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EVALUATING WORKFORCE TRANSITIONS IN THE ROYAL CANADIAN AIR FORCE

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ABSTRACT

Aircraft fleet transitions are about more than obtaining a new platform. The transition of personnel, support, and operational responsibility makes transitions complex and fraught with risk. Here we discuss Defence Research and Development Canada (DRDC) Defence Scientists' approach to evaluating Royal Canadian Air Force (RCAF) fleet transitions. We delve into the use of two different toolsets to model transitions.

1 INTRODUCTION

"An air force is always verging on obsolescence..." — Hap Arnold

Fleets of aircraft inevitably become obsolete and must eventually be stood down, with a replacement fleet stood up, while minimizing capability loss. As the outgoing fleet is downsized and the new fleet is grown, the risk of losing operational capability is high and must be carefully managed. We describe the use of two different toolsets to study the workforce implications of such transitions for RCAF fleets—the Python Compartment Modelling (PyCoMod) system dynamics toolset (PyCoMod GitHub 2025) and Athena Lite discrete event simulation toolset (DSTG 2025). These tools allow us to pay particular attention to the challenge of absorption, which is the need for experienced pilots and crew to mentor new inexperienced members that join the fleet.

2 MODELING TRANSITIONS

"Delay and decay" models are typically used to model military workforces due to bottom entry, time-in-rank requirements, and attrition being core facets describing personnel's flow through the closed military workforce. Such models can describe some occupations or parts of some members' careers; however, for operational fleets, pilot training requires significant mentorship to allow inexperienced pilots to become experienced. DRDC Defence Scientists have developed a mentorship model, implemented in both PyCoMod (Quirion et al. 2024) and Athena (Henderson et al. 2024) to verify implementations against each other and to leverage the differing strengths of the toolsets (lightweight and rapid development facilitated by PyCoMod and enterprise level use facilitated by Athena Lite, including the potential to tap directly into systems of record). The mentorship model has been developed and refined over two decades, with the initial implementation (the Production, Absorption, and Retention Simulation, or PARSim) being a systems dynamics model inspired by RAND research outlining absorption issues. PARSim and the models discussed here have been used to support RCAF decisions related to fleet management (Séguin 2015).

On the job training and mentorship are resource constrained, be it equipment (aircraft, simulators), personnel (mentors, maintainers keeping the fleet operational), positions (number of total flying positions, non-operational positions), materiel (fuel, spare parts), or training slots (operational training unit, advanced courses). Our model and implementations capture the effect these constraints have on the absorption of inexperienced pilots into a fleet (Quirion et al. 2025). When modelling transitions, these constraints become

more pronounced and a new difficulty arises: as the "baton" is passed from the old fleet to the new, operational effectiveness must be maintained or we risk falling below an acceptable level of ability to project force (i.e., capability loss). The constrained resources and the flow from one fleet to another makes for a fragile system, and close collaboration with subject matter experts is required.

3 CURRENT TRANSITIONS

Two ongoing transitions are being modelled in PyCoMod: the Canadian Multi-Mission Aircraft (CMMA) transition from the CP-140 Aurora to the P-8A Poseidon, and the fighter transition from the CF-18 (Hornet) to the CF-35A (Lightening II). Both Defence Scientists and Department of Defence subject matter experts work collaboratively and iteratively to respond to on-the-ground changes (such as loss or gain of training slots). The horizon of accurate forecasts is limited, yet transitions can take place over many years, necessitating active, close, and sustained collaboration.

The close collaboration has led to a deepening of Defence Scientists' understanding of the various fleets and has led to improvements in the use of the models. Two examples illustrate the benefit of active collaboration. First, working with the fighter pilot community to gain a more accurate and precise understanding of mentorship dynamics and its point in time interleaving enriched our interpretation of key variables including the mentoring ratio. Second, working with the CMMA community, we have broadened application beyond pilots to a mixed aircrew. Both allow our models to be better and more broadly applied, with our improved understanding leveraged when considering other fleets.

4 WHOLE OF SYSTEM

The RCAF has over 20 fleets, each drawing from a limited pool of new pilots and sharing certain resources, suggesting a whole of system perspective is required for effective workforce management. With that in mind, we are actively exploring the use of the Athena suite of enterprise tools, collaborating with the Defence Science and Technology Group in the Australian Department of Defence to develop our mentoring model initially within Athena Lite. While PyCoMod is flexible and excels in allowing rapid changes, its use requires scientific expertise. Athena is designed for staff level use, with scientific support, and is used in that manner, for example, to support the Australian Army, and it would be beneficial to achieve the same for the RCAF.

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