Secretary of State reiterated the benefits of a factory in India that could be used for the repair as well as for the construction of warplanes, and that the Viceroy was very keen on it. Beaverbrook repeated his objections, focusing on the question of aero-engines, which, he said, were urgently required in 'all the Dominions', and which consequently had to be bought in total by Britain. The Vice Chief of Air Staff felt that the scheme might not be useful 'on a short term view'. The Prime Minister, Churchill, pointed out that Germany, whose warplanes were at that moment engaged in combat with the RAF, would likely ramp up aircraft manufacture in the occupied countries, and Britain 'must be prepared to meet aircraft production on a European scale.' This was only possible if they 'used the most efficient centres of production'; they 'must not dissipate [their] resources.' The War Cabinet resolved to reject the Indian factory proposal for the moment, but said they might look at the scheme again in a couple of months.³⁵ They appear to have kept their word, and in December 1940, the Battle of Britain over, the Walchand-Pawley scheme finally received the go-ahead, on the condition that all production inputs must be obtained from countries other than Britain or the USA.³⁶

³⁰ L.S.A. [Amery] to Beaverbrook, 16 July 1940.

³¹ Various cables and letters, including the Viceroy's telegram of 29 August 1940.

³² See L.S.A. [Amery] to Arthur Greenwood, M.P., 29 July 1940.

³³ Greenwood to Amery, 17 August 1940.

³⁴ Copy of cypher telegram (No. 5268), Secretary of State to GOI, 6 September 1940.

³⁵ 'EXTRACT from War Cabinet Conclusions' of 4 September 1940 (typescript).

³⁶ Khanolkar, *Walchand Hirachand*, p. 354; Piramal, *Business Legends*, Kindle Location 3650; Pushpinder Singh, *History of Aviation in India: Spanning the Century of Flight* (New Delhi: Society for Aerospace Studies, 2003), p. 252.

Setting up the factory

Walchand now needed capital, large tracts of land, and resources to import raw materials and machinery. He tried to raise funds from another of his concerns, the Scindia Company, but the shareholders were not interested. He then approached a number of princely states, some of whose Dewans were well known to him, and eventually elicited interest from the state of Mysore.³⁷

Walchand proposed to the Mysore government that the factory be built in their state with their cooperation. A private limited liability company would be set up, with an authorised capital of Rs. 4 Crore. Shares worth Rs. 40 Lakh would be issued to start with, half of these to be bought by the Mysore Government and the other half by Walchand and associates. The latter would form a private limited company called Messrs. Walchand Tulsidas Khatau Ltd., which would be the managing agents of the aircraft company, and appoint three of the five members to the board of directors (the other two to represent the Mysore government). The Mysore government approved this proposal. In addition to Rs. 20 Lakh worth of stock, the government provided a number of concessions to Hindustan Aircraft, Limited. The company would pay no tax on income from supplying aircraft to the Government of India; the Mysore government would grant free land where possible, or acquire private lands for the company at the latter's expense, and make available '[w]ater and power ... at rates obtaining for large industrial concerns.' Two directors were appointed by the Mysore Government: A.N. Raghavachar, Finance Secretary to the Government, and M. Venkatnaranappa, who was also Chairman of the Mysore Iron and Steel Works in Bhadravati.³⁸ In April 1941, the Government of India put in Rs. 25 Lakh, and the board was reorganised; the GOI, the Mysore government, and Walchand's managing agency contributed three directors each.³⁹

William Pawley's role in the new company was crucial. As per an agreement between him and Hindustan Aircraft, Limited dated 23 December 1940, the company 'desire[d] to obtain the assistance of Pawley who has experience essential and necessary for erecting, equipping and successfully operating such factory'. The Mysore government would shortly grant the company a 200-acre plot of land near Bangalore for building a factory and runway. Pawley was asked to 'forthwith cause to be prepared proper lay-out and all necessary and

³⁷ Khanolkar, *Walchand Hirachand*, pp. 355-7; Piramal, *Business Legends*, Chapter 9.

³⁸ G.O. No. D. 3663-3723—I. & C. 216-40-16, February 11, 1941, in Mysore Government Proceedings, February 1941. Consulted at the Karnataka State Archives, Bengaluru.

³⁹ Piramal, *Business Legends*, Chapter 9.

proper plans, designs, specifications, measurements and other details for erection on the said site of a modern up-to-date factory for manufacture of aircraft, which factory shall have a floor area of approximately 125,000 square feet, and when fully equipped shall have a production capacity sufficient to enable Aircraft Company to fulfil its obligations under the first sales contract.’ Pawley was also expected to provide ‘specifications and particulars of all machinery and other equipment necessary for the efficient capacity operation of the Aircraft Factory’, which the company would then purchase in the USA. Most significantly, Pawley was to be given full charge of the management of the factory. He could select the employees and determine their salaries, though the advice of the Managing Agents was available to him in this regard. He was also ‘empowered ... to determine the kind, quality and quantity of all materials, machinery, machine tools, hand tools, jigs, fixtures, supplies, etc., by him considered necessary and desirable’.⁴⁰

Meanwhile, Pawley’s Intercontinent Corporation had acquired on behalf of Hindustan Aircraft a licence allowing them to manufacture Intercontinent-Harlow PC 5 Trainers and spare parts from materials also to be procured by Intercontinent.⁴¹ The Corporation also purchased from the Chinese government one Vultee V12D Bomber (probably as a prototype), material to build 27 more such aircraft, and three ‘Wright Cyclone model 2,600 AB engines with 2 speed supercharger’, and rented from China ‘Jigs, tools and fixtures’ for a period of eleven months.⁴²

It is not clear how Pawley was able initially to procure material from the USA, given the condition under which the factory had been set up. Gita Piramal writes that after the initial machinery had been obtained from the Chinese government, ‘the condition seems to have been met more in the breach.’⁴³ Perhaps the MAP relaxed its stance (Beaverbrook would quit in April 1941).⁴⁴ More likely, the inauguration of lend-lease in March 1941 removed some of Britain and India’s constraints in sourcing aircraft and machinery from the USA.⁴⁵ It is clear,

⁴⁰ ‘Agreement between Hindustan Aircraft and William Douglas Pawley’, Document No. 4 in bound volume titled ‘Documents of Hindustan Aircraft Ltd., (Incorporated in Mysore State): 1940’ (printed by the Superintendent at the Government Press, Bangalore), courtesy Karnataka State Archives Library.

⁴¹ Document No. 10, ‘Documents of Hindustan Aircraft’.

⁴² Document 12, ‘Documents of Hindustan Aircraft’.

⁴³ Piramal, Kindle locations 3704-8.

⁴⁴ Boyce, ‘Aitken, William Maxwell, first Baron Beaverbrook (1879-1964)’, *Oxford Dictionary of National Biography*.

⁴⁵ ‘lend-lease’, *Encyclopædia Britannica* online, Encyclopædia Britannica Inc., 2015 (<http://www.britannica.com/topic/lend-lease>, accessed 25 Sep 2015).

though, that from around 1942 HAL was getting component materials from the USA on lend-lease (more below).⁴⁶

In Bangalore, Walchand's brother Lalchand Hirachand and two technical experts from other Walchand-promoted companies, Varadarajan and Maganlal Shah, joined Pawley, McCarty, Sellett, and some of Pawley's experts from his Chinese factory. They worked together to put up the new factory in a matter of weeks.⁴⁷ The factory was inaugurated in January 1941, and began assembling a Harlow PC-5A, a two-seater. The company was able to deliver its first aircraft to the government in August that year.⁴⁸ A year later, HAL had built and carried out a test flight for its 'first indigenous design, a nine-seat troop-carrying glider of wood-and-fabric construction'.⁴⁹

The agreement with Pawley stipulated that the employees 'shall include about sixteen American citizens possessing technical skill and experience in the art of manufacturing aircraft.' This was inclusive of managers, department heads, and a chief accountant. These experts would be paid salaries similar to those in the USA, plus a premium. Other than these Americans, the factory staff was to be made up of 'Indian engineers, technicians, mechanics and other employees'. However, if necessary, some individuals of other nationalities could be appointed. The American experts, who would be employed for a fixed period, were expected to instruct the Indians, so that the latter could take over the working of the factory after the Americans' departure.⁵⁰

Walchand's biographer writes that '300 Indian engineers highly trained in mechanics and nearly two thousand skilled workmen' were working '[u]nder the direction of 22 American technicians as of 1941.'⁵¹ A 1943 feature in the American illustrated magazine *Life*, on the other hand, shows two photographs, one of the 'American staff' and the other of the 'Indian staff', each numbering around 40. The Indians, according to the caption, were 'recruited from among the alert young men of progressive Mysore, where education is free.'⁵²

The state of Mysore, and in particular Bangalore, was indeed a key source of Indian engineers and technicians for Hindustan. The Indian Institute of Science had been inaugurated in 1911 upon the initiative of industrialist J.N. Tata and his successors, as an institution for 'research and ... advanced training in selected branches of Science and

⁴⁶ Khanolkar, *Walchand Hirachand*, p. 364.

⁴⁷ Khanolkar, *Walchand Hirachand*, pp. 357-9; Carrozza, *William D. Pawley*, p. 111.

⁴⁸ Pushpindar Singh, *History of Aviation in India*, pp. 252-3.

⁴⁹ Pushpindar Singh, *History of Aviation in India*, p. 253.

⁵⁰ Document No. 4, 'Documents of Hindustan Aircraft'.

⁵¹ Khanolkar, *Walchand Hirachand*, p. 359.

⁵² 'American Makes Planes in India', *Life*, 22 March 1943, pp. 30 and 32.

Engineering.’ When HAL was set up, the Court of the Institute saw an opportunity, and founded an Aeronautical Engineering department in December 1942.⁵³ Dr V.M. Ghatage of HAL functioned as ‘officiating head’ of the department until the arrival of Dr R.G. Harris of the Royal Aircraft Establishment, who became Professor and department head in 1945. As of 1946, there was also an Assistant Professor, two lecturers, and ‘two or three research scholars in receipt of stipends who have undergone the certificate course in Aeronautical Engineering at the Institute.’⁵⁴ Around 20 students were trained each year from 1943 to 1945. They were engineering graduates, but the course was conducted ‘at a standard lower than Post-graduate level, in view of the fact that the students ... had no background of aeronautical experience’. The course was comparable to the bachelor’s level courses at Caltech and Imperial College.⁵⁵ Most alumni thus far had got jobs ‘in the maintenance and overhaul establishments engaged in war work.’⁵⁶ In addition to the Indian Institute of Science, Bangalore was home to two other institutions that could provide engineers and technicians for the aircraft factory. These were the Central College / Engineering College, and the Sri Jai Chamarajendra Occupational Institute.⁵⁷

Exit Walchand and Pawley: the war years

The formal entry of Japan into the war had underlined the strategic importance of the HAL factory. The GOI decided that ‘the Air Forces, both our own and the American Air Force, would require services [at the factory] which would render commercial operation virtually impossible.’ The GOI also wanted to have the option of destroying the factory if it ever seemed in danger of falling into Japanese hands. They ‘therefore bought out Walchand and his friends, and sterilized the Mysore interest.’ The former were paid Rs. 45 lakh: 25 lakh being the amount they had invested at the start, and the remaining 20 lakh in the form of compensation. The Mysore Government, while it did not part with its shares, agreed to step back for the duration of the war and two years beyond, so that the GOI had complete managerial control. The GOI had to retain Pawley, whose services were handsomely remunerated under the original contract, ‘as he virtually controlled the American personnel’

⁵³ ‘Aerospace Engineering: History’, <http://www.aero.iisc.ernet.in/page/history>, accessed 22 September 2015.

⁵⁴ *Report of the United Kingdom Aircraft Mission* (Delhi: Manager of Publications, 1946), p. 19. Hereinafter cited as UK Mission Report.

⁵⁵ UK Mission Report, p. 19.

⁵⁶ UK Mission Report, p. 19.

⁵⁷ UK Aircraft Mission Report, p. 27.

at the factory. The GOI found the entire exercise ‘damnably expensive.’ The GOI took over Hindustan Aircraft in April 1942.⁵⁸

That same month, William Pawley’s CAMCO factory in Loiwing was bombed by Japanese raiders and the site rendered unusable.⁵⁹ Equipment salvaged from there was transferred to Bangalore. Since this was technically Chinese property, HAL agreed to produce in return 50 single-engine Vultee Bombers for China’s government.⁶⁰

Around the same time, the American Technical Mission (1942) visited India to make recommendations on the country’s industrial production during the war.⁶¹ The Grady Mission (as it was also known) emphasised the need to focus on the repair, maintenance and assembly of American aircraft in India during the war, and the building of more airports safe from aerial attack. India was going to become an important base and stopover for Allied planes in the Asian side of the war. In terms reminiscent of the MAP’s position a couple of years earlier, the Mission suggested that aircraft production was best left to the USA, which was scheduled to turn out 60,000 and 75,000 aircraft respectively in 1942 and 1943. India needed as many repair facilities as possible. ‘It would be unfortunate if this program were to be diverted by an abortive attempt to establish an airplane manufacturing industry in India.’⁶²

Soon after this, the GOI arranged to let the US Army Air Force use the Hindustan Aircraft factory for repairs. The United States Commander was to have ‘technical control [and would] appoint resident advisers, whose advice [would] be accepted’ unless the Chairman (Sir John Higgins, representing the GOI) thought the GOI should intervene. Among other things, this was expected to ‘remove the friction which has been perceptible between the Company’s American personnel and the R.A.F.’⁶³ In 1943 the GOI turned over the running of the factory to the Tenth United States Army Air Force. The factory’s manufacturing contracts (with the Indian and Chinese governments) were cancelled, at great cost, and it was converted almost entirely into a repair centre.⁶⁴

⁵⁸ Extract, E.M. Jenkins to W.D. Croft, 13 April 1943, in IOR/L/E/8/1711; Khanolkar, *Walchand Hirachand*, pp. 363-5; Piramal, *Business Legends*, Chapter 9. The quoted text is from the first source (the extract from Jenkins’s letter).

⁵⁹ See R.C. Wertz to W.D. Pawley, 18 June 1942, ‘CAMCO and the fall of Loiwing’, on the writer Daniel Ford’s website: <http://www.warbirdforum.com/loiwing.htm>, accessed 26 September 2015.

⁶⁰ Extract, E.M. Jenkins to W.D. Croft, 13 April 1943.

⁶¹ David Lockwood, *The Indian Bourgeoisie: A Political History of the Indian Capitalist Class in the Early Twentieth Century* (London and New York: I.B. Tauris, 2012), pp. 154-5.

⁶² Typescript extract from American Technical Mission Report, 20 May 1942, in IOR/L/E/8/1711.

⁶³ Extract, E.M. Jenkins (GOI) to W.D. Croft (India Office), 13 July 1942.

⁶⁴ Extract, E.M. Jenkins to W.D. Croft, 13 April 1943; ‘Hindustan Aircraft, Ltd.’, *Flight*, 27 August 1954, p. 296. All issues from *Flight* cited here were accessed via the online scanned archive at <https://www.flightglobal.com/pdfarchive/index.html>.

Pawley's role now began to diminish. Signs were already visible in 1942, when he was in the US trying to procure materials. A.C.B. Symon of the Indian Purchasing Mission in Washington, D.C. reported to W.M. Yeatts of the American Purchasing Section in the GOI's Supply Department that while his office felt India should undertake procurement through lend-lease, Pawley was against it, thinking that it would take more time. Pawley was a suave negotiator used to making rapid deals,⁶⁵ and, Symon felt, he was 'finding it difficult to realise that his influence in high quarters here in present circumstances is far less than may have been the case in pre-war days.' He was also finding it difficult to get material from the US Air Corps. The RAF Delegation in the US, on the other hand, was doing an effective job sending out tools to India, and it might soon prove necessary to 'take the whole thing out of Pawley's hands and deal with it through the R.A.F. Delegation who are giving us the fullest possible co-operation.'⁶⁶ Nor did Pawley find the going easy in Bangalore. Jenkins of the GOI reported in 1943 that he was 'heartily (and I think unjustly) disliked by the Americans, and in the changed conditions is not really needed.' Consequently, the government was 'trying to get him "organised out" of the business, and ... he [had] agreed.'⁶⁷

Under the USAAF, the Hindustan Aircraft factory swiftly scaled up its capacity and its workforce.⁶⁸ It operated in three shifts and had some 15,000 workers. The engine (overhaul) department was hived off, and conditioned engines at the rate of 300 a month.⁶⁹ The factory, functioning as the 84th Air Depot of the USAAF, repaired and serviced Catalinas, P-38 Lightnings, B-25 Mitchells, B-24 Liberators, C-46 Commandos and C-47 Dakotas. In short, 'Bangalore became the centre for all major overhaul and repair work on US aircraft'. The war years left 'thousands of Indian workers [with] thorough training in all aspects of aircraft and engine maintenance'.⁷⁰

Post-war: towards manufacture

The US Army left after the war, and the Mysore Government was once more represented in the management of the company. Meanwhile, there was naturally a drop in demand for the

⁶⁵ Carrozza, *William D. Pawley*.

⁶⁶ Extract, Symon to Yeatts, 24 June 1942, in IOR/L/E/8/1711.

⁶⁷ Extract, E.M. Jenkins to W.D. Croft, 13 April 1943..

⁶⁸ Pushpindar Singh, *History of Aviation in India*, p. 253.

⁶⁹ 'Hindustan Aircraft, Ltd.', *Flight*, 27 August 1954, p. 296.

⁷⁰ Pushpindar Singh, *History of Aviation in India*, p. 253.

factory's services, and a new programme had to be found for it in peacetime.⁷¹ It was in this context that the Government of India requested the British MAP (which soon after this became the Ministry of Supply and Aircraft Production, or MSAP) to constitute a mission to advise on the potential for beginning aircraft manufacture in India for the civil sector and the Royal Indian Air Force (RIAF). The United Kingdom Aircraft Mission consisted of J.V. Connolly and L.R. Barnett of the MSAP, and J.D. North and S.P. Wordley of the Society of British Aircraft Constructors.⁷² They spent around a month touring India in March-April 1946, visiting various private industrial enterprises, the Hindustan Aircraft works, the Indian Institute of Science in Bangalore, and meeting with officials of the Government of India.⁷³

Perhaps unsurprisingly, the Mission recommended that the HAL factory be the centre of aircraft production. This was the only factory in the country where full assembly of aircraft had been undertaken; it had even constructed and tested a glider of its own design in the early years. The Indian Institute of Science, the Central College / Engineering College, and the Jai Chamarajendra Occupational Institute in Bangalore could act as sources of trained personnel, and the salubrious climate of Bangalore would be suitable for foreign employees should they be required.⁷⁴

The factory, however, would need to be 'reorganised' (i.e. downsized), as the wartime demand could not be expected to continue.⁷⁵ The Director-General of Civil Aviation informed the UK Technical Mission that Government plans for flight carrying passengers, mail and freight would translate to a demand of about 30 planes, 20-30 seaters 'of the DC.3 or Viking class'. He estimated that the total annual demand for planes required for commercial use, private ownership and flying clubs combined in the period 1946-50 was 65. This was projected to increase gradually to 120 in the period 1961-65.⁷⁶

The Mission was particular that 'a firm order should be placed with the reconstituted company for the manufacture and development of a locally designed aircraft'.⁷⁷ In order to enable this indigenous aircraft, a Technical Director was to be appointed from outside India

⁷¹Pushpindar Singh, *History of Aviation in India*, p. 253; 'Hindustan Aircraft, Ltd.', *Flight*, 27 August 1954, p. 296.

⁷²*Report of the United Kingdom Aircraft Mission* (Delhi: Manager of Publications, 1946), p. 1. Hereinafter cited as UK Mission Report.

⁷³ UK Mission Report, pp. 1-3.

⁷⁴UK Mission Report, p. 5 and pp. 26-7.

⁷⁵UK Mission Report, p. 5.

⁷⁶UK Mission Report, p. 16.

⁷⁷UK Mission Report, p. 6.

to provide guidance as HAL's design team prepared a design, though he was to keep at a distance and allow the HAL team to make mistakes and learn from them.⁷⁸

The Mission also made recommendations on the training of personnel for the expanded factory, stressing the need for HAL to take more direct responsibility for it. While 'Indian craftsmen [had] a high traditional skill' in terms of 'mechanical aptitude and co-ordination of eye and hand', this was not enough for aircraft production. Employees must be able to undertake multiple types of task, and be able 'to fill in from [their] own knowledge the difference of specification between an engineering drawing and the minute details conveyed by operation drawings and operation instructions as well as those implicit in the tooling and ganging equipment.'⁷⁹ At the level of the engineer, 'intuition' was required,⁸⁰ and this could only be found in engineers who had had a sound combination of theoretical training and practical training (through apprenticeship) since 'the formative years of 16 and 17'. The (Jai Chamarajendra) Occupational Training Institute in Bangalore was a start, 'but the aircraft organisation must take with the utmost seriousness the prime responsibility for training the kind of workpeople it needs.'⁸¹ The Mission recommended a five-year programme of apprenticeship beginning at the age of sixteen, with instruction either at a vocational institute or in a school in the factory.⁸² The American system of TWI (Training Within Industry) might be used in modified form for training '[a]t the lowest supervisory level', whereas '[a]t the higher levels research and subsequently education in administration is a necessity ... since the complexity of human relationships arising from scientific and technological advance has outstripped our knowledge of how to administer.'⁸³

Around a year after the UK Mission's visit, a start was made on manufacturing, though not based on an in-house design, when the GOI placed an order for Percival Prentice trainers. Initially the components for 20 trainers were to be sent to Bangalore to be assembled there, and the subsequent planes would be built 'under licence from the Percival Aircraft Company'.⁸⁴ The first of these was test-flown on 30 April 1949.⁸⁵ Meanwhile, in 1948, HAL began working on the designs for the HT-2 and HT-10, both trainer aircraft. The HT-2, designed by Dr V.M. Ghatage, was 'the first aircraft of wholly Indian origin to be put into

⁷⁸ UK Mission Report, p. 30.

⁷⁹ UK Mission Report, p. 38.

⁸⁰ UK Mission Report, p. 38.

⁸¹ UK Mission Report, p. 39.

⁸² UK Mission Report, p. 39.

⁸³ UK Mission Report, p. 40.

⁸⁴ 'Percival Prentice Under Licence', *Flight*, 15 May 1947, p. 445.

⁸⁵ 'Indian Prentice Airborne', *Flight*, 19 May 1949, p. 587.

production.’ It used a Cirrus Major III engine (155 h.p.), with tandem seating for the flying instructor and the trainee. Weighing 2,240 lb, it was 25 feet long and had a wing span of 35 feet. The HT-2 could achieve a maximum speed of 130 miles per hour.⁸⁶ As of 1954, the company planned to sell HT-2s not only to the RIAF, but also to flying clubs for civilians.⁸⁷ By 1955, there was serious thought of exporting, particularly to Asian countries, ‘[t]his unpretentious but efficient basic trainer’. ‘[A]n overseas demonstration tour’ was on the cards, and the HT-2 had been praised by the well-known German aircraft designer Dr Kurt Tank.⁸⁸ The HAL factory had expanded considerably from its post-war position. It now spanned 1,100 acres and had around 10,000 employees in all.⁸⁹ In the 1960s two further aircraft came out of the Hindustan Aircraft stable: the HF-24 Maruta fighter and bomber, and the HJT-16 Kiran, a jet trainer.⁹⁰

The most prominent name associated with these HAL-designed aircraft is that of Vishnu Madhav Ghatage, who became head of a Design and Development Department around 1947. Ghatage, it will be recalled, had earlier served on deputation on the faculty of the Indian Institute of Science. He had done his doctoral work under the famous German aerodynamics expert Ludwig Prandtl at Göttingen in the 1930s.⁹¹ Perhaps due in part to Ghatage’s presence, the post-war history of Hindustan Aircraft had a significant German connection. In December 1949, SP Mukerjee, the Indian Minister of Supply and Industry, announced that Willy Messerschmitt, the designer of many aircraft for the Luftwaffe some years earlier, had been engaged, apparently to help HAL produce ‘a new type of fighter.’⁹² The Maruta fighter which was completed in the 1960s was the result of several years’ effort by a design team under another German expert, Kurt Tank.⁹³ German expertise was present at the Indian Institute of Science too. O.G. Tietjens, who (like Ghatage) had been a student of Prandtl in Göttingen,

⁸⁶ ‘Hindustan HT-2’, *Flight*, 27 August 1954, p. 284.

⁸⁷ ‘Hindustan Aircraft, Ltd.’, *Flight*, 27 August 1954, p. 296.

⁸⁸ ‘Aircraft of the Commonwealth...’, *Flight*, [26 August?] 1955, p. 295.

⁸⁹ ‘Hindustan Aircraft, Ltd.’, *Flight*, 26 August 1955, p. 330.

⁹⁰ ‘India’s Hindustan HF-24 Joins the IAF: Maruta’, *FLIGHT International*, 2 July 1964, pp. 16-17; ‘Hindustan HJT-16 Kiran: India’s Primary Trainer’, *FLIGHT International*, 11 March 1965, p. 371.

⁹¹ Pushpinder Singh, *History of Aviation in India*, p. 253; ‘Vishnu Madhav Ghatage’, Mathematics Genealogy Project (run by North Dakota State University, Fargo), <http://www.genealogy.math.ndsu.nodak.edu/id.php?id=115380>, accessed 27 September 2015; ‘Ludwig Prandtl “Father of modern aerodynamics”’, page on the website of the DLR (German Aerospace Center), http://www.dlr.de/100Jahre/en/desktopdefault.aspx/tabid-2565/4432_read-7449/, accessed 22 Sep 2015.

⁹² ‘News from India’, *Flight*, 15 December 1949, p. 757. On Messerschmitt, see ‘Willy Messerschmitt’, *Encyclopaedia Britannica* online. Encyclopaedia Britannica Inc., 2015. <http://www.britannica.com/biography/Willy-Messerschmitt>, accessed 22 September 2015.

⁹³ ‘India’s Hindustan HF-24 Joins the IAF: Maruta’, *FLIGHT International*, 2 July 1964, pp. 16-17. See also John Zukowsky, ‘Kurt Tank’, *Encyclopaedia Britannica* online. Encyclopaedia Britannica Inc., 2015. <http://www.britannica.com/biography/Kurt-Tank>, accessed 22 September 2015.

became head of the Aeronautical Engineering department at the Institute in 1949 and presided over the expansion of its research facilities, including a new wind tunnel.⁹⁴

The colonial government had, of course, been replaced by a national one, but British interests continued to keep a close watch on the fortunes of HAL. As might be expected, there was some uneasiness about Ghatage and continental European experts. In July 1948 the British Deputy High Commissioner, C. Gault, in Madras visited the Hindustan Aircraft factory and filed a report. At this time the company had also begun a side line, building railway carriages on order from the Indian Railways. He met and spoke to the Scottish Commercial Manager and two engineers on loan from the Percival Company of Britain. He gathered that

[i]n recent months two Rumanian aircraft engineers and a Czech had visited Hindustan—at different times. Both Rumanians and the Czech claimed to represent the nationalised aircraft industries of their respective countries and were at pains to decry British products. In this they found a ready helper in the Hindustan designer, Dr. Ghatage, who was trained in Germany and affects to admire German aircraft products ... After these visits Dr. Ghatage had much to say about the alleged faults of Bristol engines.⁹⁵

When the Indian government engaged a Dr. Carp, a Romanian, as a technical adviser, the UK Trade Commissioner's (Roland Owen) Delhi Office prepared a memo describing his role. Carp had visited Hindustan Aircraft in 1948 to advise on 'the reorganisation [of the factory] ... and ... the prospects of aero engine manufacture in India.' He later paid another visit 'in connection with the project for the manufacture of diesel engines in India.' Carp acted on behalf of a Liechtenstein-based 'syndicate of three companies', two of them Swiss and one Austrian. Carp, it was felt, had been advocating to the GOI the use of the Steyr Daimler Puch diesel engine. The GOI, in turn, were 'undoubtedly interested' in this model, but 'would be glad to hear from United Kingdom manufacturers' too.⁹⁶

⁹⁴ O.G. Tietjens, 'Der Windkanal am Indian Institute of Science, Bangalore, Süd-Indien', *Zeitschrift für Flugwissenschaften*, 6- 9 (1957), reprinted in *Journal of the Indian Institute of Science*, Vol. 88:3 (July-September 2009), pp. 760-3; see also G.S.Bhat and K.R. Sreenivasan, 'Roddam Narasimha', *Current Science*, Vol. 107, No. 2 (25 July 2014), pp. 297-305, here p. 298.

⁹⁵ 'Extract from report of Mr. C. Gault, Deputy High Commissioner, Madras on a visit to Mysore, July, 1948. POL. 25/1/7. Typescript in IOR/L/E/8/3622 (file titled 'Aircraft Industry in India: Including Manufacture of Railway Coaches by Hindustan Aircraft Limited, Bangalore.')

⁹⁶ Confidential Memorandum, Office of the Senior U.K. Trade Commissioner in India, New Delhi, 31 March 1949, in IOR/L/E/8/3622.

Conclusion

American collaboration, Indian capital, Walchand Hirachand's energies, and the policies of the princely state of Mysore played an important role in the birth of aeronautical engineering in India. Existing accounts have focused largely on Walchand's efforts to get permission to start aircraft manufacture in India, and have emphasised the colonial government's uncooperative stance. This account has argued that the government's position was a far more layered and complicated one, which depended on domestic and international political considerations, and above all the exigencies of wartime. The British government under Churchill, and the Ministry of Aircraft Production under Lord Beaverbrook, appeared to show little patience or interest in India's aerial defence, occupied as they were with the Battle of Britain and the European theatres of war. The colonial government in India, on the other hand, expended considerable energy on assessing proposals from business groups (European and Indian) to undertake aircraft manufacture in India. Indeed, the GOI had been considering the issue even before Walchand's proposal. In this they were guided by two concerns: the increasing need for India to have a modicum of aerial defence capability, and the fact that the demand for aircraft had become a rallying cry for those who felt that the colonial government was not representative of Indian interests. Viceroy Linlithgow's communications in particular reveal a clear concern that it was in the interests of political stability to heed these demands. Consequently, he became a keen champion of the Walchand-Pawley proposal for an Indian factory. L.S. Amery, Secretary of State for India in London, was also an energetic proponent of the scheme. (This is of a piece with his known broader stance on India during the war. He was for saving the Empire through 'the maximum expansion of Indian troops and production, proposing to reciprocate with a clear-cut statement promising Indian self-government, with a home-made constitution, at the end of the war'; a view which Churchill did not share.⁹⁷)

The United States played no small role in the fortunes of the factory (if indirectly at first). Indeed the prospects for establishing an aircraft factory depended not only upon the policies and patronage of the colonial government, but also on the ability of Indian entrepreneurs to identify technological partners who would sell them machinery and manufacturing know-how while undertaking to train a future generation of Indian engineers. William Pawley's contacts and reputation in China played an important part in HAL finally

⁹⁷ Deborah Lavin, 'Amery, Leopold Charles Maurice Stennett (1873-1955)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edition, Sep 2015 (<http://www.oxforddnb.com/view/article/30401>, accessed 22 September 2015).

getting the green signal. Again, world politics (as opposed to localised colonial concerns) were important: had Britain and America not been engaged in trying to support (despite declared neutrality) Chiang-Kai Shek's Chinese government as a bulwark against Japanese expansion, Pawley would not have set up his CAMCO factories in China. It is conceivable that the meeting with Walchand came as a godsend to Pawley, who knew that his Loewing factory was in a perilous situation, and could now think of shifting his Asian base to India.⁹⁸ After Walchand and Pawley's exit, the United States Air Force's management helped consolidate HAL's reputation as a centre for repair and overhaul.

Continuities are more apparent than any ruptures in HAL's trajectory after Independence. Experts such as V.M. Ghatage continued to play an important role, as did the educational institutions of Mysore state. The UK's advice was sought on the way to transition to manufacturing, and HAL continued to have a strong relationship with both British and American aircraft industries. The most visible difference, though, was in the increased role of German expertise.

The present working paper is part of an on-going study. Future versions will incorporate the author's recent research to analyse in greater detail the role of the Indian Institute of Science in the development of HAL in its early years.

⁹⁸ See Carrozza, *William D. Pawley*.

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