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THE CASE FOR GREATER INVESTMENT IN, AND EMPLOYMENT OF, RCAF TACTICAL CONTROL RADAR SQUADRONS

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THE CASE FOR GREATER INVESTMENT IN, AND EMPLOYMENT OF, RCAF TACTICAL CONTROL RADAR (TCR) SQUADRONS

AIM

1. The Royal Canadian Air Force (RCAF) could possess the right mix of future air power capabilities by providing a greater role for its Tactical Control Radar (TCR) Squadrons.¹ There is strategic support for this initiative as outlined in the Government of Canada's current defence policy *Strong Secure Engaged* (SSE), and the operational importance of these units is well established within RCAF doctrine.

INTRODUCTION

2. The RCAF has two TCR Squadrons in 12^e Escadron de Radar and 42 Radar Squadron, located at 3^e Escadre Bagotville and 4 Wing Cold Lake respectively. They currently employ the AN/TPS-70 radar system. The current nomenclature referring to these units as Tactical Control Radar Squadrons leads us to a misinterpretation of what capabilities these squadrons provide, and how to employ them properly. TCR Squadrons provide more than just ground radar. It would be more appropriate to refer to these units by their NATO definition as deployable control and reporting centers (CRC).² CRCs are mobile command, control, and communication elements

¹ There is a move to update the current nomenclature from Tactical Control Radar (TCR) to Air Control Squadron (ACS) within 1 Canadian Air Division, because ACS better reflects the mission and capabilities of the squadrons. Since the current *Concept of Operations (CONOPS) Tactical Control Radar (TCR) Squadrons* (Winnipeg: 1 Canadian Air Division SSO ACR, 2015) has not been updated to reflect this, this paper will refer to the two RCAF mobile radar units as TCRs.

² North Atlantic Treaty Organization, NATO Standard AJP-3.3, *Allied Joint Doctrine for Air and Space Operations* (Brussels: NATO Standardization Office, 2016), 2-3.

of a greater theatre air control system. They integrate a comprehensive air picture via data links from air-, sea-, and land-based sensors, as well as from their own surveillance and control radar. CRCs perform decentralized command and control of joint operations by conducting threat warning, air battle management, fighter control, combat identification, and strategic communications.³ The value of TCR employment will be explained by:

- a. An overview of the history of the TCR Squadrons and their capabilities;
- b. Identifying how TCR investment and employment ties into the Canadian Armed Forces (CAF) strategic framework as outlined in SSE;
- c. Linking the capabilities and effects of mobile radar squadrons to the operational requirements stated in the RCAF doctrine; and
- d. Outlining of two examples of TCR employment from the Royal Australian Air Force (RAAF) and the United States Air Force (USAF).

DISCUSSION

3. In 1990 the CAF purchased two TPS-70 radar systems. At the time these radars were considered state of the art. They provided a 3-Dimensional, radar jamming resistant, search and secondary mobile radar capability. These systems are able to track 500 targets from 0 to 100,000 feet to a maximum range of 240 nautical miles (444 kilometres).⁴ The radars have been proven

³ Royal Canadian Air Force, (Draft Version 1) *Area of Operations Management (Aerospace Control-Theatre Aerospace Control System) Force Employment Concept* (Winnipeg: 1 Canadian Air Division Director Aerospace Readiness, 2017), 6.

⁴ GlobalSecurity.org, "Military Systems – A/N/TPS/70," last modified 7 July 2011, www.globalsecurity.org/military/systems/aircraft/systems/an-tps-70.htm.

reliable and compact, requiring little infrastructure. Later in 1994, the squadrons were outfitted with tactical satellite communications (SatCom), giving them a flexibility to deploy anywhere in support of operational commitments ranging from support to land force units, as well as gap filling in the Northern Warning System.⁵ The TCR squadrons are able to provide control in all weather conditions, anywhere, and maintain a 72 hour notice to move readiness posture. They possess a fleet of Heavy Engineering Support Vehicles (HESV) and Heavy Land Vehicle Wheeled (HLVW) vehicles in order to facilitate the ability to meet this mandate.⁶

4. Over time the systems fell into disrepair, leading to a project to replace the TPS-70s starting in 2008. Eventually a \$55 million contract was established with Thales Canada Ltd. to provide new mobile radar systems, but in 2015 the deal to replace the aging systems was terminated. It was decided at the time to refurbish the current systems rather than replace them outright.⁷ During the refurbishment, the TCRs underwent many system upgrades to include: new controller display consoles, and upgraded datalink communication suites to include LINK16 capability. These upgrades ensure that the TPS-70 radar and accompanying systems remain a credible force enabler for CAF operations. Despite recent improvements, the RCAF has been very hesitant to employ the TCR Squadrons due to perceived fragility and due to the squadrons supporting role with fighter force generation at the main operating bases of Cold Lake and Bagotville.

⁵ Department of National Intranet, Cold Lake Squadrons, "42 Radar History," last accessed 26 January 2018, http://coldlake.mil.ca/Squadrons/42RDR/History_E.aspx .

⁶ Department of National Defence, *Concept of Operations (CONOPS) Tactical Control Radar (TCR) Squadrons* (Winnipeg: 1 Canadian Air Division SSO ACR, 2015), 2-3.

⁷ Dean Beeby, "Military plans to refurbish 'unsupportable' radar systems," *CBC News*, 31 December 2015, www.cbc.ca/news/politics/military-plans-to-refurbish-unsupportable-radar-systems-1.3384528.

5. SSE provides strategic support for a greater focus, investment, and role for the RCAF's TCR Squadrons. The Government of Canada clearly outlines the need for the CAF to remain active in a renewed partnership in NORAD and do its part to contribute to a stable world order. Part of the strategy in implementing this policy was a renewed investiture in tactical integrated command, control, and communications systems.⁸ In the future, TCRs will play a crucial role in supporting government policy as the primary gap-filler to NORAD's Northern Warning System, coastal, and interior radars. They also possess a unique, fully deployable, platform through which tactical command and control (Tac C2) can be executed in deployed operations.

6. Fighter replacement is one aspect of SSE that should not be overlooked in respect to TCR Squadron investment and improvements. In order to remain interoperable with allies and operational partners, the government intends to procure 88 jets to replace the CF-18 fleet.⁹ The RCAF needs to ensure that current units have the capabilities required to remain interoperable with the new fighter fleet. This is particularly relevant when it comes to the TCR Squadrons, which play a crucial role in fighter force generation within main operating bases in Canada. The units provide Tac C2 during major exercises, and fighter control throughout the training cycle. The fighter force needs to train with units that have the communication and sensor equipment that are of the same generation. Canada would be negligent in investing in a new capability in order to be interoperable with allied partners, while not first ensuring that supporting units and systems have the same level of interoperability.

⁸ Department of National Defence, *Strong, Secure, Engaged – Canada's Defence Policy* (Ottawa: DND Canada, 2017), 14, 39.

⁹ Department of National Defence, *Strong, Secure, Engaged – Canada's Defence Policy...*, 38.

7. Operationally, the TCR Squadrons are particularly relevant within four of six RCAF operational functions of command, sense, act, shield, sustain, and generate:¹⁰
- a. Command. In their essence, mobile radar units enable near real-time Tac C2. With various secure and/ or non-secure radio capabilities across various frequency bands, satellite and electronic means, to include data links that can be used to provide a common operating air picture to the theatre commander. They are an ideal platform for control and coordination with other tactical air, naval, and land assets.¹¹
 - b. Sense. The TPS-70 radar system permits surveillance from the Earth's surface to the stratosphere, over land or water. The primary radar combined with identification of friend or foe (IFF), can be used to detect, identify, and track enemy and friendly aircraft. The mobile radar units provide equipment essential for all source data fusion.¹²
 - c. Act. Mobile radar units perform airspace control and theatre battle management functions of combat identification, force allocation, fighter control, airspace management, and inter-service connectivity. Their capabilities can directly impact all types of air operations.¹³
 - d. Shield. By providing early warning and detection, mobile radar units can provide an integral part of protecting air, naval, and land forces. Their connectivity with

¹⁰ Department of National Defence, B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine* (Trenton ON: Canadian Forces Aerospace Warfare Centre, 2016), 19.

¹¹ RCAF, *Area of Operations Management (Aerospace Control- Theatre Aerospace Control System) Force Employment Concept...*, 9.

¹² *Ibid.*, 8.

¹³ *Ibid.*

combat air patrols, sea- and ground-based air defence assets are substantial force multipliers.

8. Under the operational functions, the RCAF has both “core” and “enabling” capabilities that are essential for mission success (see Figure 1 below). These capabilities create air power effects through the assignment of roles, the conduct of air power missions, and the execution of supporting activities.¹⁴ One could argue that TCR Squadrons could assist in any role, mission, or activity executed by the RCAF, but these units are particularly relevant within 15 of these 21 roles, missions, and activities.

¹⁴ B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine...*, 31.

RCAF FUNCTIONS	CAPABILITIES		ROLES, MISSIONS, ² ACTIVITIES
COMMAND SENSE ACT SHIELD SUSTAIN GENERATE	Core	Control of the Air	Counter Air (OCA, DCA, Air Defence)
			Area of Operations Management ³ (Airspace Control, Nav Systems, Air C2)
		Air Attack	Counter Land (CAS, Interdiction)
			Counter Sea (ASW, ASUW)
		Air Mobility	Airlift (Strategic and Tactical, Aeromedical Evacuation)
			Air-to-Air Refuelling
	Intelligence, Surveillance and Reconnaissance	Search and Rescue (Personnel Recovery)	
	Enabling	Electronic Warfare	Collect, Process, Disseminate ⁴ (Early Warning, RAP)
			Electronic Attack
			Electronic Protection
		Command and Control	EW Support
			Monitor, Assess, Plan, Direct, Coordinate
		Force Protection	Security
			CBRN Defence
		Force Sustainment	Health Protection
Aircraft Maintenance			
Logistics			
Force Generation	Engineering		
	Communications		
Force Development	Readiness, Education and Training		
		Capability Development	

Table 5-1. RCAF capabilities, roles, missions, and activities

Figure 1

Source: B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine...*, 32

- a. Control of the air, air attack, and air mobility. TCR Squadrons are able to provide deployable combat identification and tactical fighter control. This is essential in counter air and land operations, possible even indirect support to counter sea

operations. The battle management capacity of these units are essential in providing area of operations management through airspace de-confliction. This includes air-to-air refuelling tanker orbit and fuel management. TCR Squadrons possess the systems and personnel necessary to interpret battlespace information and take tactical action based on the real-time situation in accordance with command intent.¹⁵

- b. ISR, EW, C2, and Force Protection. TCR Squadrons have a role with respect to Intelligence, Surveillance and Reconnaissance (ISR), Electronic Warfare (EW), Command and Control (C2), and Force Protection. Long-range radar helps develop the overall air picture and provide early warning when integrated into other systems, enhancing the overall ISR capability and assisting with force protection. With high burn-through rate and frequency agility, the TPS-70 possesses good electronic countermeasures, and the ability to help triangulate and detect any jamming emitters. Along with Tac C2 as their primary function, the TCR Squadrons can provide digital display and transfer of the recognized air picture (RAP) data via data links. Detached elements of the squadron can act as data forwarders and/or transmit the RAP vertically and/or laterally to other theater C2 agencies.¹⁶
- c. Force Sustainment, Generation, and Development. Although not a primary logistic enabler for the RCAF, the integral vehicle fleet, generator equipment, and first line maintenance personal allows the TCR Squadrons to have less of a

¹⁵ RCAF, (Draft Version 1) *Area of Operations Management (Aerospace Control- Theatre Aerospace Control System) Force Employment Concept...*, 12.

¹⁶ *Ibid.*, 13.

support dependency and an ability to operate in more austere locations than other RCAF capabilities. Co-located at the CAF two fighter main operating bases, the units have always played an essential role in fighter force readiness and capability development.¹⁷

9. A recent example of how investment and employment in mobile radar units had significant tactical and operational effects is through the RAAF No 114 Mobile and Control Reporting Unit (114MCRU) to Afghanistan. Like the RCAF TCR Squadrons, the RAAF's MCRUs were not committed to overseas operations, focusing most of their efforts on national tasks. This changed in 2007, when the USAF requested RAAF assistance to replace their Air Control Squadrons in Southern Afghanistan, when members and equipment were in need of a period of rest and re-constitution. The 114MCRU deployed to Kandahar Airfield after essential equipment upgrades to complement its TPS-77 radar system to match the USAF's in theatre capability.¹⁸ Once in place, the unit controlled and coordinated all coalition fixed wing aircraft, and compiled the air picture that was disseminated to the higher headquarters. With up to 120 aircraft operating in their airspace at one time, the unit coordinated the support for over 5000 combat engagements in a two year period. Despite extreme temperatures ranges and fine dust, the 114MCRU was able to achieve better than 98 per cent serviceability throughout the deployment, a testament to persistence of these mobile systems, not common to most air force capabilities. Through participation in Afghanistan air operations, the RAAF gained invaluable experience for the mobile radar unit, while contributing significantly to the Coalition effort. The

¹⁷ *Concept of Operations (CONOPS) Tactical Control Radar (TCR) Squadrons...*, 4-5.

¹⁸ Royal Australian Air Force Air Power Development Centre, "Taipan in Afghanistan," *Pathfinder Bulletin*, Issue 254 (October 2015).

movement of equipment and personnel did place considerable demands on the small operational and maintenance force within the 114MCRU. However, the success of the deployment brought RAAF capabilities in line with Allied skills and capabilities.¹⁹

10. The USAF is the best institution to turn to when it comes to mobile radar employment. A typical USAF Air Control Squadron (ACS) is comprised of up to 300 personnel from as many as 25 occupations. Equipment generally includes one to two TPS-75 radars, communication equipment, generators, and as many as 100 tactical vehicles. These units are deployed regularly in order to provide air battle management and Tac C2 functions. Recent ACS deployments include: Italy in 1994 and 1999 to support operations in the Former Yugoslavia; Kuwait in 2000 during Operations DESERT SHIELD/STORM, Southwest Asia in 2001 during Operation ENDURING FREEDOM, and to Iraq in 2003 during IRAQI FREEDOM.²⁰ ACSs provide one distinct advantage over other Tac C2 platforms such as the E3 Sentry (AWACS); the system provides a level of permanence (ability to operate 24/7/365), and despite the size of a USAF ACS in comparison to the units in the RCAF and RAAF, they do have a much smaller sustainment requirement and footprint than a squadron of aircraft. Control of the air can not be obtained without air control; this explains the heavy operational tempo and utilization of the ACS capability within the USAF. With the operational demand placed on USAF ACSs, the personnel and equipment are often in need of rest and reconstitution. Employing RCAF TCR Squadrons in relief of USAF units would fill an operational need, while having a strategic impact with our principle ally.

¹⁹ Royal Australian Air Force Air Power Development Centre, "Taipan in Afghanistan,"...

²⁰ Aviano Air Base, "606th Air Control Squadron," last modified 9 June 2016, www.aviano.af.mil/About-US/Fact-Sheets/Dispay/Article/794939/606th-air-control-squadron/.

11. One counter against further investment in the TCRs is that the RCAF already has a deployable communication and control capability in 8 Air Communications and Control Squadron (8 ACCS) located at 8 Wing Trenton. But there are key distinctions between the mission sets of 8 ACCS and the TCR Squadrons. First, 8 ACCS inventory includes combat information systems and expeditionary aerospace management equipment. These systems are ideal for opening a headquarters or establishing an expeditionary air traffic management and control capability at an airfield.²¹ The MPN-25 radar and associated equipment are designed solely for air traffic control within an airbase, they would be inadequate for providing a long range search and battle management control capability as was done in the RAAF MCRU and USAF ACS examples.²² The majority 8 ACCS personnel are engaged in maintenance and support. Operational personnel are provided from other units throughout the RCAF during exercises and operations, the majority of which are trained in the air traffic control function and not in theatre air battle management. The RCAF would have to significantly change the manning profile, equipment, and concept of operations of 8 ACCS prior to employing it in a TCR function. Divestment of the TCR Squadrons to augment the capability of 8 ACCS would come at a great cost to fighter force generation.

CONCLUSION

12. With an everlasting battle for resources and shortage of personnel, the RCAF has to choose wisely in which capabilities merit further investment, and which capabilities should be

²¹ Department of National Intranet, 8 Wing Units and Squadrons, Lodger Units, "8 Air Communications and Control Squadron," last accessed 26 January 2018, <http://w08-ttn-vmweb01.forces.mil.ca/cms/en/main/8WingUnitsandSquadrons/Lodger/8accs/8ACCS.aspx>.

²² Harris Corp., "AN/MPN-25 Military Air Traffic Control Radar," last accessed 31 Jul 2018, www.harris.com/solution/anmpn-25-military-air-traffic-control-radar.

divested. The TCR Squadrons provide a capability that deserves greater investment. Their current systems should continue to be upgraded in order to meet the expectations of our allies, with a medium-term view towards replacement. The TCRs have strategic and operational relevance as outlined in SSE and RCAF doctrine. They provide characteristics unique within air forces in that they can provide permanent presence, with relatively low support dependency. Yet the effects they can provide are immeasurable. They are in high demand during coalition operations; therefore the RCAF should employ these units in order to have a greater role in commanding and controlling air force assets and synergizing air force effects. This will truly make the RCAF a leader among air forces and a responsible, value added partner with NORAD, NATO, and Coalition partners.

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