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*At the End of the Final Line: A Brief History of Aircraft Manufacturing at Canadian Vickers and Canadair from 1923 to 1984.* By Patrick J Campbell. (Sainte-Anne-de-Bellevue: Shoreline, 2006, 132 p, ill., tab., index, gloss, ISBN 1-896754-49-X \$21.95)

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de cette affaire sont reproduites dans le livre et vont intéresser les historiens qui voudront creuser l'affaire sans se rendre aux archives. Une deuxième partie totalisant 70 pages se penche sur les répercussions de cette affaire dans les années qui ont vu le Québec s'émanciper de la tutelle du clergé. Le cardinal Léger et Jean-Paul II, égratignés au passage par l'auteur, sont les principaux protagonistes de cette seconde partie. Encore-là, ces pages souffrent d'une problématique qui, au fond, vise à séparer les bons des méchants, d'un côté les bienfaits émancipateurs de la science, dont Galilée et Laurendeau se font les thuriféraires, de l'autre l'obscurantisme de la religion et ses dignes représentants que sont, tour à tour, Pie IX, M<sup>gr</sup> Archambault, Pie X et Jean-Paul II.

Je confesse, cela dit, que j'ai bien apprécié ma lecture de ce petit livre de Sylvestre. Les luttes épiques entre la science et la religion donnent toujours lieu à des récits captivants car, pour quiconque croit en la raison, les savants ont toujours l'étoffe des héros et les arguments des élites religieuses sont si peu honnêtes qu'ils font de ces dernières de parfaits éteignoirs.

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## Technology / Technologie

*At the End of the Final Line: A Brief History of Aircraft Manufacturing at Canadian Vickers and Canadair from 1923 to 1984.* By Patrick J Campbell. (Sainte-Anne-de-Bellevue: Shoreline, 2006, 132 p, ill., tab., index, gloss, ISBN 1-896754-49-X \$21.95)

*At the End of the Final Line*, by Patrick J. Campbell, offers a brief introduction to the history of aircraft manufacturing at Canadian Vickers and Canadair between 1923, when the company began manufacturing their first aircraft, the Vickers Viking IV flying boat, and the production of the CL-600 Challenger jet, which began in 1976. This short narrative history begins with Campbell's important observation that, while historians of Canadian aviation have tended to focus on corporate histories, design technicalities, significant firsts, and anecdotal memoirs, they have traditionally overlooked the actual process of manufacturing aircraft (p.8). In this book Campbell, who himself worked at Canadair from 1952 to 1984, sets out to redress this omission.

Campbell's goal is a valuable reminder of the importance of the shop floor in the history of aviation and the history of technology more

broadly. This reminder is especially timely in the history of Canadian aviation, which, with a select group of exceptions, can tend towards hagiographic anecdotal histories and detailed internalist technical histories of particular aircraft designs. While these histories often supply important information, they can treat aviation as a curiously isolated activity. Campbell's approach, however, sparks important questions. Using an episodic structure built around the introduction of different aircraft designs and the resulting changes to the production line, Campbell traces the evolution of production skills and techniques at Canadian Vickers/Canadair. With his concentration on the shop floor, Campbell is able to highlight the ongoing dialogue between manufacturing skills and techniques and technological design, tracing the adaptation of existing methods and the introduction of new processes, skills, techniques, and machinery as new designs are produced. His narrative highlights the knowledge embedded in translating these designs into material objects and the skills involved in manipulating machinery and materials to produce these aircraft, reminding us of the importance of the process of production in both aviation history and the history of technology more generally. For those readers unfamiliar with aircraft structures and manufacturing, the short but excellent glossary will be a welcome aid in following this history. Further information can be gleaned from the photographs that comprise the later half of the book. Although missing information indicating their sources, the collection of images is impressive and can be analyzed to provide a large amount of detail about manufacturing techniques, aircraft construction, and changes in the company's manufacturing premises and processes.

*At the End of the Final Line* fills a similar gap to Rex Terpenning's memoir, *Bent Props and Blow Pots: A Pioneer Remembers Northern Bush Flying* (Madeira Park, B.C.: Harbour Publishing, 2003), which preserves the experience of an aircraft mechanic living and working along the Mackenzie Valley in the interwar years. Where Terpenning's account provides a great deal of detail regarding the mechanic's daily work, however, Campbell's book provides tantalizing glimpses of intriguing episodes, whetting the reader's appetite and raising many more questions than it answers. For instance, when describing the conversion of World War II military aircraft designs (C-47s and C-53s) to the civilian North Star configuration, Campbell notes that the pressurized design presented new manufacturing challenges for the company (p.31-32). The details of these challenges and their solutions, however, are never clearly outlined. Similarly, when describing the CL-44D4's manufacture, Campbell outlines the technical issues created by the aircraft's swing-tail opening. He ends his account with the statement,

“All these [issues] were solved” (p.47), without describing how they were addressed. These accounts leave one’s curiosity unsatisfied. In the case of the North Star, for example, one is left wondering: what were the problems? How were they resolved? Did the resolution require the development of new skills (and by whom) or did it draw on existing knowledge? If so, whose knowledge and skills? Who developed the solutions? Did they come from management, from the shop floor, or from an interaction between the two? At the same time, one looks for more detail about the men and women who worked at the company: who were they? Where and how were they trained? How did they adjust to new machines, skills, and techniques? What was their involvement in reconfiguring manufacturing programs? When new designs and production processes were introduced, how was this process negotiated and what did it mean for the workers’ skills and knowledge and for their experience of working in the factories? By prompting these questions and others, Campbell’s work provides a starting point for further investigations of the history of aircraft manufacturing at this Canadian company and elsewhere. Discovering the answers to these questions will be an important contribution to achieving his goal of providing a more complete history of aircraft production.

At the same time, the book occasionally falls prey to an issue that confronts many histories of Canadian aviation: while it provides a great deal of detail, the history of aircraft manufacturing at Canadian Vickers/Canadair is treated as separate from larger historical developments in the history of Canadian aviation, the history of aviation more generally, and Canadian history as a whole. For instance, Campbell recounts that Canadian Vickers began manufacturing flying boats and floatplanes because the factory had no land from which wheeled aircraft could be flown (p.13-14). While these circumstances may well have played a role in Canadian Vickers’ decision, placing the company’s design decision within the context of existing patterns of Canadian aviation in the 1920s provides a richer understanding of the design’s selection. In this period, much of Canadian flying took place in the Canadian Shield as part of both private and public forestry operations. Relying on flying boats to exploit waterways as natural landing fields—and thereby avoiding the need to build costly airfields on the Shield’s rocky terrain—Canadian aviators found a market for their services in the resource industries that expanded northward into the Shield during the interwar years. Moreover, in 1922 the Canadian government called for tenders to replace its existing fleet of war-surplus HS-2L flying boats with a new flying boat. Seen in this light, Canadian Vickers’ decision to produce water-based aircraft likely reflected patterns of Canadian aviation practice and economic

opportunities, as well as the location of its factory. Later developments, such as the move to component manufacturing or the rise and fall of Canadian-design-production, also deserve to be placed in the context of larger patterns in the history of North American aviation and aircraft production. To do so would provide a deeper understanding of how these patterns influenced production practices and how developments in manufacturing techniques potentially influenced these larger trends.

Despite any shortcomings, this book provides an important stimulus for investigations into the history of aircraft production and producers that move beyond the existing corporate histories. At the same time, it raises a series of questions whose answers will enrich our understanding of Canadian aviation history. For historians of technology more generally, Campbell's work articulates an important challenge: that our work should not ignore the shop floor and the knowledge embedded in the production process nor the ongoing dialogue between design, object, and techniques of manufacture.

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***Canada in NORAD, 1957-2007: A History.* By Joseph T. Jockel.** (Montreal/Kingston: McGill-Queen's University Press 2007. x + 225p., notes, app., maps, index. ISBN 978-1-55339-135-7 hc. \$85 978-1-55339-134-0 pb. \$34.95)

It is highly unusual for an American scholar to take a sincere interest in Canada and Canadian history. Joseph T. Jockel, a professor of Canadian Studies at St. Lawrence University in Canton, New York, is a rare exception, and students of Canada's national past should be grateful. Already the author of the standard history of the founding of the North American Air (and now Aerospace) Defence Command (NORAD), in his new book, Jockel extends his analysis ahead fifty years, focussing on the Canadian contributions to the most significant bilateral institution of Canada-US defence cooperation between 1957 and 2007.

The book has three specific goals, all of which are met impressively. Jockel aims to describe and assess Canadian participation in NORAD missions, to document the history of NORAD as a Canada-United States bi-national command, and to track the institutional evolution of NORAD as a security agreement. His analysis is divided into five main chapters and a conclusion, with each substantive section ending during one of the