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FATIGUE RISK MANAGEMENT : A RCAF WICKED PROBLEM

Lieutenant-Colonel Colin Peek

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Introduction

The Royal Canadian Air Force (RCAF) has recently adopted the new Fatigue Risk Management System (FRMS) as of 1 July 2018. The program stemmed from an initiative delivered by the former RCAF Commander, Lieutenant-General Hood, and was issued in the form of Air Force Order (AFO) 8008-0, 23 June 2016. The RCAF Flight Operations Manual (FOM) defines fatigue as a physiological state of reduced mental or physical performance resulting from insufficient sleep that can impair an individual's ability to perform duties.[1] As stated in the AFO, fatigue is a known threat that degrades operational effectiveness, Flight Safety, and the retention of trained personnel across all communities.[2] The order also goes on to describe how successful delivery of airpower effects requires a pan-RCAF approach to fatigue management and how the program is recognized by all levels of command as being a critical operational enabler.[3] AFO 8008-0 laid out the policy, governance, guiding principals to the program, and specifically identified seven RCAF departments with respects to their responsibilities within the development, implementation, and management of the program. With such clear direction and powerful messaging as to the importance of the program from the Commander RCAF, why has the RCAF struggled to readily embrace FRMS and what has attributed to the delays in implementation and FRMS buy-in from RCAF operational

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[1] Royal Canadian Air Force, Flight Operations Manual, 2.1.3, 21 March 2019.
[2] Royal Canadian Air Force, Air Force Order 8008-0, Fatigue Risk Management System for the Royal Canadian Air Force, 23 June 2016.
[3] Ibid..

communities? With the seven separate departments responsible for the many different facets of the program, did AFO 8008-0 create a wicked-problem?

This paper will look to uncover the challenges within the multi-stakeholder wicked-problem implementation of FRMS within the RCAF and why those challenges exist. In doing so, we will look at the origins of FRMS, fatigue science, and legacy prescribed orders that preceded FRMS. This will include why the legacy orders have led to some resistance within RCAF tactical leadership. One large misunderstanding of the program is that FRMS will act as an inhibitor to operations and limit operational effectiveness. This misnomer is contrary to Commander RCAF direction and has garnered much attention by the entities responsible for the program.[4] In acknowledgement of and in anticipation to a natural resistance to change, AFO 8008-0 discusses culture-building tools to educate and counter the tendency to hang-on to legacy methods of doing business. Culture change is a key metric that is required before FRMS can be considered a success. This paper will also briefly look at path dependency theory and how that has helped and/or hindered implementation of FRMS and FRMS culture. As well in addressing culture change, this paper will look at education as a key ingredient in understanding transformation as it applies to the RCAF accepting a new program as significant as FRMS. In understanding what drives change and some of the roadblocks that counter change, the RCAF can better build upon the FRMS foundations that have already been established.

[4] Royal Canadian Air Force, Fatigue Risk Management Working Group Record of Decisions, 19 October 2017.

The FRMS Wicked Problem

In looking at the nature of the wicked-problem as it pertains to RCAF FRMS, AFO 8008-0 identified several stakeholders and defined their authorities and accountabilities for the program. These stakeholders included DG Air Readiness, Commander 1 Canadian Air Division (CAD), Commander 2 CAD, Director Air Comptrollership and Business Management, Director Air Readiness and Plans, Department of Flight Safety, and the RCAF Surgeon. With so many competing priorities and different levels of leadership responsible for so many different facets of the program, AFO 8008-0 and the creation of an RCAF FRMS can be defined as a wicked-problem. The multi-stakeholder element of the wicked-problem was managed with a coordinated and detailed timeline that clearly laid out the deliverables and expectations of each stakeholder via the RCAF Director of Air Readiness FRMS FRAG Order (FRAGO). The FRAGO documented progress of all stakeholders in a single order, which necessitated a coordinated discussion and effort in order to meet timelines and deliverables. The initial FRAGO laid out a timeline that through multi-stakeholder discussion was eventually perceived as unattainable, and resulted in a revised timeline that although delayed, all stakeholders were able to meet.

The wicked-problem, however, carried down to the lower levels as well and even the end-user of the program had its own set of competing stakeholders when one looks at the different trades that the program was intended for. Air traffic control, aircrew, aircraft technicians, and aviation support trades all had an invested interest in how FRMS would

impact their roles. Even unit logistic trades were impacted by the program, and needed to understand their requirements when it comes to processing claims that may have had unique factors that push treasury board guidelines. One example of this is an air mobility crew that claims breakfast, when staying at hotels that include breakfast, in order to preserve a Trenton circadian rhythm. Maintaining local circadian rhythms is a part of an FRMS fatigue counter measure that reduces fatigue risk, and needs to be understood by the chain of command to support. In an attempt to address this wicked-problem, the 1 CAD and 2 CAD entities hosted a multi-trade pan-RCAF FRMS working group in October 2018. The aim of this working group was to identify and address challenges for the delivery of the program to the end user. This included metrics and feedback mechanisms that could be reported up the chain for high headquarter participation, as part of the continuous improvement through a *top-down, bottom-up* approach that was directed in AFO 8008-0. Having all trades involved in a pan-RCAF solution to the wicked problem, also had a goal to render user buy-in and help promote the culture change required for a successful implementation of the program.

Why does the RCAF need FRMS?

What was the catalyst for AFO 8008-0? The RCAF already had prescribed orders for crew duty and rest cycles in the RCAF Flight Operations Manual that were community specific and explicitly detailed how long an operator could be employed, hold duty periods, along with the mandated rest cycles. These legacy prescribed orders also defined the conditions for extending duty cycles and who could approve such extensions

to these orders. Aircrew in the RCAF are also subject to a standardized pre-flight mission briefing that looks at crew readiness and appropriate fitness for duty. Along with proficiency and readiness requirements, flight authorization officers, aircraft captains, and/or mission commanders are all responsible to ensure that their crews be considered fit to fly/fit for duty. In saying fit to fly, we refer to not being subject to illness, fatigue, or stress (for example) symptoms that would preclude one from safely carrying out their duty. With prescribed rules in place and an established pre-flight self-reporting standard, why did the RCAF need FRMS? This is the question that implementers of the program continually face.

The RCAF FRMS fully acknowledges that existing prescriptive orders on Crew Flying Time, Duty Day Limits, Crew Rest, Hours of Service and Non-Working Day regulations are critical and complimentary components of FRMS, but they are not sufficient to account for all fatigue-related factors.[5] Duty and rest cycles were not science-based and stemmed from a long history of limits on working hours dating back to the industrial revolution.[6] In step with the International Civil Aviation Organization (ICAO) that has recognized significant developments with fatigue science, the RCAF is now aware of the scientific understanding that can improve aviation safety both in the air and on the ground. While prescriptive orders are still important, as described in the FOM, they do not account for key sleep elements, such as sleep debt, continual wakefulness, and circadian rhythm effects. RCAF leadership recognizes that they are required to permit

[5] Royal Canadian Air Force, Flight Operations Manual, 2.1.3, 21 March 2019.
[6] International Civil Aviation Organization, Fatigue Risk Management System, Implementation Guide for Operators, 1.2. July 2011.

for at least eight hours of uninterrupted crew rest prior to flying duties, but that alone does not ask how a pilot slept prior to duty, how long they have been awake/or will be awake, or if they will be performing safety sensitive tasks during periods of circadian rhythm lows. Employing FRMS within the RCAF ensures these issues are addressed, and in doing so better equips the RCAF for safety and success. Even when permitting extensions to hours of service, a supervisor can now do so with a better understanding of the actual fatigue risk that he/she is accepting. The problem lies in communicating this importance to the tactical and strategic chains of command, that in large want to defer to the legacy prescriptive orders for ease of operations. Unfortunately, this means ignoring real fatigue risks that are based upon science.

Path Dependency Theory

One can look at Path Dependency Theory to help describe this resistance to change and slow adaptation of FRMS. Path Dependency Theory is commonly used to explain how organizations seemingly change course on long-held policies and beliefs.[7] Path dependency requires a significant event for those of the institution to question existing policies and stimulate change.[8] The RCAF cannot draw upon a single aviation incident to provide the penultimate moment where the RCAF as a whole would be able to recognize that a change was necessary. Safety reporting that includes fatigue as a causal factor is relatively new, and thus has only recently began to include fatigue findings in

[7] Johnson, Jessica. At the Pilot's Discretion: The Evolution of Personnel Fatigue Management in the Royal Canadian Air Force, University of Manitoba, 2019.
[8] Ibid..

the RCAF Flight Safety program. Unlike the relatively new Human Factors in Military Aviation (HPMA) program that came as a result of the 2006 Cormorant crash off of the coast of Nova Scotia that killed three. The accident was a result of pilot error, as the pilots were challenged to appropriately comprehend and manage the Cormorant's highly sophisticated levels of automation. The Cormorant was a relatively new fleet to the RCAF, and following the accident the RCAF recognized that a program was needed to develop standard operating procedures and the associated training and evaluation with respects to automation and technological advances that the introductions of several new fleets have and will bring in the near future. The successful implementation and buy-in for HPMA can be attributed to the unfortunate and catastrophic Cormorant crash as its catalyst to adopt change.

Understanding that lack of a dependency theory catalyst moment, FRMS trainers and implementers have included recent Flight Safety reports that now include fatigue causal factors, to support their educational delivery. The Flight Safety report on the 2013 Sea King roll-over crash on the ramp at Shearwater, Nova Scotia sites fatigue as a causal factor after crews experienced lengthy delays and a resultant prolonged duty day (continual wakefulness) that attributed to the pilot's decision making in this incident. FRMS educators also refer to the infamous Air Canada near miss in San Francisco that saw the pilot's lining up to land on a parallel taxiway. This incident occurred during a period of circadian low and the National Transportation Safety Board concluded that the

pilots were fatigued due to continual wakefulness and circadian rhythm effects.[9] These incidents are relatively new and have helped to counter the pessimistic views that refer to a lack of RCAF fatigue related crashes as a supporting argument when encountering a reluctance to embrace FRMS. Implementation of FRMS is also included as preventive measures to thwart similar occurrences in the future.

Education to assist with culture change.

In addition to using testimony and statistics to support the need for FRMS, the associated AFO refers to applying the *layers of defence*, where education is referred to as the first layer. In order to instill a change of culture as it relates to accepting FRMS and adopting a new RCAF program, education is paramount. Education is also a requirement to align the many stakeholders for a unified delivery. Operators and the chain of command cannot stand behind a program that they do not understand. This lack of understanding is due mostly in part for not having received the education piece that is so critical to the program.

As part of the reporting metrics, FRMS statistics are reported at the semi-annual RCAF Airworthiness Review Board (ARB). This is a forum in which the commander of the RCAF is made aware of the status of his fleets and or any trends that his flying communities are subject too. As part of aircrew's pre-flight mission briefing, crews are required to record and report their fatigue risk score, as deemed by a standardized fatigue

[9] National Transportation Safety Board, Incident Report, NTSB/AIR-18/01 PB2018-101561.

risk measurement tool. These scores are tallied by units and wings and presented at the ARB. Feedback from this forum indicated that the senior levels of command did not understand the significance of the numbers that were reported to them and questioned the relevance of the statistics.[10] This was another indication of opposition to the program attributed to a lack of education. The 1 Canadian Air Division (1 CAD) department responsible for FRMS uncovered that the planned education strategy for the program often did not reach those at the Lieutenant Colonel level both at the squadrons and headquarters level. To the contrary however, 1 CAD determined that the education packages had reached the operator levels of the units, who had embraced the concepts of the program. This level of buy-in was seen in the relatively accurate scores from crews reporting their levels of fatigue, and reports from the 1 CAD Air Operations Centre and users that have seen crew changes, itinerary adjustments and other fatigue counter-measures that have sited fatigue as their justification. 1 CAD standardization visits, a formal directive for providing oversight of RCAF unit flying practices and standardization, that took place in late 2018 and early 2019 have also seen buy-in at the Captain and Major operator level. This level of buy-in and culture change from the bottom up has been attributed to a successful measure of education that reached the units in both training packages and manuals and via promulgation of policy, orders, directives, and liaison initiatives from the FRMS responsible agents.

[10] Post Airworthiness Review Board Meeting – 1 Canadian Air Division Senior Staff Officer Operational Airworthiness/1 CAD Senior Staff Officer Air Force Standards, 29 May 2019.

Another finding from 1 CAD standardization visits was the outstanding requirement of Wings to stand-up their semi-annual Wing FRMS Council meetings. This is a mandated part of the program in which key Wing stakeholders discuss and address FRMS issues that are affecting their units. This process both informs the local chain of command and provides feedback to relevant stakeholders and higher headquarters. Having all Wing stakeholders together to address their issues is one of the avenues to manage a wicked-problem at the Wing level. This is also a key information piece for chain of command to understand their fatigue problems and their statistical metrics that are reported at the ARB. Squadron and community representatives not understanding their ARB FRMS slides is an unfortunate fall-out of this failure in the program. Fortunately this feedback has been circulated again to Wing Commanders for correction, as seen by 19 Wing Comox who was noted as the first RCAF Wing to stand-up their FRMS Council as of 31 May 2019. That meeting reviewed all unit fatigue-risk pre-mission results, along with other Wing FRMS issues pertinent to their units. With other Wings to soon follow the 19 Wing Comox example, this has marked a pivotal moment in the adaptation of change.

In another measure to address the gap between the operator's understanding of FRMS and those of the Lieutenant Colonel level and above at the Wings and headquarters, 1 CAD has created a briefing and education package to target those specifically that have missed the initial training deliveries. At a recent RCAF Unit Command Team training session for incoming unit Commanding Officers and Chiefs, the 1 CAD Air Operations Centre (AOC) representative was witnessed by the author of this paper to have stated that when reporting reasons for flight delays or cancellations to the 1 CAD Comd, fatigue was

not good enough (as a reason).[11] This point is raised to support the notion that a gap still exists between the operators that understand the program and are attempting to use it as directed for the benefit of the RCAF, and some senior levels in operations that are out-of-step with current regulations and Commander directives as they relate to FRMS. Without all levels of the institution understanding the program, there is a risk for this program to fail. The success of the program is jeopardized if an operator's request for changing an itinerary to reduce an assessed fatigue risk, and communicated as such, is ignored by higher headquarters. The 1 CAD FRMS developers understand that FRMS does not *eliminate* fatigue risk, but have designed the program to better *manage* fatigue and the associated risks. This includes mitigations to reduce fatigue risk and also includes the identification of the level of authority that can accept fatigue risk. This premise of accepting risk, however, is based on the authorizing officer understanding the science-based program and the concepts of fatigue risk management contained within. The 1 CAD AOC is a targeted audience for the information briefing that was designed to help bridge this gap in FRMS training.

Conclusion

Despite AFO 8008-0 laying out a wicked problem for RCAF stakeholders to resolve, the roadmap to solve the wicked-problem was laid out with clear direction from the Commander RCAF. Stakeholders were all identified, along with their authorities and what elements of the program they were responsible for. The AFO comprehensively laid

[11] Royal Canadian Air Force Unit Command Team Orientation Program, CAOC Brief, 30 May 2019.

out policy, governance and the guiding principles that helped drive the end-user product that is in place today in support of safer and more efficient operations. Again, the program does not necessarily eliminate fatigue risk, but educates the end-user and chain of command to reduce the risk and better understand the risk when applying operational decision making. Despite not having a significant event to serve as a catalyst for change, it is that education piece that continues to take precedence in breaking the reluctance to change and accept new science-based strategies for reducing fatigue risk. AFO 8008-0 also mandated feedback mechanisms for continuous improvement of the program. This continuous feedback loop is a big part of the wicked problem solution at all levels of the RCAF, and a key provider to its future success in driving change. With the feedback loop contributing to the recent commencement of the first RCAF Wing FRMS Council meeting, we have already seen the how AFO 8008-0 has provided all the necessary components to address the FRMS wicked-problem.

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