

**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS
INFORMATION BRIEFING NOTE**

Date: July 4, 2013
File: 280-20
Cliff/tracking #: 198915

I. PREPARED FOR: The Honourable Steve Thomson Minister of Forests, Lands and Natural Resource Operations

II. ISSUE: Anticipate request from the Coulson Group of companies (CG) to continue direct-award contracted services beyond 2013 for the Martin Mars.

III. BACKGROUND:

The Martin Mars (Mars) has been a highly visible asset working a small percentage of fires within British Columbia since 1960. For many years the aircraft's operating costs were covered by a consortium of timber companies. The aircraft was available for use by the Wildfire Management Branch (WMB) on a *call-when-needed* basis primarily on Vancouver Island.

In 2006, the final member of the consortium sold the aircraft to CG and now operates under the name of *Coulson Flying Tankers*. Starting in 2007 the CG was offered a direct-award contract for Mars services largely based on the urgings of the Minister and the need to confirm its utility. In 2008, despite a 90 day standing offer with the WMB, the CG opted out of this contract (no penalty assessed) part way through the season to pursue opportunities in the USA.

In 2009 the CG did not pursue a contract with the province as they acquired a 1-year agreement with the US Forest Service (USFS). The 2009 fire season was one of the busiest for the provincial air tanker program to date.

After failing to exercise an agreement with the USFS in 2010, the CG was direct-awarded a contract on an annual basis from 2010-2013 fire seasons.

Since the CG acquisition of the Mars the CG has received \$5.1 m from the Province of British Columbia. The aircraft has worked a total of 13 fires in BC and has directly cost the province \$3.66 m. In 2011 the Mars was deployed to Alberta through its contract with the Province of British Columbia and received a further \$1.35 m.

The Mars has been utilised primarily on Vancouver Island for initial attack and for large fires in the interior of BC.

On average the provincial air tanker program conducts 625 air tanker missions per year mostly facilitated by its land-based fleet of aircraft.

The WMB has 55 years of experience working with varied scooper aircraft types through previous contracts to WMB as well as out-of-province mutual aid aircraft. The WMB has been utilising the Martin Mars since 1960 and has significant operational expertise relating to its use:

- Flown 785 hours for WMB since 1996 (1960-1995 hours not included)
- Flown under WMB air attack officer (AAO) command and control on 45 fires since 1996
- WMB has lead Mars annual briefings and debriefings for each year under WMB contract
- WMB led level 1 air attack training delivery to Mars staff during the CG's inaugural season with the Mars.
- WMB participation in 2005 Mars gel application testing in Coastal Fire Centre.
- WMB paid research through FP Innovations re: gel use from Mars on BC wildfires (included 7 wildfire data sets)
- WMB participation in Mars aerial delivery trials through FP Innovation- Port Alberni 2008
- USFS Mars California test drops: at the request of the Honourable Minister Pat Bell FP Innovations attended trials and produced subsequent information material forwarded to the Minister and delivered to WMB aviation managers.
- WMB authored scooper/Mars evaluation reports 1999 and 2010
- Over the last four years on contract the WMB has spent s.17, s.21 on conducting practices with the Mars aircraft.

Based on analysis of present and future operational needs, WMB intends to tender a *request for proposal* (RFP) for a scooper group for the 2014 fire season. The tender will be for a turbine, amphibious (able to land on both land and water), multi-aircraft group and will not include a single-aircraft, piston engine, flying boat like the Martin Mars. This will result in a more modern, manoeuvrable and operationally effective tool for aerial fire suppression in BC.

s.13, s.17, s.21

IV. DISCUSSION:

The mandate of the provincial air tanker program is the “*safe, effective and efficient delivery of retardants and suppressants in support of fire control*”. The following information highlights the Mars limited efficacy and supports the assertion that through the RFP process, industry can supply the province with a scooper fleet option that better meet the aforementioned mandate.

Safety:

- The Mars aircraft creates significant wing-tip vortices resulting from its heavy gross weight, slow flying speed and *clean* configuration. Wing-tip vortices pose a significant safety concern for other aircraft following in its flight path. WMB AAOs do not provide quick assessments of drop accuracy of the Mars due to the risks associated with lingering wingtip vortices. This is contrary to the standard operating procedures (SOPs) associated with all other aircraft in the provincial air tanker fleet. WMB staff experienced a near catastrophic aviation occurrence associated with this phenomena in 2007 involving a bird dog and the Mars. The wing-tip vortices likewise adversely affect the ability to integrate the Mars with helicopter resources.
- The large drop pattern and volume of payload discharged by the Mars pose safety challenges to ground resources requiring such resources to retreat from the portion of the fire being actioned by the Mars until safe to return. Furthermore, attention must be paid by ground resources to the overhead hazards potentially created by the Mars payload contacting the forest canopy.
- The Mars is a flying boat meaning it can only land on water bodies. Therefore fuelling and operational maintenance is carried out on water. This represents an environmental risk and liability to the province and the contractor.

Effective:

- Although the Mars aircraft has upgraded its avionics and gel delivery system it still maintains the same performance limitations it had when first used by the WMB in 1960.
- The principle around the management of water scooping aircraft is that of *litres per hour*. Aircraft are most effective when actioning a fire in close proximity to suitable water source of limited elevation difference. This principle is pronounced with the Mars aircraft due the performance limitations of its piston engines. Table 1 below highlights the performance limitations relating to *litres per hour* delivered by the Mars compared to other scooper types as a function of cruise speed, climb rates and minimum scooping length requirements. Furthermore, the Mars' piston engines limit its performance when flying in flight profiles that require significant descent rates associated with steep fire bombing runs and descent requirements to water sources when working in mountainous terrain.

Aircraft Type	Loaded climb rates (ft/min)	Loaded cruise speed	Minimum scooping length	Engine Type
Martin Mars	300	130 kt	5555 metres	Piston
CL-415	1375	180 kt	1325 metres	Turbine
CL-215T	1280	175 kt	1325 metres	Turbine
Fire Boss	890	145 kt	855 metres	Turbine

Table 1: Aircraft Performance Specifications

The Mars is the only aircraft in the provincial fleet that is not of the more modern, higher-performing turbine type.

- Given the Mars performance limitations, it has demonstrated itself to be most effective when working fires on Vancouver Island where flight time to a suitable water source is mitigated by proximity to the ocean and it is not subject to the same density-altitude challenges faced in the interior of BC. However, the number of air tanker missions on Vancouver Island over the last 10 years represents less than 2 percent of the total air tanker missions. Given this statistic it is important for WMB to contract aircraft that are best suited to the environment where the majority of the fires occur.
- The Mars requires a water body of at least 3 nautical miles to scoop from. According to the numbers provided by the CG, the Mars has 113 viable water bodies in BC to scoop from. Comparatively, there are more than 1700 (15 times more) identified water bodies in BC suitable for the CL-415s, CL-215Ts and Firebosses. This translates into a potential increased time requirement by the Mars to transit in between scooping source and fire and can adversely impact the *litres per hour* concept.
- The Mars is a single aircraft versus a multi-aircraft group. Consequently, if the aircraft is unserviceable or is fuelling the entire group is unavailable. When a multi-aircraft group experiences unserviceability or requires fuelling, the remaining aircraft are able to continue providing aviation services. Furthermore, multi-aircraft groups allow the operational flexibility of “splitting off aircraft” and servicing multiple fires simultaneously or prepositioning the resources in various locations with identified fire hazard.
- The Mars is unable to carry retardant on initial launch unlike smaller more modern scoopers.
- The Mars requires aviation gasoline (Avgas) to power its radial engines. Avgas is increasingly difficult to procure. No other aircraft in the provincial air tanker program fleet utilizes avgas.

Efficient:

- The Mars presents very limited cost-recovery/mutual aid opportunities with other agencies. The Martin Mars has only been activated once through the Canadian Interagency Forest Fire Centre (CIFFC) Mutual Aid Resource Sharing Agreement. Since 2007 there have been 83 filled scooper group resource requests. The Martin Mars represents only 1.2 percent of the total scooper exports. The

inability to export this resource during periods of low activity represents a significant loss of cost-recovery opportunity.

s.13, s.17

s.13, s.17

- Scooper aircraft analyses were conducted following the busy fire seasons of 1998 and 2010 where scooper aircraft were brought to BC under mutual aid agreements. This provided the opportunity to make direct cost/litre comparisons between various aircraft and the Martin Mars (see table 2). Both cost comparison analyses demonstrated an increased cost/litre for Mars suppressant delivery versus the more modern turbine aircraft type of the CL-415 or the Fireboss.

Fire Season Analysis	Mars	CL-415	FireBoss
1998			
2010		s.13, s.17, s.21	

Table 2: Cost per Litre Data

V. CONCLUSION:

The WMB has a long history with the Mars aircraft dating to 1960.

When reviewed through the lens of the provincial air tanker program's mandate of the "*safe, effective and efficient delivery of retardants and suppressants in support of fire control*"; the Mars aircraft does not represent the best scooper group option for the province. Through the RFP process, industry can supply the province with a turbine, multi-aircraft, amphibious scooper group that will provide the operational flexibility and performance to better meet the provincial air tanker program's mandate.

The CG has been encouraged to lend their excellent service delivery approach to a modern aircraft fleet and to bid on the upcoming RFP tender.

Beyond 2013 the CG maintains the option to provide Mars services on a "*call-when-needed*" basis.

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Approved	Initials	Date
DM		
ADM		
RED/Dir.		

Attachment:

- BCFS martin Mars Analysis 2010

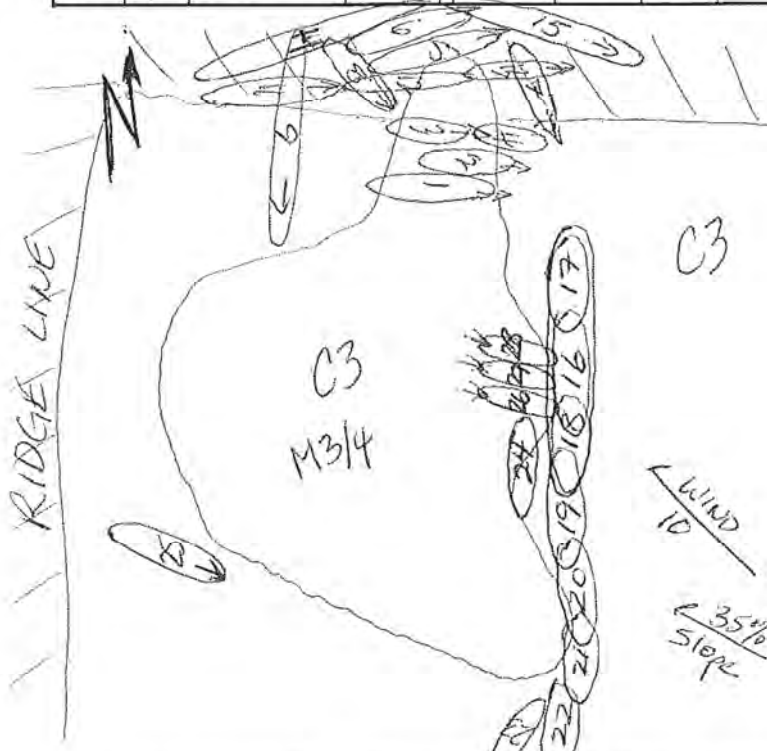
+13

BRITISH
COLUMBIA

AIRTANKER ACTION REPORT



DATE JULY 26 2013		FIRE NO N50196		GROUND CREW 1C 196		ON SITE <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		ALT 2999		TARGET ELEV 6200	
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ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input type="checkbox"/> Y <input checked="" type="checkbox"/> B <input type="checkbox"/> P		ROLL YCG 1220		STOP YCG 1454		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6					
CO-ORD 49 37.45 117 37.97		ROLL YCG 1615		STOP YCG 1857		BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6					
GEO PERRY RIDGE		ROLL		STOP		L/B RATIO <input type="checkbox"/> 1:1 <input type="checkbox"/> 2:1 <input checked="" type="checkbox"/> 3:1 <input type="checkbox"/> 4:1 <input type="checkbox"/> 5:1 <input type="checkbox"/> :1					
BRG 344 °		DIST 20 nm		ETA		ARR		<input type="checkbox"/> RECCE <input type="checkbox"/> INITIAL <input checked="" type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL			
REPORTED BEHAVIOR R3		SIZE REPORTED 35 Ha		SIZE ON ARRIVAL 35 Ha		SIZE ON COMP 40 Ha		<input type="checkbox"/> CANCELLED <input type="checkbox"/> NO ACTION			
DRP NO		TKR NO		DROP TYPE		TIME		ASSESS		INSTR	
1		697		ALL C4		1252		BE		RL	
2		698		ALL C4		1254		BE		RL	
3		696		ALL C4		1259		BE		RL	
4		699		ALL C4		1300		BE		RL	
5		697		ALL C4		1320		BE		RL	
6		698		ALL C4		1321		BE		RL	
7		696		ALL C4		1326		BE		RL	
8		699		ALL C4		1328		BE		RL	
9		489		ALL C6		1337		BE		YKA STAY	
10		697		ALL C6		1353		BE		RL	



CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE ACHIEVED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
Support request to stop fire from breaching the ridge to the N and to reestablish retardant lines along base to protect crews helipad access.				
Low Rtl made containment challenging. T823 requested to help cool fire to re-enforce retardant. Objectives met.				
pg 1/2				
SIGNATURE	Somerville			AAO NUMBER
PHOTOS	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> VIDEO	1 OF 2



DATE		FIRE NO		GROUND CREW		ON <input type="checkbox"/> YES SITE <input type="checkbox"/> NO		ALT		TARGET ELEV					
AAO REQ		BD NO		OTHER A/C				HEAD RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6							
ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P				ROLL		STOP		FLANK RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6							
CO-ORD				ROLL		STOP		BASE RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6							
GEO				ROLL		STOP		L/B RATIO <input type="checkbox"/> 1:1 <input type="checkbox"/> 2:1 <input type="checkbox"/> 3:1 <input type="checkbox"/> 4:1 <input type="checkbox"/> 5:1 <input type="checkbox"/> :1							
BRG 0		DIST nm		ETA		ARR		<input type="checkbox"/> RECCE <input type="checkbox"/> INITIAL <input type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL <input type="checkbox"/> CANCELLED <input type="checkbox"/> NO ACTION							
REPORTED BEHAVIOR		SIZE REPORTED		SIZE ON ARRIVAL		SIZE ON COMP		TEMP							
DRP NO	TKR NO	DROP TYPE	TIME	ASSESS	INSTR	RET SRCE	FUEL TYPE	DRP NO	TKR NO	DROP TYPE	TIME	ASSESS	INSTR	RET SRCE	FUEL TYPE
15	444	ALL C 6	1444	BE	YKA STAY	YKA	C3	25	696	ALL C 4	1825	BE	STAY	CG	C3
16	445	ALL C 4	1727	BE	STAY	YVF	C3	26	699	ALL MAX	1836	BE	STAY	CG	C3
17	696	ALL C 6	1729	BE	RL	CG	C3	27	698	ALL MAX	1840	BE	STAY	CG	C3
18	699	ALL C 6	1731	BE	RL	CG	C3	28	697	ALL MAX	1842	BE	STAY	CG	C3
19	698	ALL C 6	1742	BE	RL	CG	C3	TANKER TYPE		RETARDANT BASE					
20	697	ALL C 6	1743	BE	RL	CG	C3								
21	696	ALL C 3	1757	BE	RL	CG	C3								
22	699	ALL C 6	1806	BE	RL	CG	C3								
23	698	ALL C 6	1810	BE	RL	CG	C3								
24	697	ALL MAX	1812	1/2 S	RL	CG	C3								

CATEGORY REPORTED ☐ A ☐ B ☐ C ☐ D
ACTUAL ☐ A ☐ B ☐ C ☐ D
OBJECTIVE ACHIEVED ☐ YES
☐ NO

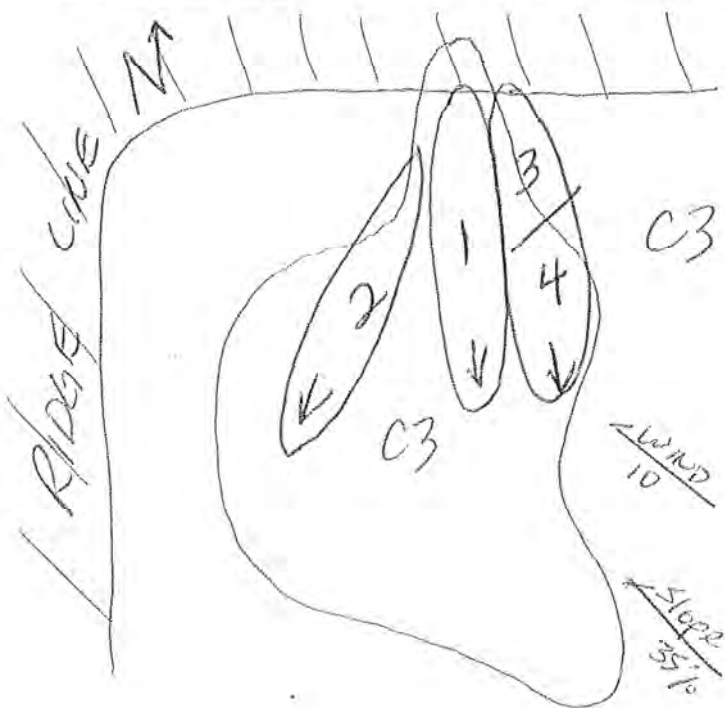
SIGNATURE *[Signature]* SOMMERVILLE
PHOTOS ☒ YES ☐ NO ☐ VIDEO
AAO NUMBER 63
2 of 2




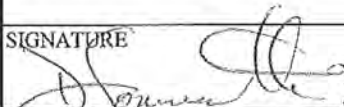
BRITISH
COLUMBIA



SCOOPER AIRTANKER ACTION REPORT

[illegible]

CATEGORY REPORTED		<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL		<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE				ACHIEVED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK					
Objective to blanket 'saddle' on N ridge to hold fire at ridge.					
Gel requested because of low RH. (10%)					
NO color package in gel.					
Objectives achieved					
SIGNATURE				AAO NUMBER	
				63	
PHOTOS				PAGE	
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL				11	

CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE ACHIEVED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
Rec'd to evaluate objectives for T823.				
Objectives established and passed on to PATE.				
SIGNATURE				AAO NUMBER
				63
PHOTOS	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> VIDEO	1 OF 1

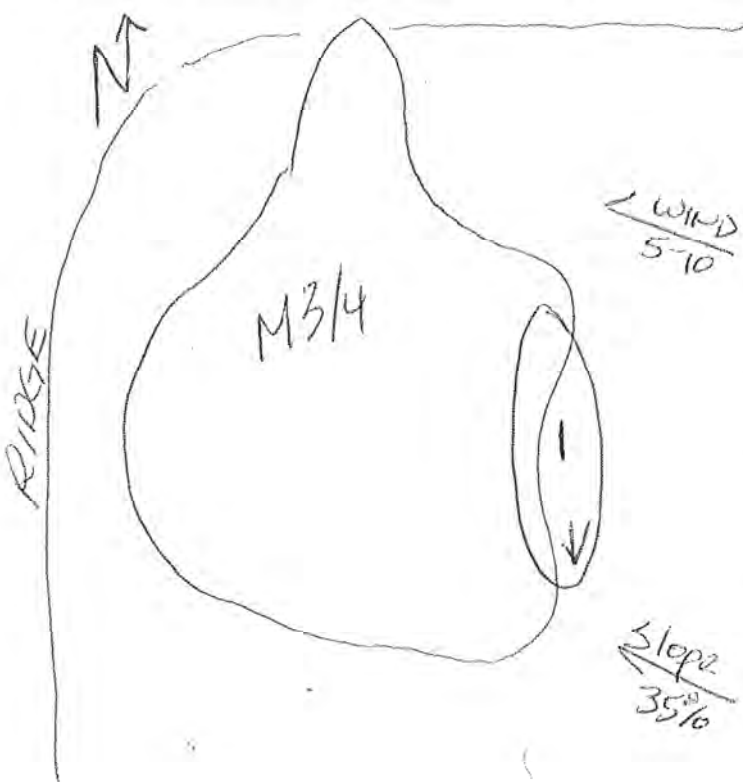


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SCOOPER +13 30' YCG
AIRTANKER ACTION REPORT

DATE JULY 27/13	FIRE NO. N50196	GROUND CREW Sen IC 196	ON <input checked="" type="checkbox"/> YES SITE <input type="checkbox"/> NO	ALT 2993	TARGET ELEV.													
AAO REQ. 1230	BD NO. 125	OTHER A/C Helco 196	HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6															
ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input checked="" type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P	ROLL YCG 1740	STOP YCG 1308	FLANK RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6															
COORD 49 37.45 117 37.97	ROLL	STOP	BASE RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6															
GEO PR	ETA 1155	ARR	L/B RATIO RANK <input type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 4:1															
BRG 344	DIST 22	<input type="checkbox"/> RECCE <input type="checkbox"/> INITIAL	<input type="checkbox"/> NO ACTION <input type="checkbox"/> SUPPORT	<input type="checkbox"/> CANCEL <input type="checkbox"/> RECALL	REP W. STATION SLOCAN #													
REPORTED BEHAVIOR R2	SIZE REPORTED 60 Ha	SIZE ON ARRIVAL 60 Ha	SIZE ON COMP 60 Ha	FFMC	DMC DC ISI BUI FWI													
TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP to Tgt	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP to Tgt	SCOOP SRCE	
1	823	1243	/	5700	3500	24												
2	823																	
3	823																	
4	823																	
								TANKER TYPE	LOADS									
									WATER			FOAM			OTHER			
								MMS							1 Gel			



CATEGORY REPORTED	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
OBJECTIVE	<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK
ACHIEVED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
1214 5 miles back	
Reverse Scoop direction	
1247 US #4	
Objective to blanket fire.	
Dnd first drop engine #4 had a mechanical issue and T823 U/S.	
Objectives not achieved.	
SIGNATURE	AAO NUMBER
<i>[Signature]</i>	63
PHOTOS	PAGE OF
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL	11

P6 1/2

BRITISH COLUMBIA

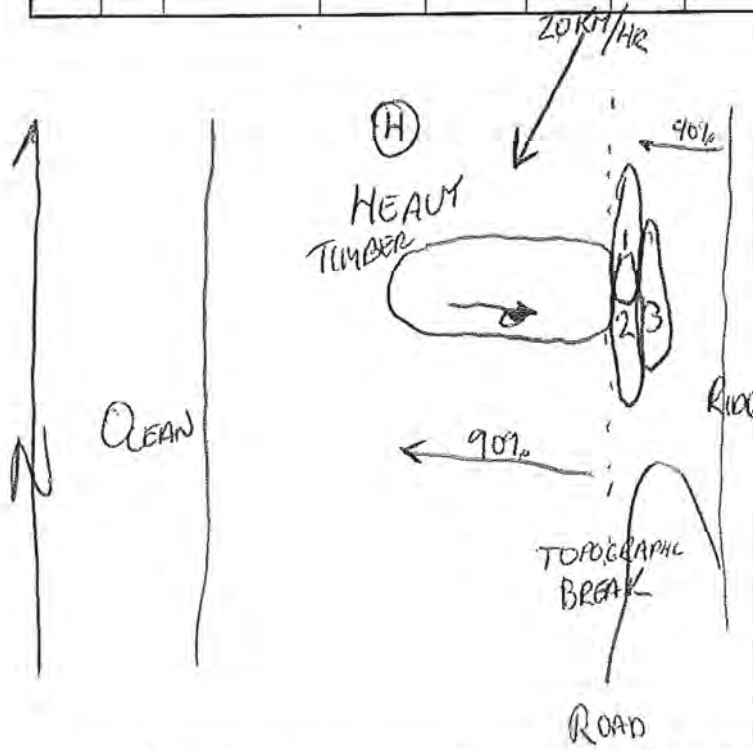
AIRTANKER ACTION REPORT



DATE August 3, 2013		FIRE NO VA 389		GROUND CREW 2P82 SIFAC 6		ON SITE <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		ALT 3013		TARGET ELEV 2200	
AAO REQ 12:16		BD NO BD 052		OTHER A/C DGA, EBO		HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	
ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input checked="" type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P		ROLL 12:26 BL		STOP 13:42 BD		L/B RATIO <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 3:1 <input type="checkbox"/> 4:1 <input type="checkbox"/> 5:1 <input type="checkbox"/> 1		RECCE <input type="checkbox"/> RECCE <input type="checkbox"/> INITIAL		SUPPORT <input checked="" type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL	
CO-ORD 52° 17.01' 126° 56.215'		ROLL 14:02 BD		STOP 17:38 BL		CANCELED <input type="checkbox"/> CANCELED <input type="checkbox"/> NO ACTION		TEMP			
GEO SOUTH BENTINCK ARM		ROLL		STOP							
BRG 317°		DIST 154 nm		ETA 13:15		ARR 13:11					
REPORTED BEHAVIOR R2/3		SIZE REPORTED 6.0		SIZE ON ARRIVAL 6.0		SIZE ON COMP 6.0					

DRP NO	TKR NO	DROP TYPE	TIME	ASSESS	INSTR	RET SRCE	FUEL TYPE	DRP NO	TKR NO	DROP TYPE	TIME	ASSESS	INSTR	RET SRCE	FUEL TYPE
1	482	all@max	13:20	BE	PURL	BL	C-3								
2	460	all@8	14:10	BE	BLST	XX	C-3								
3	482	all@max	14:23	BE	BLST	PU	C-3								

TANKER TYPE	RETARDANT BASE		
	BL	XX	PU
L188	1	1	1



CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE ACHIEVED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
OBJECTIVE - BUILD RETARDANT LINE ALONG EAST FLANK (UPHILLSIDE)				
OBJECTIVE MET NO PROBLEM				
SIGNATURE [Signature]				
PHOTOS				AAO NUMBER
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> VIDEO				59
				1 OF 2



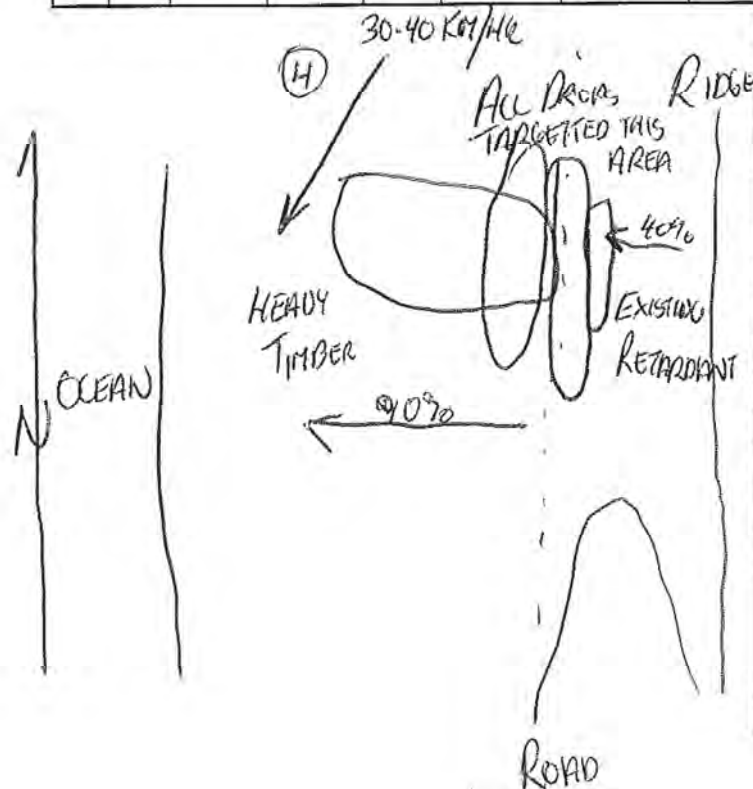
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SCOOPER AIRTANKER ACTION REPORT

PG 2/2

DATE August 3 2013		FIRE NO. VA 359		GROUND CREW 2P82		ON <input checked="" type="checkbox"/> YES SITE <input type="checkbox"/> NO		ALT 3013		TARGET ELEV. 2200							
AAO REQ. 12:16		BD NO. 052		OTHER A/C DGA EBO		HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6							
ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input checked="" type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P		ROLL 12:26 BL		STOP 13:42 BO		L/B RATIO RANK <input type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 4:1		REP W. STATION #									
COORD 52°17'01" 126°56.215		ROLL 14:02 BO		STOP 17:38 BL													
GEO SOUTH BENTINCK ARM		ETA 13:15		ARR 13:11													
BRG 317		DIST 154 NM		<input type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL <input type="checkbox"/> INITIAL <input checked="" type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL													
REPORTED BEHAVIOR R/2/3		SIZE REPORTED 6.0		SIZE ON ARRIVAL 6.0		SIZE ON COMP 6.0		FFMC		DMC DC ISI BUI FWI							
TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. nm	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP SRCE		
1	823	15:08	0	2200	4000	6.5	Ocean										
2	823	15:22	14	2200	4200	7.5	Ocean										
3	823	15:36	14	2200	4400	7.5	Ocean										
4	823	15:50	14	2200	4600	7.5	Ocean										
5	823	16:06	16	2200	4800	7.5	Ocean	TANKER TYPE		LOADS		WATER		FOAM		OTHER	
6	823	16:20	14	2200	5000	7.5	Ocean	MARRS		8							
7	823	16:36	16	2200	5200	7.5	Ocean										
8	823	16:54	18	2200	5400	7.5	Ocean										



CATEGORY REPORTED	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
OBJECTIVE	<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK
ACHIEVED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
OBJECTIVE	
BLANKET FIRE TO COOL AND HOLD FOR GROUND CREWS	
OBJECTIVE NOT MET	
STRONG QUARTERING WIND RESULTED IN DIFFICULT HITTING TARGET DUE TO DRIFT. CALLED OFF ACTION BD LOW ON FUEL. MARRS STILL HAD 30 MINUTES ON SCENE	
SIGNATURE	AAO NUMBER
KH/08	59
PHOTOS	PAGE 2 OF 2
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL	



BRITISH
COLUMBIA



SCOOPER AIRTANKER ACTION REPORT

DATE AUG. 11 / 13		FIRE NO. K20587		GROUND CREW H-26		ON SITE <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		ALT 29.81		TARGET ELEV. 4400'						
AAO REQ. N/A		BD NO. 115		OTHER A/C -		HEAD RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6						
ALERT <input type="checkbox"/> A <input checked="" type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P		ROLL 1656 KA		STOP 1830 AIR		L/B RATIO RANK <input type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 4:1		REP W. STATION #								
COORD 50° 40.6 120° 51.3 W		ROLL 1850 AIR		STOP 1948 XX												
GEO MT. SAVONA		ETA -		ARR -												
BRG 246°		DIST 15 NM		<input checked="" type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL		<input checked="" type="checkbox"/> INITIAL <input type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL										
REPORTED BEHAVIOR RANK 3		SIZE REPORTED 1.5 HA		SIZE ON ARRIVAL 1.5 HA		SIZE ON COMP 1.5 HA		FFMC		DMC DC ISI BLI FWI						
TGT. NO.	TKR NO.	DROP TIME	TURN ARND	TGT. ELEV.	LOAD VOL.	DIST. nm	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP to Tgt	SCOOP SRCE
1	823	1725		4400'	4400	5 NM	KAMLOOPS LAKE									
2	"	1744	19	"	4800	"	"									
3	"	1810	26	"	5200	"	"									
4	"	1828	18	"	5200	"	"									
5	"	1910	21	"	5600	"	"	TANKER TYPE MARS		LOADS WATER FOAM		1" GEL OTHER				
												5				

CATEGORY REPORTED <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D		ACTUAL <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	
OBJECTIVE <input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK		ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
MARS INITIAL SCOOP AT 17113.			
ALL LOAD VOLUMES IN US GALLONS.			
NOTE BETWEEN DROPS 4 + 5, THE MARS DROPPED ON FIRE K20615 IN THE VICINITY. TURNAROUND TIMES INDICATE MINUTES BETWEEN CONSECUTIVE DROPS - DISTANCE BETWEEN FIRE + LAKE CONSISTENT.			
* 4 SAWO DROPS + 1 STRING DROP			
MARS REQUESTED TO COOL ACTIVE INTERIOR OF BURN + SPOT FIRES UNTIL GROUND CREW RECEIVED REINFORCEMENTS + DEPLOYED RESOURCES.			
SIGNATURE <i>Phantom</i>		AAO NUMBER 19	
PHOTOS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL		PAGE 1 OF 1	

WIND
10 KPH



HEAVY
C7

UP-SLOPE

Scanned

UPDATED: 8/4/2003

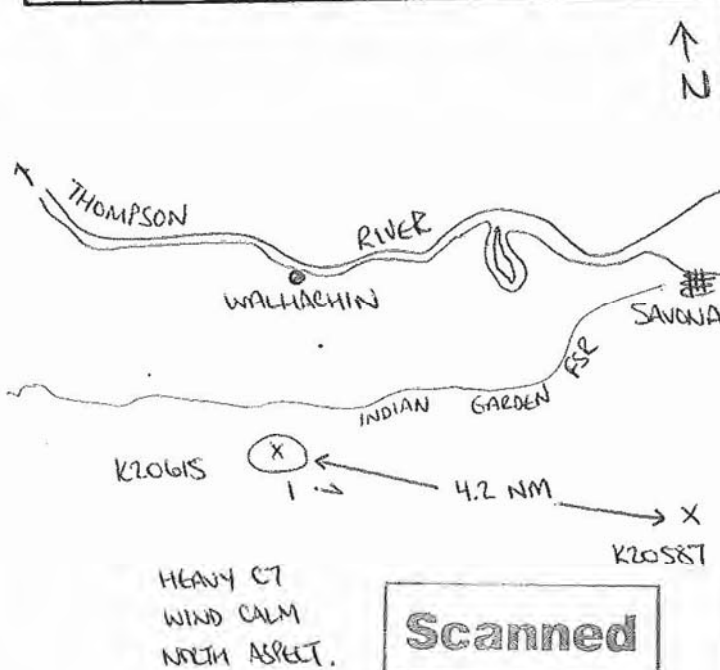


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SCOOPER AIRTANKER ACTION REPORT

DATE AUG. 11 / 13	FIRE NO. K20615	GROUND CREW N/A	ON <input type="checkbox"/> YES SITE <input type="checkbox"/> NO	ALT 29.81	TARGET ELEV. 3000'
AAO REQ. 1834	BD NO. 115	OTHER A/C N/A	HEAD RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		
ALERT <input checked="" type="checkbox"/> A <input type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P	ROLL 1830	STOP 1850	FLANK RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		
COORD 50° 42.4' N 120° 56.4' W	ROLL	STOP	BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		
GEO MT. FEHR	ETA 1830	ARR 1830	L/B RATIO RANK <input checked="" type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input type="checkbox"/> 2:1 <input type="checkbox"/> 4:1		
BRG 4 NM ← → 183°	<input type="checkbox"/> RECCE <input checked="" type="checkbox"/> INITIAL	<input type="checkbox"/> NO ACTION <input type="checkbox"/> SUPPORT	<input type="checkbox"/> CANCEL <input type="checkbox"/> RECALL	REP W. STATION #	
REPORTED BEHAVIOR RANK 1	SIZE REPORTED SPOT	SIZE ON ARRIVAL SPOT	SIZE ON COMP SPOT	FFMC	DMC
TGT. NO.	TKR NO.	DROP TIME	TURN ARND	TGT. ELEV.	LOAD VOL.
1	823	1849	21	3000	5400
DIST. nm		SCOOP	SRCE	DIST. Nm	
5 NM		KAMICOOPS LAKE		SCOOP to Tgt	
US GALLONS					
TANKER TYPE		LOADS		1% GEL	
MARS		WATER		FOAM	
				OTHER	
				1	



Scanned

CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE	<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK			ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
AIR REQUEST FROM CENTRAL CAME IN WHILE BD 115 WAS OVERHEAD AND ALREADY COMPLETING IFR. BD 115 WAS WORKING FIRE K20587 4 NM EAST AT TIME OF IGNITION OF K20615.				
MARS USED TO BLANKET FIRE WITH ONE DROP IN BETWEEN ROUNDS ON K20587. IFR CONVEYED TO KAMICOOPS FIRE CENTRE.				
UPON COMPLETION, BD 115 + MARS RETURNED TO K20587				
FIRE SPOT SIZE, RANK 1.				
SIGNATURE	<i>[Signature]</i>			AAO NUMBER 19
PHOTOS	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> DIGITAL	PAGE 1 OF 1

UPDATED: 8/4/2003



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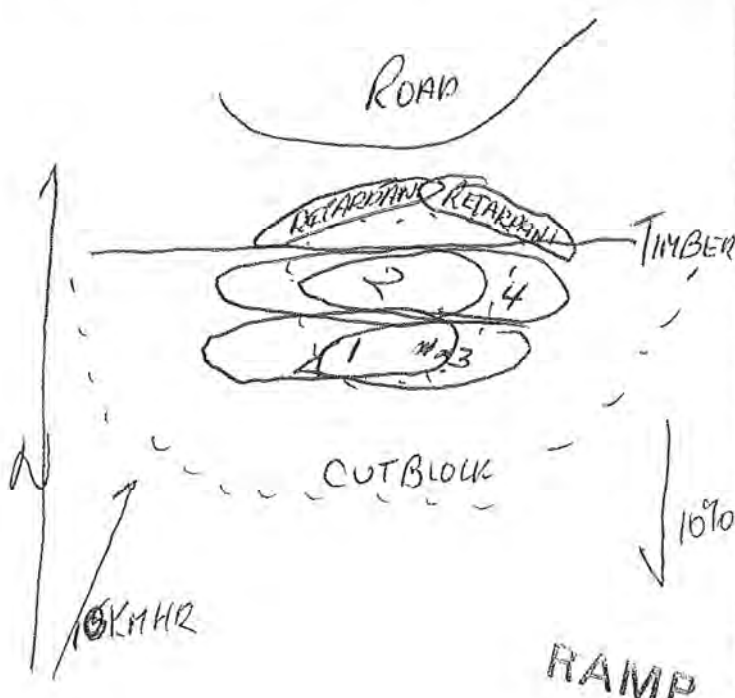


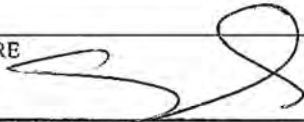
SCOOPER AIRTANKER ACTION REPORT

2/2

DATE JULY 9, 2013		FIRE NO. 150186		GROUND 2P53 CREW 2P50		ON <input type="checkbox"/> YES SITE <input type="checkbox"/> NO		ALT 2990		TARGET ELEV. 1000'							
AAO REQ. 3:45		BD NO. 125		OTHER A/C		HEAD RANK <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6											
ALERT <input type="checkbox"/> A <input type="checkbox"/> R <input checked="" type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P		ROLL 15152 KA		STOP 19:18 KA		FLANK RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6											
COORD 49° 51.246 129° 28.55'		ROLL		STOP		BASE RANK <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6											
GEO POWELL RIVER		ETA		ARR		L/B RATIO RANK <input type="checkbox"/> N/A <input checked="" type="checkbox"/> 1:1 <input type="checkbox"/> 2:1 <input type="checkbox"/> 4:1											
BRG 234		DIST 163 NM		<input type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL <input checked="" type="checkbox"/> INITIAL <input type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL		REP W. STATION #											
REPORTED BEHAVIOR R2		SIZE REPORTED 0.5		SIZE ON ARRIVAL 2.0		SIZE ON COMP 2.0		FFMC		DMC DC ISI BUI FWI							
TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. nm SCOOP to Tgt	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm SCOOP to Tgt	SCOOP SRCE		
1	823	17:31		1000	4600	818 NM	CLEAN										
2	823	17:42		1000	4600	10 NM	CLEAN										
3	823	17:53		1000	4800	10 NM	CLEAN										
4	823	18:03		1000	5000	10 NM	CLEAN										
								TANKER TYPE				LOADS					
												WATER		FOAM		OTHER	
								MARS						4			

CATEGORY REPORTED		<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL		<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE		<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK			ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
② BLANKET ACTIVE FLANKS WITHIN THE CUTBLOCKS WITH FOAM DROPS					
OBJECTIVE MET NO PROBLEM					
SIGNATURE 					AAO NUMBER 59
PHOTOS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL					PAGE 2 OF 2



CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE ACHIEVED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
<p>objective - re-enforce existing retardant line along base of fire + by access crew fire to construct helipad - access target for Mars suitability. No issues - Mars was dispatched - see Scooper AAR.</p>				
SIGNATURE				AAO NUMBER
				72
PHOTOS	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> VIDEO	1 OF 1

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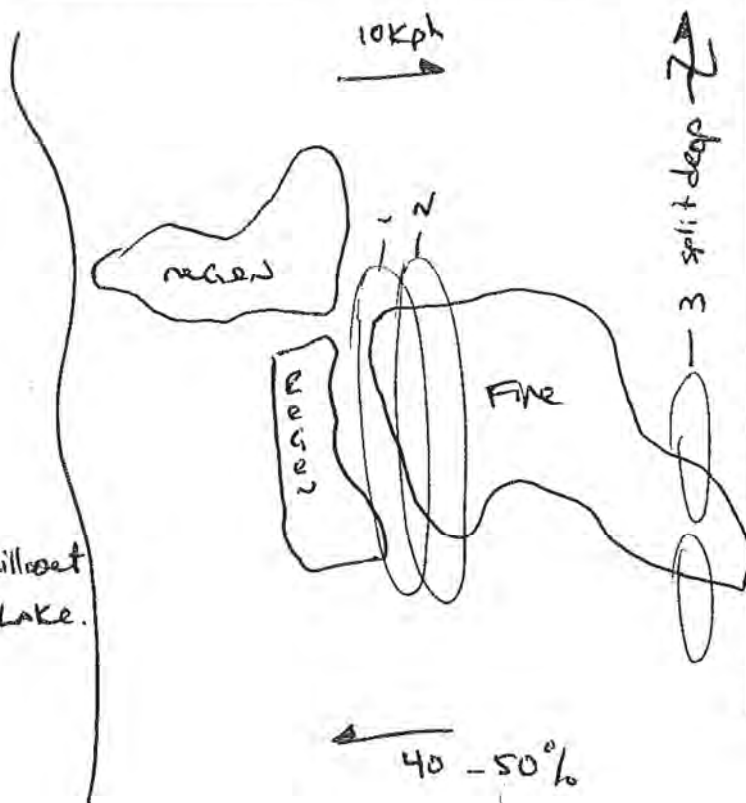


* Retardant AAR completes this AAR.

SCOOPER AIRTANKER ACTION REPORT

DATE July 16th	FIRE NO. V30216	GROUND CREW see 1	ON <input type="checkbox"/> YES SITE <input type="checkbox"/> NO	ALT 3014	TARGET ELEV. 2500												
AAO REQ. 8:52	BD NO. 134	OTHER A/C SEE, FCC, NPG, JTH	HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6														
ALERT <input checked="" type="checkbox"/> A <input type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P	ROLL YKA 09:00	STOP YXX 10:48	FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6														
COORD 50° 10.16 122° 28	ROLL YXX 11:18	STOP YKA 14:03	BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6														
GEO Lizzie Creek.	ETA 09:23	ARR 09:28	L/B RATIO RANK <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> 1:1 <input type="checkbox"/> 2:1 <input type="checkbox"/> 4:1														
BRG 229	DIST 84	<input type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL <input type="checkbox"/> INITIAL <input checked="" type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL	REP W. STATION #														
REPORTED BEHAVIOR R3	SIZE REPORTED 40ha	SIZE ON ARRIVAL 40ha	SIZE ON COMP 40ha	FFMC	DMC DC ISI BUI FWI												
TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP to Tgt	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm	SCOOP to Tgt	SCOOP SRCE
1	823	12:18	35	2500	4800	65km		Seton Lake									
2	823	12:50	38	2500	5200	"		"									
3	823	13:30	40	3500	5400	"		"									
									TANKER TYPE								
									LOADS								
									WATER								
									FOAM								
									OTHER								
									Maes								
									15,400								

CATEGORY REPORTED	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
ACTUAL	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
OBJECTIVE	<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK			ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
<p>objective - cool fire have retardant line and slow spread (pull - 1% gel added to water - drops had a significant effect on observed fire behaviour. No issues.</p>				
SIGNATURE				
AAO NUMBER				
72				
PHOTOS				
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL				
PAGE OF				
1 / 1				



SCOOPER

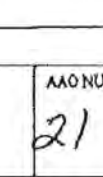


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SCOOPER AIRTANKER ACTION REPORT

DATE 2013/07/16				FIRE NO. V3-0216				GROUND CREW				ON <input checked="" type="checkbox"/> YES SITE <input type="checkbox"/> NO		ALT 2988		TARGET ELEV. 3700	
AAO REQ.				BD NO. A-216				OTHER A/C SEE,				HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		BASE RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	
ALERT <input checked="" type="checkbox"/> A <input type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P				ROLL 1329 Air				STOP Spread		L/B RATIO RANK <input type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 4:1							
COORD				ROLL				STOP									
GEO Lillooet Lake				ETA				ARR									
BRG				DIST				<input type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL <input type="checkbox"/> INITIAL <input type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL		REP W. STATION #							
REPORTED BEHAVIOR				SIZE REPORTED				SIZE ON ARRIVAL		SIZE ON COMP 40 ha		VPM/C		DMC		DC	
												ISL		BUI		FWI	
TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. nm SCOOP to Tgt	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. Nm SCOOP to Tgt	SCOOP SRCE		
823	1406	35	3700	5600			Lake										
823	1441	35	3700	6000			Lake										
								TANKER TYPE		LOADS		WATER		FOAM		OTHER	
								Martins								2	

CATEGORY REPORTED ACTUAL	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D
	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D
OBJECTIVE	ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
<input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK	
→ Cool South East corner holding actions with gel	
→ Drop 1 1/2 short	
→ Drop 2 1/4 short	
SIGNATURE	AAO NUMBER
	21
PHOTOS	PAGE OF
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIGITAL	1-1

Wind
5 km/hr

Lake

2

1

All Drops



BRITISH COLUMBIA



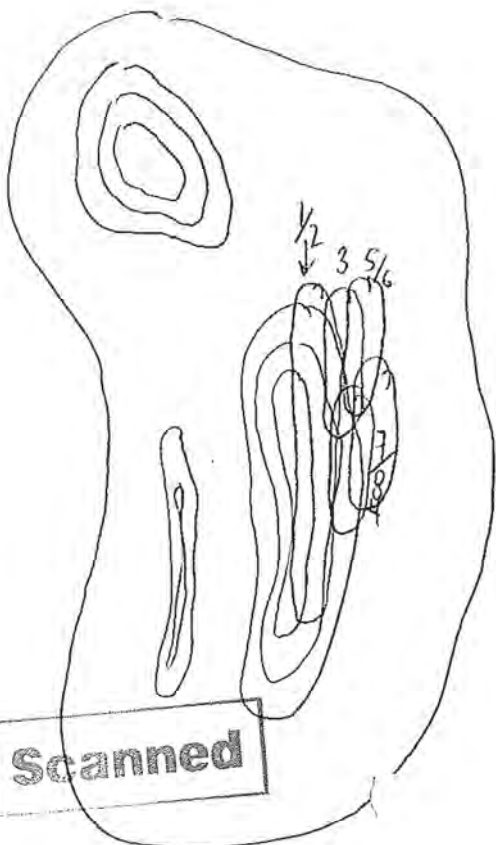
SCOOPER AIRTANKER ACTION REPORT

DATE July 31/13		FIRE NO. V10310		GROUND CREW Coast 2ulu 1		ON <input checked="" type="checkbox"/> YES SITE <input type="checkbox"/> NO		ALT 3010		TARGET ELEV. 1300	
AO REQ. 14:04		BD NO. 115		OTHER A/C OCA, VSP, EBA, Sam, SHB, NPA		HEAD RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6					
ALERT <input type="checkbox"/> A <input checked="" type="checkbox"/> R <input type="checkbox"/> Y <input type="checkbox"/> B <input type="checkbox"/> P				ROLL 14:16 YXX		STOP 15:06 YXX		FLANK RANK <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6			
COORD 49 36.175 x 122 38.795				ROLL 16:04 YXX		STOP 18:59 YXX		BASE RANK <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6			
GEO Pitt Lake				ETA 14:30 / 16:16		ARR 14:29 / 16:16		L/B RATIO RANK <input type="checkbox"/> N/A <input type="checkbox"/> 1:1 <input checked="" type="checkbox"/> 2:1 <input type="checkbox"/> 4:1			
BRG 325		DIST 37 NM.		<input type="checkbox"/> RECCE <input type="checkbox"/> NO ACTION <input type="checkbox"/> CANCEL <input type="checkbox"/> INITIAL <input checked="" type="checkbox"/> SUPPORT <input type="checkbox"/> RECALL		REP W. SLOQUET		STATION #		TEMP	
REPORTED BEHAVIOR		SIZE REPORTED 45		SIZE ON ARRIVAL 45		SIZE ON COMP 45		92.3		109	
								FFMC		DC	
								307		8.2/115/29	
								ISI		FWI	

TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. nm	SCOOP to Tgt	SCOOP SRCE	TGT. NO.	TKR NO.	DROP TIME	TURN ARND.	TGT. ELEV.	LOAD VOL.	DIST. nm	SCOOP to Tgt	SCOOP SRCE
310	823	16:53	✓	1300	4800	11 NM		PITT LAKE									
		17:07	14 min		5000												
		17:22	15 min		5200												
		17:36	14 min		5400												
		17:50	14 min		5600												
		18:05	15 min		5800												
		18:19	14 min		6000												
0	0	18:33	14 min	0	6000	11 NM		PITT LAKE									

TANKER TYPE	WATER	FOAM	GEL OTHER
MMARS			1%
			8

CATEGORY REPORTED <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	
ACTUAL <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D	
OBJECTIVE <input checked="" type="checkbox"/> BLANKET <input type="checkbox"/> BOX IN <input type="checkbox"/> FLANK	
ACHIEVED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Objective was to work the head of the fire, to the east side. Objective included cooling action. Successfully cooled off the head and east/north sections.	
Gel injected, with colour package, at 1%.	
Total Imperial Gallons = 43,800 / APPROX	
Total Litres = 175,200 L / APPROX	
All runs from North to South. First two runs were "string", remainder were salvo.	
SIGNATURE <i>Tracy White</i>	AAO NUMBER # 41
PHOTOS <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> DIGITAL	PAGE 1 / 1



Martin Mars Analysis 2010 Fire Season



Prepared By:
Wildfire Management Branch
Aviation/Airtanker Operations

Executive Summary

The purpose of this analysis is to provide cost efficiency and operational realities of the Martin Mars (may be referred to as the Mars) (*see specification sheet Appendix II*) water bombing aircraft. This report uses the AT802F (hereafter referred to as the FireBoss) (*see specification sheet Appendix II*) as a comparator and example of alternate “modern” technology that performs the same mission function (suppressant delivery). This report also provides recommendations regarding the future status of the existing Standing Agreement for supply of the Martin Mars water bomber.

This report contains data and operational staff observations which support the recommendations made.

The following observations were made from actual operational data on the Martin Mars and FireBoss aircraft during the 2010 fire season.

The Martin Mars was on a provincial 45 hour guaranteed contract over a 90 day period and was repositioned to Fraser Lake, west of Prince George, for a period of 26 days. A group of six FireBosses, on loan through a Canadian interagency forest fire centre (CIFFC) Mutual Aid agreement from the Alberta sustainable resource development (SRD), were deployed to various areas around BC for a period of 22 days. Both aircraft types were managed by the Provincial Air Tanker Centre (PATC). This situation provided an excellent opportunity to analyse costs and compare operational efficiencies of these two water bomber aircraft types.

The Martin Mars needs significantly larger lakes to scoop from than the FireBoss. Accordingly, there are fewer suitable lakes to work the Martin Mars from in the province than for the FireBoss. This operational restriction has a direct impact on cycle times. (*cycle time= time from drop “a” to drop “b” on a particular fire from a set water source*)

Fire G40490

Fire G40559

	Cycle Time	Distance	Cycle Time	Distance
Martin Mars	20 minutes	18 nautical miles	12 minutes	6 nautical miles
FireBoss	6 minutes	5 nautical miles	6 minutes	6 nautical miles

Increased cycle times have a negative impact on the cost per litre delivered.

For all activities during the 2010 fire season the cost per litre of water delivered were:

- Martin Mars ranged s.21 Average = s.21
- AT802 FireBoss ranged s.21 Average = s.21

Because the Martin Mars is restricted to water operations only (it is a flying boat) it requires specialized on-water refuelling equipment. There is a permanent facility at its home base on Sproat Lake and the company also has mobile refuelling capability that can travel if the Mars is relocated elsewhere in the province.

On the other hand the FireBosses are able to land and refuel from fixed or mobile sources at smaller airports. This creates a substantially higher degree of flexibility when using this group.

Suppressant delivery remains a key component of aerial support in any wildfire operation. It can be accomplished in many ways; this analysis focuses on the Martin Mars. The Mars aircraft is one tool available to The Wildfire Management Branch (WMB) for use in the aerial delivery of suppressants in support of ground fire operations, and as such it has a role to play. What is evident is that role is growing smaller each year. The production of new turbine-powered light airtankers (such as the AT802F FireBoss compared in this analysis) has brought to bear the inevitable evolutionary pressures that have been present since the first single-engine aircraft dropped paper bags full of water on fires in the mid 1950's. This evolutionary pressure and the availability of far more cost effective and efficient fixed and rotary-wing aircraft means s.17, s.21

It should be noted that all staff involved are of the opinion that the operator of the Martin Mars, the Coulson Group Inc. is a quality operator. This aircraft is well maintained and the crews well trained. The company maintains a customer focus and are open and receptive to change to meet the needs of WMB.

Recommendations:

No further expansion of the existing Standing Offer:

- The 45 hour guarantee is considered the maximum number of hours appropriate for this particular resource. Historically, based on a twenty year average, the Martin Mars has flown 39.1 hours for the WMB. (*avg. hrs. Flown 1990-*

2010, 27.1 hours with outliers removed) Logistically, it is challenging to find suitable water sources in close enough proximity to fires to make the Martin Mars cost competitive to other options such as the FireBosses or some heavy lift helicopters

Review the contract and look for further cost savings:

- The bulk fuel costs appear high relative to provincial fuel standing offer rates currently in place. The range of fuel “rack” rates for the month of August available to the WMB under these standing offers, all inclusive of taxes and dispensing charges, was s.17, s.21 per litre. Based on the hourly fuel burn rate quoted in the contract with the Martin Mars, the cost per litre equates to s.21 A complete review of this with supporting rationale is required.
- Practices held every 7 non-operational days within the term of the standing offer cost on average s.17, s.21 each. It is recommended that as practices are of benefit to the both operator and WMB, that the standing offer be amended as appropriate to mitigate these costs.

Preamble

The purpose of this analysis is to provide cost efficiency and operational realities of the Martin Mars (*see specification sheet Appendix II*) water bombing aircraft. This report uses the AT802 FireBoss (*see specification sheet Appendix II*) as a comparator example of alternate modern technology that performs the same mission function, namely suppressant delivery.

Suppressant delivery remains a key component of aerial support in any wildfire operation. It can be accomplished in many ways; this analysis focuses on the Martin Mars.

All cost and technical information relevant to the Martin Mars in the 2010 season was included in this analysis. The Martin Mars was on a provincial 45 hour guaranteed standing offer over a 90 day period and was repositioned to Fraser Lake, west of Prince George, for a period of 26 days. A group of six AT802 FireBosses, on loan from the Alberta SRD, were deployed to various areas around BC for a period of 22 days. Both aircraft groups were managed by the Provincial Air Tanker Centre (PATC).

Martin Mars Historical Use

The Martin Mars was (*1960 to mid 1990's*) owned and operated by a consortium of forest industry companies, Forest Industry Flying Tankers (FIFT). They operated primarily on the British Columbia coast on their private and TFL lands. FIFT responded under their own dispatch and direction on lands that they were responsible for, or had insured timber on. The Mars bombers flew considerable hours and were in the public eye regularly, which in part led to the perception that it was a highly effective suppression tool. The Mars was made available under a tariff casual hire basis with no minimum guarantee to the BC Forest Service as required. For many years there were two Mars tankers (CF-LYK and CF-LYL).

Changes in slash burning philosophy and harvesting techniques contributed to a reduction in the overall wildfire workload on the coast of British Columbia. This, coupled with an evolutionary shift to the utilization for firebombing of the same R/W aircraft used in harvesting operations, made the viability of operating the Martin Mars solely for coastal timberland protection no longer cost effective.

In 2007 the Martin Mars operation was purchased by a private company, Coulson Group Inc.. One of the aircraft was retired from active service. Today, only one is operational.

In 2007, Coulson Group Inc. entered into a contract with BCFS which guaranteed 45 hours of flight time over a specified period during fire season. In 2008, at their request, Coulson Group Inc. was released from its contract with BCFS to pursue a contract with the US Forest Service (USFS). In 2009, Coulson Group Inc. operated the aircraft under exclusive contract to the US Forest Service and it was not available to BC. The contract with the USFS was not renewed upon expiry. In 2010 Coulson Group Inc. negotiated a contract with BCFS for a guaranteed 45 hours.

**Hours Flown For BCFS
By Martin Mars 1990 – 2010**

Year	CF- LYK	CF- LYL	Total
1990	7.6	6.2	13.8
1991	0	0	0
1992	0	4.3	4.3
1993	1.7	0	1.7
1994	31.2	28.4	59.6
1995	0	0	0
1996	1.7	0.9	2.6
1997	1.3	0.8	2.1
1998	93.4	67.4	160.8
1999	1.6	2.4	4
2000	5.8	5.9	11.7
2001	0	0	0
2002	14.6	17.4	32
2003	123.1	157.7	280.8
2004	10	20.6	30.6
2005	9.6	10.7	20.3
2006	29.2	39.1	68.3
2007	N/A	36.5	36.5
2008	N/A	0	0
2009	N/A	0	0
2010	N/A	53.3	53.3

Observations of Martin Mars Historical Use

The Martin Mars was not available to BCFS in 2009. Accordingly, the calculations for averages from 1990 to 2010 are based on 19 years and not 20.

The Martin Mars flew in 15 of the previous 19 years. There were only 5 of those 15 years where the total hours flown exceeded 45 hours. Two of these years, 1998 and 2003, were historically busy fire seasons and are considered anomalous.

In 1998 the Mars flew the majority of its hours on the Salmon Arm fire. Incident Command staff on the Salmon Arm fire found “close air support” missions with suppressants easier and more effective with the onsite R/W aircraft and the smaller mutual aid CL215Ts in the province that season. It was determined the foot print of the Martin Mars drop was so large (purported to be 1 ha) that working in close proximity to ground resources was dangerous. Suppressants are only effective when wet so working in close proximity to crews who must back up aerially applied suppressants is a key to their success.

In 2003 the Mars flew the majority of its hours on the Kelowna fire. In both cases, the use of the Martin Mars was of marginal benefit from a fire operations perspective as all suppressant delivery operations are with very high temps, low relative humidity’s and extreme fuel moisture deficits. However, these operations were viewed by the general public as a major success. In both cases the Mars was under FIFT ownership. The average hours flown per year over the 19 year period is 39.1, including years prior to 2007 when both Mars aircraft were available to BCFS.

Removing “outliers” in statistical analysis is a common technique. It culls the highest and lowest value(s) so as to not unduly skew the results. Once outliers have been removed the 17-year average hours flown is 27.7.

Analysis

Both aircraft types are capable of delivering more than just plain water. The Martin Mars delivered a fire gel product and the FireBosses delivered a fire foam product. For the purposes of this comparison only the volumes of water picked up and delivered, either straight or mixed with another product, were used. The gel and foam

- Martin Mars ranged s.21 Average = s.21
- AT802 Fire Boss ranged s.21 Average = s.21

Cycle Distance & Times

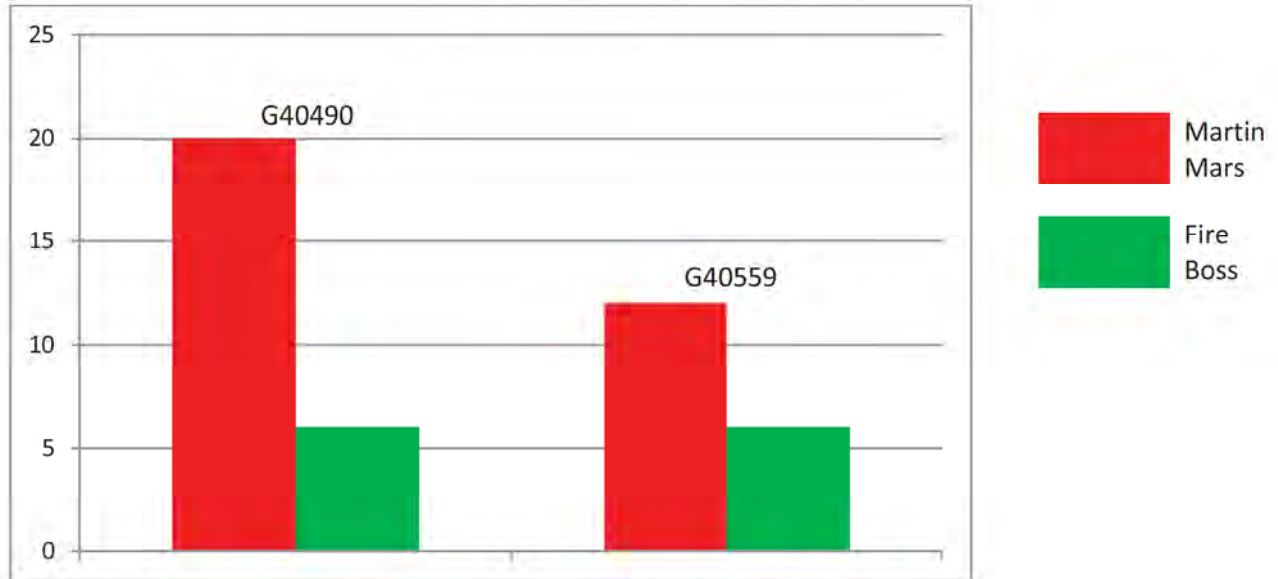
Page 7 of 30

Fire G40490

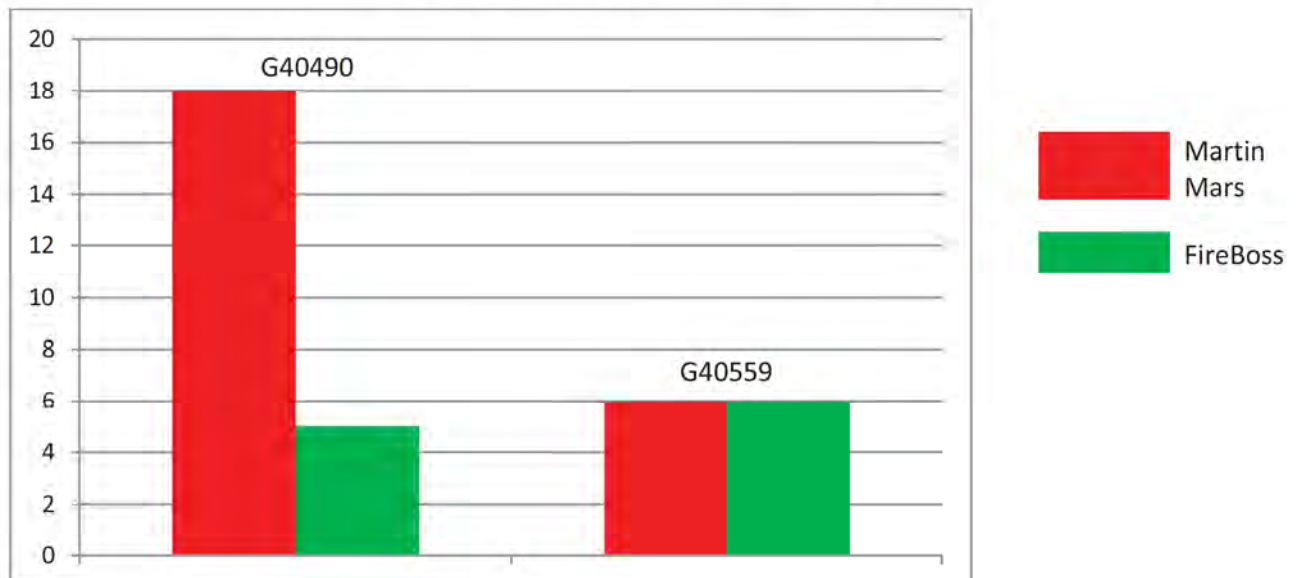
Fire G40559

	Cycle Time	Distance	Cycle Time	Distance
Martin Mars	20 minutes	18 nautical miles	12 minutes	6 nautical miles
AT 802 Fire Boss	6 minutes	5 nautical miles	6 minutes	6 nautical miles

Cycle Times (minutes)



Cycle Distances (nautical miles)



Relative Hourly Costs

It is standard practice within WMB aviation contracts to use a daily term of 7 hours when calculating hourly costs for part-days of activity. When away from their home

base, both the Mars and the FireBosses have a daily availability rate from which an hourly rate can be established. For the Martin Mars, the hourly availability rate is

s.21

. For the FireBoss, the hourly availability rate is

s.21

Based on this, a calculation about hourly operating costs can be made. For a deployment away from home base, the Martin Mars hourly cost of operation considering hourly availability, flight rate and fuel only is

s.21

per hour. The FireBoss hourly availability, flight rate and fuel only cost is

s.21

per hour.

Based on these calculations, the comparable number of FireBosses that can be operated for the same cost as the Martin Mars is a little over 9 aircraft. (see figure 1 below for breakdown)

Figure 1

	Daily Availability	Hourly (Daily ÷ 7)	Flight Rate	Hourly Fuel	Total Hourly Cost
Martin Mars			s.21		
FireBoss					

Aircraft Fuel Considerations

Because the Martin Mars is restricted to water operations only (it is a flying boat) it requires specialized on-water refuelling equipment. There is a permanent facility at its home base on Sproat Lake. The company also has a mobile refuelling capability that can travel if the Mars is relocated elsewhere in the province. There are minimum lake size requirements to operate the Mars from so suitable options for repositioning are significantly restricted, and if mobile refuelling is required the lake needs good road access. On the other hand, the FireBosses are able to land and refuel from fixed or mobile sources at smaller airports. This creates a substantially higher degree of flexibility when using this group.

The Martin Mars has piston engines, which require the higher octane Avgas. In the current global petroleum fuels market, Avgas is being phased out as more aircraft around the world are being built with jet turbine engines which require either Jet A or Jet B fuel. Because of this trend in the market, as well as some other operational performance requirements, the Provincial Air Tanker Centre during its most recent Request for Proposal and subsequent tendering process transitioned the majority of its remaining Avgas Aircraft to Turbine Aircraft. It is anticipated that the last remaining aircraft requiring Avgas will be replaced by a Jet fuel type in the medium

term. There are some challenges anticipated around the logistics, availability, and cost of Avgas in the future.

The Martin Mars burns approximately 2500 litres of fuel per hour with an operational endurance of 5.5 hours. The FireBoss burns approximately 282 litres per hour with an operational endurance of 4 hours. Standard air attack management practice is to stagger the refuelling cycle of the group of FireBosses so that there is constant firebombing occurring as required. The type of aviation fuels notwithstanding, the Martin Mars burns approximately the same amount of fuel by volume as at least 9 FireBosses and the limited number of refuelling sites significantly limits its operational flexibility.

Staff Observations:

The following is a cross-section of operational Air Attack Officer observations made during the 2010 fire season (*Complete staff comments are contained in appendix I*).

“My concern lies in the financial burden of the practice. Obviously not my call to determine whether it is cost-effective or not but for the 2 practices total costs were over s.17, s.21

“It should be noted that in both cases the MARS aircraft was actually overhead the practice area for no more than 30 minutes”.

s.22

“Engine management to eliminate excessive cylinder head cooling severely limits the rate of decent to the pickup lake and the climb performance in the density altitudes of the interior plateau are major contributors to lengthy cycle times”.

“The Mars may have a small support role on small IA targets.

s.22

“The level of professionalism, flexibility and capability of the aircrew and traveling support team is top-notch. We can deploy the Mars to any suitable remote location with very little hassle and can expect equally-exceptional human performance as any of our groups”.

“The Mars is not a "7000-gallon airplane". A typical fuel cycle will see a range between 4600 USG up to about 5400 USG per load”.

“The Mars dropped about the equivalent volume per unit of time as a group of 6 FireBoss aircraft over a fire where almost all other variables were equal. It has less operational flexibility (needs bigger lakes/one can't divide a single airplane group) at a far higher hourly cost”.

s.22

Calculation of Cost per Litre of Water Delivered

One commonly accepted performance measure when comparing water bombing aircraft is to use Cost per Litre delivered. To be accurate the inputs must consider all costs to the operation. These include daily aircraft operating costs as well as incidentals such as vehicle rentals and support staff.

Formula Variable Definitions

D = Daily Availability Cost per contract or agreement

E = Engine Warm up Rate (Mars contract only)

FA = Hourly Fuel Rate (when away from home base)

FH = Hourly Fuel Rate at Home Base (Mars contract only)

FC = Cost of Fuel for Flights

FL = Cost of Flights

HA = Hourly Availability (daily rate divided by 7 hours per contract; this is a standard practice)

HF = Actual Hours Flown

HFR = Hourly Flight Rate per contract or agreement

V = Daily Vehicle Cost Away (Mars contract only, actual invoiced amount over 22 days)

Formulae

$$FL = HF \times HFR$$

$$FC = FA \times HF$$

$$HA = D \div 7 \text{ hours}$$

$$\text{Cost per Litre} = (FL + FC + HA) \div W$$

Martin Mars Cost per Litre

Martin Mars Contract Rate Inputs

Hourly Flying Rate = s.21

Daily Availability When Away From Home Base = s.21

- Includes travel & equipment for support staff
- Does not include mileage for vehicles
- Hourly Availability Calculation (1/7th of Day Rate) = s.21

Daily Availability When Away, 1st and Last Day = s.21

Hourly Availability Calculation (1/7th of Day Rate) = s.21

Engine Warm Up Rate Per Start = s.21

Hourly Fuel Rate While At home Base = s.21

Hourly Fuel Rate While Away From Home Base = s.21

Actual Known Costs While On Deployment For 22 Days to Fraser Lake

1st and Last Day Availability = s.21

Daily Availability = s.21

Vehicle Mileage = s.21

- Vehicle Mileage Daily Cost = s.21

	K20262	G40490	G40559	R10100	R20165	V90518
Hours Flown	4.8	10.7	3	2.1	9.5	2
Flight Cost	s.21					
Water Volume (L)	181,600	363,200	248,645	113,500	681,000	103,185
Fuel Cost	s.21					
Hourly Availability	Local Dispatch	\$16,753.14	\$4,697.14	\$3,288.00	\$14,874.29	Local Dispatch
Cost per Litre	s.21					

Martin Mars Average Cost per Litre = s.21

Alberta SRD Fire Boss

Hourly Flying Rate = s.21

Daily Availability When Away From Home Base = s.21

- Includes travel & equipment for support staff
- Hourly Availability Calculation (1/7th of Day Rate) = s.21
- Hourly Fuel Rate While Away From Home Base = s.21

	C10205	C10258	C10299	C20289	C30378	G40490	G40559
Hours Flown	89	16.5	11.9	20.3	16.6	67.3	22.7
Flight Cost	s.21						
Water Volume (L)	1,566,950	217,800	48,400	393,250	108,900	520,300	254,100
Fuel Cost	s.21						
Hourly Availability							
Cost per Litre							

FireBoss Average Cost per Litre = s.21 _____

Other Considerations

The Martin Mars was unserviceable due to mechanical reasons this past season from August 10 to 12, for a total of 3 days. Because it is a “one of a kind” aircraft, relatively speaking, there was no replacement available. This meant that the capacity of this aircraft was lost during a peak fire load period. Conversely, the group of AT 802 Fire Bosses comprise 6 aircraft so that when one is unserviceable there is still capacity and flexibility with the remaining multiple aircraft. In fact, in 2009 fire season, 2 of the 6 Fire Bosses from Alberta went unserviceable at the same time and BC was still able to fully utilize the remaining 4.

The drop footprint of the Martin Mars is very large and is often inefficient when dropping on small targets. Suppressants must be applied directly to the flaming material to be effective. Much water (or chemical) is wasted when actioning hotspots or fires that are considerably smaller than the Mars’ salvo footprint because a significant portion of the load lands either before or after the target. This means that the Mars is generally more suitable to support actions with large flame fronts than initial attack fires and project fires with spotty or fingered perimeters.

Operationally, there are some challenges around using the Mars in difficult terrain. It has some performance limitations regarding density altitude, steep descents, and along mountainous contours.

Practices are held every 7 non-operational days within the term of the standing offer. Under the terms of the current standing offer these cost on average

s.17, s.21 /practice. As well as meeting a standard within the WMB for all fixed wing firebombing aircraft, periodic practice sessions are a direct benefit to the supplier. These costs should be reviewed and reduced if possible to reflect the mutual benefit.

Fuel cost per litre as described in the standing offer appears high. A request for supporting rational for the unit cost should be made prior to agreeing to the cost in a future standing offer. The hourly fuel burn rate should also be rationalized through documentation.

Quoted Rack Rates for Avgas 100LL Under Provincial Standing Offer, August, 2010

Shell Oil	Victoria Airport	s.21
	Kamloops Airport	
	Smithers Airport	
Esso Imperial	Campbell River Airport	
	Prince George Airport	
	Fort Saint John Airport	
Executive Flight Services	Penticton	
Martin Mars Quoted Rate	Home Base Sproat Lake	

The Martin Mars is easily configured for foam or water enhancer injection. Although not analysed in this report currently the Martin Mars carries enough Gel concentrate for 10 loads of water enhancing Thermo Gel. These types of products are continually coming on stream and the presence of a water bomber that can be easily configured to inject these is seen as advantageous when conducting operational trials of these new approved products.

Conclusion:

The Martin Mars aircraft is one of the tools available to WMB used in the aerial suppressant support of ground fire operations and as such it has a role to play. What is evident is that role is growing smaller each year. The production of new turbine powered light airtankers (such as the AT802F FireBoss compared in this analysis) has brought to bear the inevitable evolutionary pressures that have been present since the first aircraft dropped paper bags full of water from single engine aircraft on fires in the mid 1950's. This evolutionary pressure and the availability of far more cost effective and efficient aircraft means

s.17, s.21

s.17, s.21 This process does not have to be carried out over night as there is still a limited role for this aircraft, it does however dictate that we limit our cost exposure with respect to the Martin Mars and look for efficiencies to insure we are seeing the best return for our dollar.

Recommendations:

No further expansion of the existing standing offer:

- The 45 hour guarantee is considered the maximum number of hours appropriate for this particular resource. Historically based on a twenty year average the Martin Mars has flown 39.1 hours for the WMB. (*avg. hrs. Flown 1990-2010, 27.1 hours with outliers removed*) Logistically, it is challenging to find suitable water sources in close enough proximity to fires to make the Martin Mars cost competitive to other options such as the FireBosses or some heavy lift helicopters

Review the contract and look for further cost savings:

- The bulk fuel costs appear high relative to provincial fuel standing offer rates currently in place. The range of fuel “rack” rates for the month of August available to the WMB under these standing offers, all inclusive of taxes and dispensing charges, was s.21 per litre. Based on the hourly fuel burn rate quoted in the contract with the Martin Mars, the cost per litre equates to s.21 A complete review of this with supporting rationale is required.
- Practices held every 7 non-operational days within the term of the standing offer cost on average s.17, s.21 each. It is recommended that, as practices are of benefit to the both operator and WMB, that the standing offer be amended as appropriate to mitigate these costs.

Next steps

There is no compelling reason to expand or cancel the existing Standing Offer with the Coulson Group for the supply of the Martin Mars aircraft.

- Historic utilization would indicate an average utilization of approx 39 hours.
- The Coulson Group is a quality operator that delivers a customer-focused professional product.
- The Martin Mars can easily be reconfigured to inject any one of the new recently approved water enhancers enabling operational testing of these products.
- WMB staff are committed to finding the remaining niche for this very specialized aircraft.

Renegotiate the Standing Offer with Coulson Group Inc. reflecting the changes and enhanced cost controls outlined in this report.

Continue working towards a decision that establishes an alternate suppressant delivery model.

- Source those assets in the most economically sensible way. Interim, casual hired or mutual aid deployment will provide opportunities for analysis and further exposure until a long term contract can be developed for the most suitable business case and asset.
- Continue ongoing operational analysis of all suppressant delivery systems.

Appendix I - Air Attack Officer Observations

Testimonial #1:

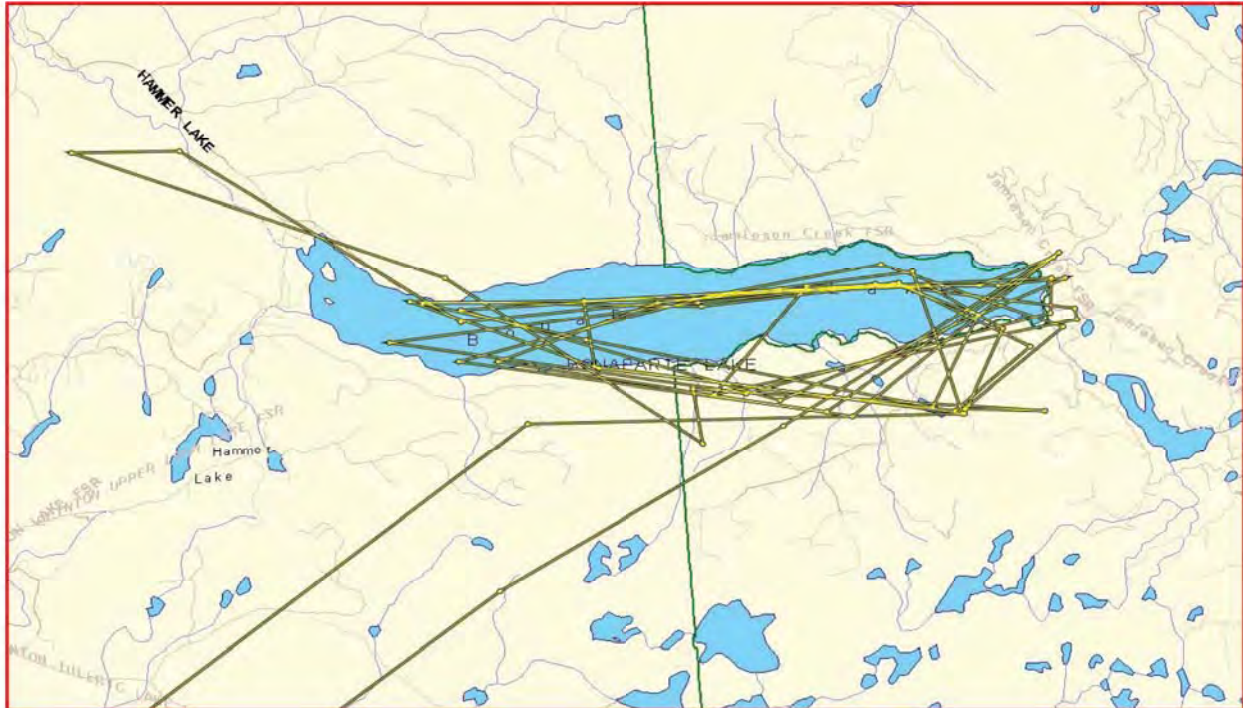
I had two actions with Martin Mars Tanker 823 this summer. Below are my observations.

The first was K20262, Bonaparte Lake, July 28. This IA fire was approximately 20 ha on arrival, burning vigorous Rank 3 and occasional Rank 4 in a C3 fuel type, burning south to north and spotting 300 metres. Fire was uncontainable with retardant due to lack of available a/c. Retardant objective was structure protection on lakeside homes and cabins approximately 1000m to the northwest. Adjacent Bonaparte Lake was identified as suitable for Tanker 823 scooping and request was made with objective being to cool and hopefully prevent spotting and lessen intensity on the flank and head of the fire closest to the structures (northwest corner). There were no difficulties regarding integration with the retardant action as it had ceased (objectives completed) just prior to Tanker 823's arrival.

The pickup site was Bonaparte Lake immediately adjacent to the target. Tanker 823 required a couple of miles to run through post-drop procedures, turn-out along the exit path, and then descend for the scoop (west heading). The scoop began approximately 3nm from the eastern shore and finished approximately 6nm from that shore, at which time Tanker 823 completed a left turn (180 degrees) and was set-up on a lengthy base leg (east) to target. First load was 5,500 Imperial gallons and by the 5th load it had increased to 5,800 gallons. Immediately after the 5th load BD119 turned the fire over to BD052 who completed action with three more drops (reported to be 6,000 gallons) and then released Tanker 823 for Sproat Lake when fuel was required. The average turnaround between drops was 11.5 minutes.

Birdog 119 utilized a lead-in for the first run and then orbited and directed the remaining drops. Gel was utilized and was applied directly to the Rank 2 and 3 fire along that continuous fire flank. All drops were salvos, and as far as could be observed each drop in its entirety was being placed directly on flame. There was no observable lessening in fire behaviour and spotting along that flank was not observed (before or after Tanker 823's action). Rapid spread never occurred on that flank and the fire never did threaten the structures to the northwest. The fire behaviour on that

flank was less intense than the opposite flank as it was a slightly backing fire, and the time of day was past peak burning period and evening was approaching. It is unclear what impact the drops may have had on lessening spread and preventing spotting.

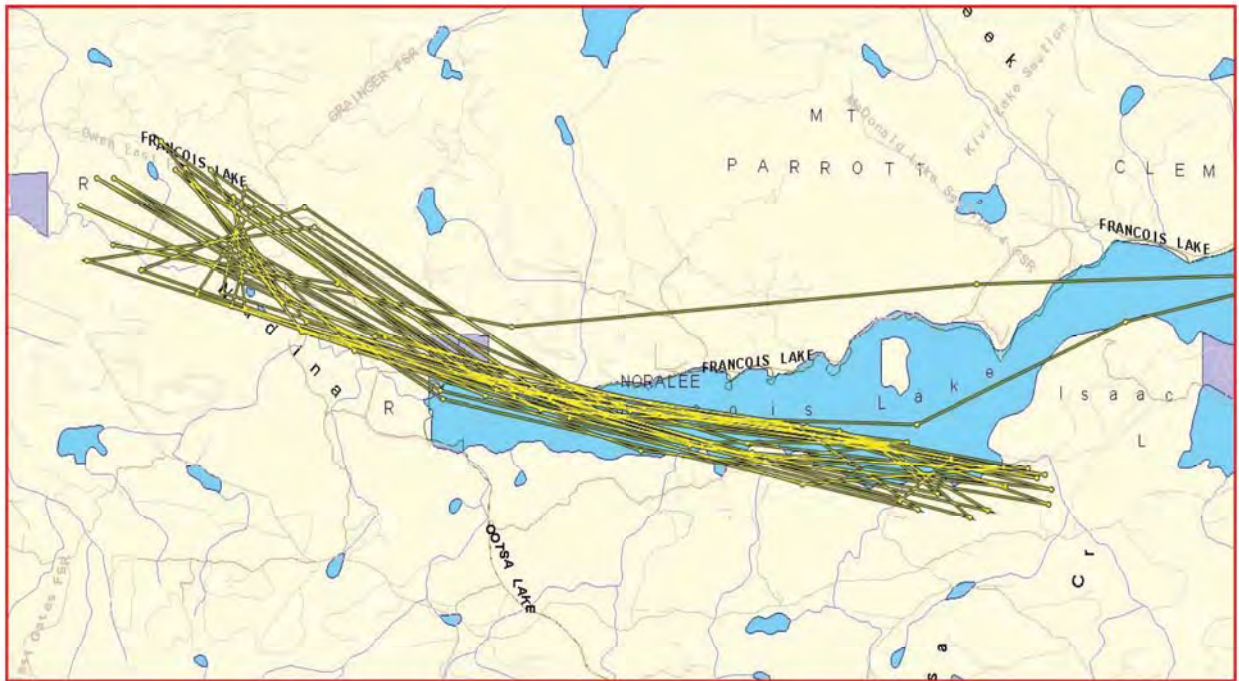


Summary:

- Request for Martin Mars @ 1620 hrs, Arrival @ 1808 hrs, First Drop @ 1816 hrs, Return to Sproat Lake for fuel @ 1940 hrs.
- Average turnaround was 11.5 minutes with ideal pickup spot adjacent to fire and same elevation.
- Dispatch distance limited mission endurance to 8 drops (5 with BD119 and 3 with BD052).
- Because of the nature of the target (long flaming flank) 100% of each drop was able to be placed entirely on flame with great efficiency (46,400 Imperial Gallons in total). In that regard it was a perfect objective.
- Tanker 823's effectiveness on fire behaviour was undeterminable by observation, but likely positive.
- Tanker 823 crew was professional and adhered to all protocol.

The second action was on fire R20165, adjacent to the west shore of Francois Lake, August 22. This was a support action on a fairly inactive flank of a large fire. The flank was near the Nadina River and sensitive ecological considerations so IC requested water only. The fire was backing down a slope in scruffy C3 fuels, Rank 1 and occasional Rank 2. The fire along this flank was spotty with an irregular perimeter and many areas that had already self extinguished. Rather than a solid flank of burning material, the targets were generally hotspots of 20 or 30 metres size, scattered along the perimeter. The objective was to cool the hotspots, lessen spread and intensity, and prevent spotting. The action would be supported by handline construction or allowed to burn out to the river. No foams or gels were appropriate. There was no retardant action occurring at this time so no integration issues were encountered.

Tanker 823 was stationed on Fraser Lake (approx. 60nm from target) and dispatch was timed so Tanker 823 arrived after Birddog 131 had received the objectives from the IC, so there was no delay in getting to work. The first drop was accomplished by way of Birddog lead-in and the subsequent drops were orbit and direct. The first drop was 5,000 imperial gallons, and each drop increased by 200 gallons until 6,000 gallons was reached on drop 6. All the remaining drops (total 15) were 6,000 gallons. Most drops were salvo drops but a couple were string drops. The pickup point was Francois Lake, but on this action Tanker 823 flew east over water on the exit, completed a 180 degree turn before descending for the scoop 9 nm from the target exit point. The scoop was completed in approximately 3 nm and then Tanker 823 flew directly back to the target (west) on the downwind leg. Fifteen drops were completed and the turnaround was consistently 12 minutes. There was an observable decrease in fire behaviour (down to primarily Rank 1) after each hotspot on the flank had been actioned by a couple of drops. The actioned was terminated when Tanker 823 required fuel.



Summary:

- Average turnaround was 12 minutes with ideal pickup spot adjacent to fire and same elevation.
- Total 15 drops was possible because of short dispatch distance (Tanker 823 pre-positioned on Fraser Lake).
- Most drops were placed only partially on flaming material as the targets were much smaller than T823's salvo footprint. Although 87,000 Imperial Gallons were delivered, I estimate only 50% was actually placed directly on burning fuel.
- Tanker 823's effectiveness on fire behaviour was observable, as Rank 2 lessened to Rank 1 and spread rates were lessened.
- Tanker 823 crew was professional and adhered to all protocol.

s.22

Testimonial #2:

Good morning Bruce. I did not have the opportunity to operationally work with the MARS this summer. I did however have 2 practices with the aircraft. Both involved the MARS scooping from Henderson Lake or nearby Great Central Lake. As such flight time for that aircraft was minimized. The practices did however require a birddog aircraft to fly from Abbotsford to the practice location.

My concern lies in the financial burden of the practice. Obviously not my call to determine whether it is cost-effective or not but for the 2 practices total costs were over: s.17, s.21

It should be noted that in both cases the MARS aircraft was actually overhead the practice area for no more than 30 minutes.

In my opinion, a business model in which our organization hired heavy lift helicopters on a long-term basis would offer significant benefits over the MARS model. One could likely hire 4 or so heavy helis for a similar hourly rate of the MARS. Four helis of course offer flexibility in being able to be pre-positioned in several different locations at the same time, the ability to carry passengers and the ability to get far greater amounts of suppressant/retardant onto the fire per hour than can the MARS (all things being equal).

s.22

Testimonial #3:

The Rank 4/5 with short distance spotting fire behaviour was not impacted or changed by any of the mars drops, however, it should also be noted that the 2 heavy helicopters were also not being effective even though they were on +/- 2 minute cycles. It is very difficult to work with this aircraft in smoky conditions with terrain issues especially on large complex support actions. The long turnaround times, even when cooling of the fire is accomplished, allow fire intensity to rebuild and any effect the drop may have had is lost. Back to square 1 we go. The ever changing smoke conditions and large circuits generally require other fire control actions to be curtailed as the birddog must be constantly monitoring approach and exit paths while the Mars

is on the scoop. This often requires a lead-in on every drop which makes drop evaluation and effect on fire behaviour difficult to observe because of the time delay for the bird dog a/c to return to the drop area. It also delays clearance back in to the area of bucketing R/W that are in the hold.

2nd Support action –R10100 comments. This action was at the NE section of the fire to cool and prevent downhill spread of a backing Rank 2/3 to buy time for Structural Protection Units, who were working in the area. The visibility and terrain were not issues on this action. There also were no other fire control operations in the area, therefore, the operation went considerably smoother and fewer lead ins allowed for better drop observation. The Gel drops were effective against this type of fire behaviour in almost extinguishing portions of the line. However, if any small spot was not hit with a portion of the drop as it built in intensity, an additional entire Mars drop was required to be used to cool this small excursion. Even though there was no terrain issues and only approx 600ft elevation difference, the turnaround times were still in the 12 minute range which again would prove ineffective if fire behaviour increased. This operation also was smoked out but close to the end of the fuel cycle. The portion of line was cooled and showing Rank 1/2 behaviour at action termination. This action although it met with limited success again illustrated that the Mars requires lots of airspace and possesses limited manoeuvrability.

Additional comments: - Engine management to eliminate excessive cylinder head cooling severely limits the rate of decent to the pickup lake and the climb performance in the density altitudes of the interior plateau are major contributors to lengthy cycle times.

The Mars may have a small support role on small IA targets.

s.21

Testimonial #4:

I led one practice, one fire and was aboard during one run-up of the Mars this season. Not a lot of 2010 experience, but enough to update my previously-held opinions on this type, gained over my 30+ incidents using the Mars aircraft. Here are some

hopefully unbiased opinions:

Pros

1. The 120 kias airspeed is a minor issue. It drops at a comparable speed to our airtankers, and can be easily matched in the circuit by any of our birddog types or a rotary platform.
2. Its empty climb performance (900 ft/min rate) exceeds most people's expectations.
3. The level of professionalism, flexibility and capability of the aircrew and traveling support team is top-notch. We can deploy the Mars to any suitable remote location with very little hassle and can expect equally-exceptional human performance as any of our groups.
4. The investment in terms of avionics (best in fleet), strain gauging (on par with other operators) and maintenance infrastructure is to be commended. This is not a bare-bones operation.

Cons

1. The Mars is not a "7000-gallon airplane". A typical fuel cycle will see a range between 4600 USG up to about 5400 USG per load.
2. The Mars dropped about the equivalent volume per unit of time as a group of 6 FireBoss aircraft over a fire where almost all other variables were equal. It has less operational flexibility (needs bigger lakes/one can't divide a single airplane group) at a far higher hourly cost.
3. The Mars fuel endurance cycle exceeds that of the amount of gel concentrate it can carry.
4. Circuit times even when fires are adjacent to scooping lakes at comparable elevations are excessive at times (10 min avg turns in my experience).

5. Steep terrain is an issue as the Mars can only descend while loaded at very gentle (~200 ft/min) rates, and has issues contouring steep slopes due to its 200 ft wingspan.

6. The salvo drops from the Hawaii (bottom dumping) Mars are advertised to cover three acres. It appears only half to two-thirds of the load is useful, as the rest trails along the flightpath beyond the target (a function of lack of head pressure following the evacuation of most of the load?). The Philippine Mars (side dumping) has more pronounced trailing in the early stages of the drop, and even less overall salvo ability.

s.22

Testimonial #5:

I worked 3 missions with the Mars between Aug. 4th and 9th all in support on Fire G40490 Hallett Lake approx 20 nm south of Fraser Lk.

All 3 missions had specific objectives on or near the fire identified by ground crews.

Mission objectives included:

- cooling guard to support evening burnoff (600 metre line)
- supporting ground crews establishing hand guard adjacent to a 40 ha escape (300 metre line)
- providing gel line beside a main road approx 500 metres from the main fire for burnoff support (1 km line)

All objectives were achievable and met with 5 drops on each mission.

Gel was used on all missions and performed well according to ground crew feedback. Color (blue) was used on only one drop and proved to be ineffective for reference in timber. Reflection, moisture and reference points were used after that to identify drops on the ground. Adding color to drops was also labour intensive as Mars crew member(s) had to physically add it after the scoop. The last scoop of the mission consists of straight water in order to clean the tank of gel residue.

All target elevations were between 3000 to 3200' on the fire with scoop sources between 2300 to 2800' which was favorable for turn around times. 3 lakes were used for scooping (Knewstubb, Fraser and Francois) all between 15 to 20 nm from the targets with turnaround times between 19 to 24 minutes. Hallett Lk., 2 nm from the fire, was used as a scoop source on one occasion which reduced the turnaround time to 13 minutes but the useable portion of the lake was only 3.5 nm in length and the load volume was limited to 3000 gal imp. Load volumes from the other lakes ranged from 4800 gal (mission start) to 6000 gal once fuel load was reduced.

Birddog lead-ins were used on all drops on all 3 missions and were effective. Picking up the Mars on base leg with approx 1/2 mile separation at 120kts seemed to be most effective. Ground and helicopter operations were integrated well with the Mars action. With my previous experience working the Mars in the Coast mountains, Penticton, Shuswap and Kamloops areas, I would say that the role in the Fraser Lake area of the province was the most effective - not havng to deal with performance issues such as scoop source and elevation differences, density altitude etc.

It goes without saying when using this resource, that mission obectives must be clear and achievable and ground follow up immediate.

s.22

Testimonial #6:

Gents

My only opportunity to work the Mars for 2010 was on K20262 taking the fire over from BD 119, on arrival I asked the question “ time remaining on site before fuel “ was told ½ hour left on site so decided to continue scooping for the duration . The Mars made 3 drops in that time frame that were marginally effective on the closest flank to the lodge . my main mission was to establish long term retardant line along the flank that had the potential to threaten the lodge overnight . that was achieved before dark and the Mars was sent to home base to stay .. The main observation for me was the three drops that I birddogged were full drops due to low fuel load and excellent water source adjacent, as good as it gets for using the MARS in the interior and I observed it to be marginally effective ...But in fairness to all 3 drops do not make a mission ..

s.22

Appendix 2 – Airtanker Specifications



AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Martin Mars

A/C ROLE: Airtanker - Scooper, Waterbased

AGENCY: Private - Forest Industries
Flying Tankers (F.I.F.T.) Ltd.

A/C SPECIFICATIONS:

Length: 120' 3"
Wingspan: 200' 0"
Height: 47' 11"
Gross Weight: 162,000 lbs.
Approx. Empty Wt.: 88,000 lbs.

POWERPLANT:

Engine(s): Four Wright R3350-24
Piston Radial
Horsepower (Each): 2500 H.P.



FUEL:

Type: Avgas 100
Capacity: (Normal) 21,600 lbs. (13,600 litres)
Consumption: 3,950 lbs./hr. (2,500 litres)
Operational Endurance: 5.5 hrs.

PERFORMANCE:

Cruise Speed: 165 Kts.
Target / Drop Speed: 120 Kts
Stall Speed (Operating Wt.): 89 Kts.
Loiter Speed: N/A
Minimum Field Length: N/A
Pick Up Time: 20-30 Sec.

TANKING SYSTEM:

Tank Type: Compartmented with probes
Max. Capacity: Tank - 27,240 litres, Foam concentrate capacity – 2,270 litres
Number of Doors: Mars LYL (Bottom Dump) - 22
Mars LYK (Side Dump) - 4

DROP SPECIFICATIONS:

TYPE	APPROX. LENGTH @ C.L. 1	TYPE	APPROX. LENGTH @ C.L. 1
LYL Salvo	180 Metres	LYK Salvo	150 Metres

***** Both A/C - Drops normally full salvo but can split loads into 2 drops if requested *****

COMMENTS:

Operational Crew: 2 Pilots and 2 Flight Engineers.
In-flight foam injection allows for 21 drops @ 0.4%. Salt or fresh water pick-ups.



AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Air Tractor AT-802F - Fireboss

A/C ROLE: Amphibious - Scooper

AGENCY: Alberta

A/C SPECIFICATIONS:

Length: 35' 8"
Wingspan: 59' 3"
Height: 16' 2"
Gross Weight: 16,000 lbs.
Approx. Empty Wt.: 8,500 lbs.

POWERPLANT:

Engine(s): Pratt & Whitney PT 6A – 67AG
Turboprop
Horsepower (Each): 1,350 H.P.



FUEL:

Type: Turbine Jet "A", "B"
Capacity: 2,506 lbs. (1,415 litres)
Consumption: 500 lbs./hr. (282 l/hr.)
Operational Endurance: 4 hrs.

PERFORMANCE:

Cruise Speed: 130 Kts.
Target / Drop Speed: 100 Kts.
Stall Speed (Operating Wt.): 75 Kts.
Loiter Speed: 120 Kts.
Minimum Field Length: 3,000 feet
Minimum Pick Up Dist.: 2800 feet

TANKING SYSTEM:

Tank Type: Variable Flow Rate - Computer Controlled.
Max. Capacity: 3,025 litres, Avg retardant payload = 2,460 litres; Foam tank capacity = 68 litres
Number of Doors / Compartments: 2 Doors / 1 Compartment

DROP SPECIFICATIONS:

VOLUME & APPROX. LENGTH SELECTION	APPROX. LENGTH @ C.L. 1	VOLUME & SELECTION	@ C.L. 1
Full @ Max	100 Metres	Full @ 4	120 Metres
Full @ 2	170 Metres	full @ 1	270 Metres
1/2 Vol.@ 3	75 Metres		

COMMENTS:

Operational Crew : 1 Pilot;
In-flight Foam Injection - Foam tank.

**MINISTRY OF FORESTS, LANDS & NATURAL RESOURCE OPERATIONS
WILDFIRE MANAGEMENT BRANCH
BRIEFING NOTE**

I PREPARED FOR:

Brian Simpson, Director, Wildfire Management Branch **FOR APPROVAL**

II PURPOSE:

The purpose of this briefing note is to seek the necessary approval to add a fixed-wing water-scooping group to the BC Wildfire Management Branch (WMB) airtanker fleet on a multi-year contract beginning in the 2014 fire season.

III BACKGROUND:

The WMB's response to emerging challenges may be summarized by the following: "Over the last number of years our fire seasons and workload have been increasing dramatically and experts predict this pattern will continue. Three main factors are contributing to this trend: climate change, mountain pine beetle kill, and a continued expansion of the urban interface area. Given the rapidly increasing fire workload and anticipated needs...a decision was made to increase our seasonal direct fire resource capacity in a number of areas. The results of this decision are expected to reduce our reliance on out of province resources, increase our response effectiveness while at the same time reducing impacts and total costs" (*B. Simpson, PAAG Newsletter 2011, Vol. 2, Issue 1, page 7*).

IV CURRENT SITUATION:

The Aviation Working Group and Provincial Airtanker Program staff have identified a subset of wildland fires that occur in heavy fuels on mid-slope elevations during periods of elevated (>125) Build Up Index conditions. Generally offering poor ground crew and machinery access and often following delays in ground crew response, these fires have required the aerial application of multiple rounds of unsupported retardant over successive burning periods. Consequently, these fires grow beyond the Initial Attack (IA) phase - defined as fires less than 4 hectares in size - and often exceed 100 hectares in size. Traditionally, several medium and/or heavy helicopters are assigned to these fires once in the Extended Attack phase and it becomes necessary to commit large numbers of ground personnel. The average cost to suppress fires in this target subset is \$1,380,889.

Following the 2004 Filmon Report, the BC WMB increased the overall airtanker fleet speed & retardant-carrying capacity by adding a pair of Convair 580 airtankers and consolidating the existing light airtankers into two four-airplane groups. Coupled with sound fleet management practices, the resulting provincial IA success rate increased in the immediate two years following the fleet adjustment. The recent downward trend of that same rate over the past five years may be directly attributable to the higher fire intensities exacerbated by the emergence of the Mountain Pine Beetle epidemic and the cumulative effects of widespread climatic change affecting most fuel complexes within British Columbia.

The Provincial Airtanker Centre has already optimized some Key Performance Indicators by employing aggressive and flexible fleet positioning & response strategies; the average dispatch

distance (60 NM) has stabilized at a level unlikely to improve, yet the ten-year average fire size upon arrival continues to increase, likely as a function of the factors discussed above.

V OBJECTIVE:

Observations and experience gained from six years of experience in the Alberta air attack program have proven that using a fixed-wing water-scooping group in conjunction with existing land-based retardant airtankers could increase the rate of Initial Attack success in BC by a comparable amount as seen in the post-2004 fleet adjustment. The goal of this amphibious airtanker group initiative would be to increase the overall IA success rate by 1%-2% over the length of the contract. The current use of medium and heavy helicopters now devoted to water delivery on extended-attack fires could be reduced for additional & substantial cost savings. WMB spends an average \$7.9 million per year on heavy-lift helicopters. Alternatively, these rotary-wing resources could be assigned to further improve the IA success rate on other fires within the target category, taking full advantage of ongoing improvements in helicopter management. Opportunities to integrate heavy helicopters with amphibious fixed-wing aircraft on defined incidents will present additional enhancements in support of fire line operations.

Achieving over a three-year period a 1.5% reduction in the number of extended-attack fires equates to an estimated \$12.1 million savings in direct fire costs plus the costs of damages to Crown timber and public assets. The estimated cost per year of the recommended group in Option #2 (below) including the availability charges over a 123-day term and flying an average 125 hours per aircraft each season is approximately \$3.3 million. Successful containment at less than four hectares of only three fires per season in the defined subset would result in the total recovery of the annual cost of the amphibious fixed-wing group; additional initial attack successes will result in direct fire savings to the Crown from current spending levels.

Eight of ten wildfire management agencies in Canada that employ fixed-wing airtankers use water-scoopers as part or all of their fleet. Each agency determines the ratio of amphibious to land-based airtankers depending upon their geographic suitability to each type. All these agencies are members of CIFFC, and participate in mutual-aid resource sharing to support partner agencies during elevated fire activity. The most commonly shared airtankers east of Alberta are amphibious. Sharing contract aircraft assists the supplying agency in recovering direct and preparedness aircraft costs. A water-scooper group enhances the WMB's aerial fire suppression capabilities and enables recovery of a portion of our costs when exporting these aircraft.

VI KEY CONSIDERATIONS:

The Wildfire Management Branch has traditionally opted against contracting water-scooping aircraft for long-term use in British Columbia due to the long turnaround times associated with delivering a water & foam mix to fires laterally and/or vertically distant from suitable skimming sources. The development of jet or turbine-powered amphibious firefighting aircraft (Air Tractor 802A FireBoss, CL 215T/415, Beriev BE-200, ShinMaywa US-2 and the proposed Chinese AVIC aircraft) introduces airplanes capable of using many more lakes that have the climb performance to operate with acceptable turnaround times in the more mountainous regions of the province. These aircraft are more manoeuvrable than larger piston-powered water-scooping aircraft.

Analyses conducted by WMB aviation staff have concluded, based upon actual mission data, that the average costs per litre of suppressants delivered to fires in the last year available (2010) are 35% lower when using a group of amphibious aircraft than when compared to the Martin Mars.

s.13, s.17, s.21

Considered factors when determining the best option for British Columbia include the cost per litre of product delivered, ability to carry long-term retardant on initial dispatch, logistical flexibility of the aircraft type, speed & climb/descent performance, redundancy due to the numbers of aircraft in a defined group and ease of integration into the existing fleet of airtankers.

An amphibious water-scooping group in British Columbia could operate as a stand-alone group from a defined location. It may be split into two subgroups for better initial attack response times or it may be used as a roving group to support or integrate into existing land-based groups throughout the province.

Support for the addition of an amphibious aircraft group has been received after consultation with the provincial Operations Working Group. From an Operations perspective, given the commitment to a larger and more capable ground crew complement, the WMB now possesses sufficient resources to provide timely support for an additional airtanker group. s.13

s.13

Given approval to proceed with the addition of an amphibious group to the WMB fleet, PATC staff would undertake a worldwide Request for Proposal with an award target for fire season 2014.

VII OPTIONS:

Option #1: Maintain the airtanker fleet in its present configuration.

Option #2: Approve the addition of a complete (includes birddog) amphibious airtanker group to the provincial fleet for the 2014 season.

VIII RECOMMENDATION:

Option #2 is recommended. PATC staff would commence the Request for Proposal process and determine the optimal seasonal term length & base location(s) for the additional group with a planned contract award prior to the 2014 fire season.

Jeff Berry, Superintendent – Provincial Airtanker Program

November 15, 2012

APPROVED / NOT APPROVED

(Date)

Brian Simpson
Director, Wildfire Management Branch

2012

RO	To	From	Type	# of Days
002	MB	QC	2 CL-415	15
003	ON	NL	1 CL-415	19
005	ON	QC	1 CL-415	8
007	ON	QC	1 CL-415	5
009	ON	MB	2 CL-415	9.5
			1 BD	9.5
012	QC	AB	2 CL-215T	8
			1 BD	7
013	QC	SK	2 CL-215T	9
			1 BD	9
015	ON	NL	1 CL-415	9
021	ON	MB	2 CL-215	4
			1 BD	2
042	NT	AB	2 CL-215T	5
			1 BD	5
043	NL	QC	2 CL-415	6
044	ON	QC	2 CL-415	9
063	ON	NL	1 CL-415	7
			1 CL-415	12
066	ON	QC	2 CL-415	9
070	NT	AB	2 CL-215T	4
			1 BD	4

Total Days

175

2011

011	AB	QC	4 CL-415	9
012	AB	NT	2 CL-215	9
			1 BD	9
037	SK	ON	2 CL-415	3
			1 BD	3
045	AB	BC	1 Martin Mars	17
077	NT	AB	4 AT-802 Amph	4
			1 BD	4
079	NT	SK	2 CL-215	3
			1 BD	3
080	ON	QC	1 CL-215T	7
			1 CL-215T	12
			1 BD	14
083	ON	QC	2 CL-415	
084	ON	AB	2 CL-215T	16
			1 BD	16
087	NT	AB	4 AT-802 Amph	4
			1 BD	4
094	ON	SK	2 CL-215	12
			1 BD	12
101	ON	NL	2 CL-415	5
109	MB	SK	2 CL-215	3
			1 BD	3
119	ON	QC	2 CL-415	11
120	ON	SK	2 CL-215	9
			1 BD	9

122	MB	AB	2	CL-215	8	16
			1	BD	8	
139	ON	QC	2	CL-415	13	26
148	NT	AB	4	AT-802 Amph	4	16
			1	BD	4	
152	ON	QC	2	CL-415	13	26
155	ON	QC	2	CL-215T	2	4
165	US	MB	2	CL-415	14	28
			1	BD	14	
173	ON	QC	2	CL-415	4	8
Total Days					231	277

2010

005	ON	QC	2	CL-415	5	10
007	ON	QC	2	CL-415	13	26
			1	BD	13	
008	ON	AB	4	AT-802 Amph	13	52
			1	BD	13	
011	QC	MB	2	CL-215	6	12
			1	BD	6	
016	ON	AB	2	CL-215	6	12
			1	BD	6	
032	QC	ON	1	CL-415	11	11
			1	CL-415	13	13
			1	BD	13	
034	MB	ON	2	CL-415	20	40
			1	BD	20	
040	AB	NT	2	CL-215	3	6
			1	BD	3	
062	MB	ON	2	CL-415	6	12
			1	BD	6	
083	BC	AB	4	AT-802 Amph	24	96
			1	AT-802 Amph	20	20
			1	AT-802 Amph	21	21
			1	BD	24	24
Total Days					260	345

2009

010	AB	QC	3	CL-415	5	15
			1	BD	4	
011	AB	ON	2	CL-415	6	12
			1	BD	6	
015	PC	NT	2	CL-215	3	6
			1	BD	3	3
022	QC	NT	2	CL-215	9	18
			1	BD	9	
039	BC	AB	5	AT-802 Amph	32	160
			1	AT-802 Amph	7	7
			1	AT-802 Amph	1	1
			1	AT-802 Amph	24	24
			1	BD	32	
092	BC	ON	2	CL-415	14	28
150	BC	AB	5	AT-802 Amph	6	30
			1	BD	6	

Total Days

167

304

2008

004	MB	ON	2	CL:-415	12	24
			1	BD	12	
009	MB	QC	2	CL:-415	7	14
			1	BD	8	
014	NS	NL	1	CL-215	7	7
016	NS	QC	1	CL-415	3	3
018	MB	ON	2	CL-415	4	8
			1	BD	4	
020	NS	QC	1	CL-415	4	4
024	AB	ON	3	CL-415	7	21
			1	BD	10	
026	SK	QC	2	CL-415	7	14
			1	BD	10	
028	SK	QC	2	CL-415	7	14
			1	BD	10	10
029	MB	NT	2	CL-215	6	12
			1	BD	6	
Total Days					124	131

2007

004	ON	MB	2	CL-215	3	6
			1	BD	3	
005	ON	QC	2	CL-415	12	24
			1	BD	10	
006	ON	MB	1	CL-215	2	2
007	ON	NT	2	CL-215	11	22
			1	BD	11	
008	NB	NL	2	CL-215	2	4
009	NS	NL	1	CL-215	6	6
013	ON	NL	2	CL-215	8	16
014	ON	AB	2	CL-215	5	10
			1	BD	5	
018	QC	MB	2	CL-215	10	20
			1	BD	10	
019	QC	NL	2	CL-215	5.5	11
026	AB	ON	2	CL-215	9	18
			1	BD	9	
028	QC	ON	2	CL-415	7	14
			2	CL-415	5	10
			1	BD	7	
030	QC	AB	3	CL-215	12	36
			1	BD	12	
042	QC	MB	2	CL-215	9	18
			1	BD	9	
077	MB	ON	2	CL-415	5	10
			1	BD	5	
083	MB	NT	2	CL-215	8	16
			1	BD	8	
087	BC	QC	2	CL-215T	8	16
088	AB	QC	2	CL-415	27	54
090	ON	NT	2	CL-215	7	14

			1	BD	7
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Total Days

257.5

327

Grand total	1214.5	1605
Total per year	202.4167	267.5
martin mars		

s.17, s.21

s.17, s.21

Benson, Michael FLNR:EX

From: Moerkoert, Ben FLNR:EX
Sent: Tuesday, September 24, 2013 4:30 PM
To: Benson, Michael FLNR:EX
Subject: FW: K70505 analysis

Ben Moerkoert

Air Attack Officer
Provincial AirTanker Center
Penticton AirTanker Base
Ph: (250) 492-7776 Fax: (250) 492-8011
Cell: s.17

From: Sommerville, Derek A FLNR:EX
Sent: Friday, August 9, 2013 11:45 AM
To: Benson, Michael FLNR:EX
Cc: Moerkoert, Ben FLNR:EX
Subject: K70505 analysis

Here are some numbers for the fire action on K70505:

Fire boss:

Ferry flight; 1.7hr
4 hour bombing; 84,000 USG delivered
Cost; s.21
Cost per gallon delivered; s.21
Fuel consumed; 1,995 L

Bell 214B:

Ferry flight; 0.8 hr
4 hour bombing; 16,600 USG delivered
Cos s.21
Cost per gallon delivered; s.21
Fuel consumed; 3,480 L

Bell 412 or 212:

Ferry flight; 0.7 hr
4 hour bombing; 9,400 USG delivered
Cost; s.21
Cost per gallon delivered; s.21
Fuel consumed; 2,320 L

For interest sake, it would take the 214, and the 412, and the 212 12.5 hours to deliver the same volume of water as the fire boss group, for a cost of s.21

With refuels out of Lillooet, it is a 0.6 or 0.7 refuel leg. 31% of the helicopter time is flying to and from fuel.

Derek Sommerville

Wildfire Management Branch
Aviation Technician / Air Attack Officer
Southeast Regional Wildfire Coordination Centre
W: 250-365-4051

C s.17

Benson, Michael FLNR:EX

From: Sommerville, Derek A FLNR:EX
Sent: Wednesday, July 17, 2013 3:18 PM
To: Benson, Michael FLNR:EX
Subject: FW: analysis V30216

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mike,

JTH was dispatched from Sechelt, 40 minute ferry flight, burning an additional 267 L of fuel

NPG was dispatched from Abbotsford, 73 minute ferry, burning an additional 486 L of fuel

From: Sommerville, Derek A FLNR:EX
Sent: Tuesday, July 16, 2013 3:32 PM
To: Benson, Michael FLNR:EX
Subject: analysis V30216

Mike,

I haven't calculated actual costs in this analysis. I have only looked at (effective?) gallons per hour water delivery on this particular fire with the weather data available:

- 30 celcius
- RH 20%
- FFMC 92
- FWI 30

Here are some numbers for you:

Mars;

- 35 minute ferry from base to fire
- 35 minute turn (=/- 76 nm flight path) to Seton Lake
- 1st drop approx 4800 g
- Each drop at 35 minute intervals approx volume increase of +225 g
- 5 drops within a bombing fuel cycle (please confirm drop number)
- Total 26, 250 g delivered
- Approx 11,200 L of fuel consumed
- Fuel cost approx s.20

802 Fire boss group of 4; (leaving from same starting point of Mars)

- 45 minute ferry flight from base to fire
- 5 min turns to Lillooet Lake (8 min turns to top of fire at 3000')
- 1st drops 500 g each
- Drops increase by 50 g each hour thereafter

- 144 drops within a 3 hr bombing fuel cycle
- Total 79,200 g delivered
- Approx 4,200 L of fuel consumed
- Fuel cost approx s.21

212 single (NPG) and 205++ (JTH)

- 5 min turns to Lillooet Lake (8 min turns to top of fire at 3000')
- NPG average 338 g loads
- JTH average 348 g loads
- 18 drops within a 1.5 hr bombing fuel cycle
- Total 24,700 g with both helicopters over a 3 hour cycle
- Approx 3,200 L of fuel consumed
- 28nm refuel leg (0.3 flight time)
- Fuel cost approx s.21

I won't bother to give my opinion on where the effective gallon per hour delivery is achieved, but I will say that with the 2 helicopters delivering their payload, the fire continued to increase in size, so I would draw the conclusion that their GPH was not sufficient to reach the critical volume/ critical flow rate required to contain this fire heat output.

Let me know if you want further info or different approach.

Derek Sommerville

Wildfire Management Branch
 Aviation Technician / Air Attack Officer
 Southeast Regional Wildfire Coordination Centre
 W: 250-365-4051

C: s.17

Benson, Michael FLNR:EX

From: Benson, Michael FLNR:EX
Sent: Wednesday, July 17, 2013 3:59 PM
To: Young, Bruce R FLNR:EX
Subject: Mars information

Good afternoon Bruce.

In respect to the Mars aircraft:

1. On July 12 (V70193) a decision was made by an air attack office to not use the Mars on a fire as its use would require the removal of the effective resources on site from the fireline. Ground crews and 2 helis were working together effectively on the fire and the Mars could not integrate in with these resources given the limited airspace, small fire size and large footprint of the Mars drop pattern. The ATR on 'dispatch' indicated that V70193 was not a viable target due to significant elevation difference in between the fire and the water source as well as distance to the water source.

s.13, s.21

2. On July 16 the Mars was deployed to V30216 during the initial attack phase to support operations. The aircraft flew for 5.6 hours on the fire deploying gel. Below is a cost comparison analysis of the Mars, the 2 medium helis that worked the fire, and 4 fictional firebosses (a potential aircraft type to be proposed in the upcoming RFP). Each aircraft type is compared on the total cost, cost per litre, and volume dropped within a 3-hour bombing cycle plus ferry time. Some of the efficiencies gained by the helicopter and fireboss types result from being able to scoop from Lillooet lake rather than Anderson lake (Mars water source).

MARS

- Real Total cost s.21 (real costs from the mission: daily availability, warm up, hourly, fuel)* note this cost do not include the period the Mars was loitering waiting for the refuelling birdog
- Real Volume delivered: 27,000 gallons
- Real Cost per gallon s.21

Heli JTH and NPG (dispatched and from Sechelt and Abbotsford respectively overnight in Pemberton)

- Total estimated cost: s.21
- Estimated volume delivered: 24,700 gallons
- Estimated cost per gallon: s.21
-

Fireboss Group (estimated costs inclusive of daily availability, hourly, fuel)

- Total estimated cost s.21 (assuming departure and return to Sproat Lake: daily availability, hourly, fuel)
- Estimated volume delivered: 79,000 gallons
- Estimated cost per gallon s.21

In respect to the Fire boss aircraft:

Fire Bosses are AT-802 (air tractor) aircraft that have been converted to amphibious scoopers.
Conair Aviation is the Canadian dealer for AT-802 aircraft.

If a vendor was interested in purchasing a fire boss, they would have the option of:

- buying a new AT-802 from Conair and having Whipair provide the amphibious conversion
- buying a used AT-802 from anyone and having Whipair provide the amphibious conversion
- buying a new 'fireboss' complete from FireBoss LLC

s.17, s.21

Michael Benson
Superintendent Provincial Airtanker Program
BC Wildfire Management Branch
PWCC
(250) 312-3009

s.17

(cell)



Benson, Michael FLNR:EX

From: Townsend, Gary FLNR:EX
Sent: Wednesday, September 25, 2013 12:03 PM
To: Benson, Michael FLNR:EX
Subject: Fwd: Mars water bomber

Mike, as discussed.

Begin forwarded message:

From: "Townsend, Gary FLNR:EX" <Gary.Townsend@gov.bc.ca>
Date: August 12, 2013, 5:05:06 PM PDT
To: Matthews Ken <ken.matthews@coulsonforestproducts.com>
Cc: Coulson Wayne <wayne.coulson@coulsongroup.com>, "Strongitharm, Bruce FLNR:EX" <Bruce.Strongitharm@gov.bc.ca>
Subject: Re:Mars water bomber

Hi Ken, thanks for your email of July 22. We have had a lot happening on a number of issues and I apologize for the delay in responding to you. I have heard that in the intervening time, we had the Mars working on the Perry Ridge fire in the Slocan Valley. From what I have heard, it was performing well in this situation and knocking down hot spots until ground crews could get in to put them out. It was unfortunate that an engine went and the plane had to leave for repairs, but I understand it was subsequently re-positioned to Kootenay Lake and has worked more fires.

I have taken the approach below of addressing the points and issues you raise in the body of the text of the email you sent. Although it is clear that we will not agree on all aspects of this issue, I want to assure you that the staff of Wildfire Management Branch have the highest regard for the people and professionalism that Coulson Group has shown over the years. It is important that we maintain this working relationship regardless of the discussions.

Gary

From: Matthews, Ken [mailto:ken.matthews@coulsonforestproducts.com]
Sent: Monday, July 22, 2013 2:21 PM
To: Townsend, Gary FLNR:EX
Cc: Coulson, Wayne; Merivirta@birch.itsd.gov.bc.ca; Susan@birch.itsd.gov.bc.ca; Thompson, Lin FLNR:EX
Subject: Meeting July 19, 2013 between Coulson and the Minister of FLNRO Re:Mars water bomber

Gary,

It was good to see you again at the meeting last Friday.

The meeting was short and a great of ground was covered. Wayne and I felt it important to clarify a few key points with you.

To begin, Coulson understands that BC Wildfire has been around for a long time and has experienced and dedicated personnel. As well, Coulson understands the mandate of the current Minister and the need to be fiscally responsible and manage all spending. We also know that Ministry policy does not yet allow for practices such as dropping on structures or air operations at night.

Coulson has, for the past fifteen plus years, been active with many wild fire fighting jurisdictions around the world and has developed some very innovative operations and equipment for use in other areas and has also seen different strategies and equipment used in fire suppression programs. Many of the ideas presented during our meeting last Friday were presented not to be critical of BC Wildfire but meant to open some thoughts on new ways of doing cost effective business.

Reply: WMB is indeed no stranger to fire fighting techniques and strategies around the world and in fact is sought after by different countries to provide advice to the point that we are forced to turn away requests due to capacity issues. Ultimately different jurisdictions go about their business in different ways and WMB has always been open to new ways of doing business. Many of these ideas get adopted based on our own critical analysis and what our experts believe will work best for the BC arena. Fire agencies around the world rely on sharing best business practices, perhaps more than most other business areas in the resource sector, and BC prides itself in being a key contributor to that process both nationally and internationally. Just this past year a contingent of USDA Forest staff visited our Provincial Air Tanker Centre organization in Kamloops to review our program because of its reputation as a well-run air tanker organization. They are using the information from their visit to help in the rebuilding of their own program. We do appreciate the development and thinking that CG has done to move the science of wildfire control forward and also with an eye to cost effectiveness.

One of Coulson's main issues with the Mars water bomber is that it has not been used and there for not tested or analyzed in a factual and scientific manner which can be fully compared with other water delivery systems (aircraft) to understand cost of delivery and effectiveness of water / gel drops. We are dealing with historic feelings and rhetoric, not fact. This season, we have seen a couple of instances of Mars use by BC Wildfire, but as well , we have seen a time when the Mars was ignored when clearly it was the closest and most effective aircraft for the fire action. This clearly leads us to the conclusion that BC Wildfire staff have long ago decided not to use or allow the Mars and S76 helicopter to be tested and compared on fire activity. They would prefer to let it fade quietly into oblivion.

Reply: When looking at the question or whether the Mars has been adequately tested I would like to provide some information that shows that we have actually done a lot of work with the Mars.

WMB has been utilising the Martin Mars since 1960 and has significant operational expertise relating to its use:

- Flown 785 hours for WMB since 1996 (1960-1995 hours not included)
- Flown under WMB air attack officer (AAO) command and control on 45 fires since 1996
- WMB has led Mars annual briefings and debriefings for each year under WMB contract
- WMB led level 1 air attack training delivery to Mars staff during the CG's inaugural season with the Mars.
- WMB participation in 2005 Mars gel application testing in Coastal Fire Centre.
- WMB paid research through FP Innovations re: gel use from Mars on BC wildfires (included 7 wildfire data sets)
- WMB participation in Mars aerial delivery trials through FP Innovation- Port Alberni 2008
- USFS Mars California test drops, at the request of the Honourable Minister Pat Bell, FP Innovations attended trials and produced subsequent information material forwarded to the Minister and delivered to WMB aviation managers.
- WMB authored scooper/Mars evaluation reports 1999 and 2010
- Over the last four years on contract the WMB has spent s.17, s.21 on conducting practices with the Mars aircraft
- The Mars has been deployed to five fires so far this season and flown over 40 hours.

I would also like to comment on your observation that "This season, we have seen a couple of instances of Mars use by BC Wildfire, but as well, we have seen a time when the Mars was ignored when clearly it was the closest and most effective aircraft for the fire action". We assume this is in reference to a fire on July 11th V70193. In this instance the Mars was determined to NOT be the most appropriate resource by the AAO as its use would require the removal from the fireline of the effective resources on site. Ground crews and 2 helicopters were effectively working together on the fire and the Mars could not integrate in with these resources given the limited airspace, small fire size and large footprint of the Mars drop pattern. The fire was contained and did not grow or move through the retardant. Total fixed-wing costs including retardant was \$25K.

Given that the past two years and perhaps this year have not been active wildfire years in BC.. Summers have been cooler and the number of wildfires including the incidence of serious fires has been lower than some peak years.. Coulson understands that, but in the same fashion knows that the next major fire season is coming, if not this year, then soon.. Coulson has witnessed and been part of the recent action on fire storms in Australia, Mexico and Colorado and California.

Reply: Yes, we understand this perspective and are most concerned about fire incidence in the future. Our climate change analysis as well as the fire events we are observing and being part of in other areas of the world indicates a 50% increase in the number of severe fires in BC by 2050. We are rapidly strengthening our engagement with communities, other levels of government and industry sectors to seriously address fuel and fire management. We need to work at the local, intermediate and landscape levels to develop fire resilient communities and landscapes. At the same time we are looking at ways to increase our fire fighting effectiveness including the addition of another air tanker group, e.g. the RFP for amphibious air tankers. WMB staff closely follow fire activity and trends around the globe. We are regularly involved in fire fighting in the United States, across Canada and around the world, including Australia, where we also have a joint MOU on resource exchanges.

Wayne put forward two requests at the meeting.

Key Points

- A) Effectiveness. Wayne described the value of the Mars in direct initial attack on fires simply by extinguished them or knocking them down with the volume of water or gel that other in your fleet cannot deliver.. This is a tool you cannot replace. Data provided you from the USA and other research, and there is much more , shows this.

Reply: We agree that the Mars does have a good high volume initial punch to slow down fire progress. This punch also poses safety challenges for staff on the ground who need to move away from the fire for safety reasons due to the volume of water the Mars delivers and due to danger from falling trees and branches. A further difficulty is the airspace that the Mars requires so that not only do ground staff need to retreat, but helicopters and other aircraft need to vacate the airspace for a considerable distance. There are challenges associated with flying in steep terrain, vortex from wing tips, reliability and risks related to reliance on a single aircraft tanker group.

- B) Safety. On the heels of the loss of life tragedy in the USA this summer, the Mars can with one or two strategic drops make a safe zone for fire fighters, a group of tourists , or a ranch or home for someone caught in the midst of a fire blow up.. The sheer volume of water or gel on an area has the best chance to cool it long enough to provide a safe spot.

Reply: We agree that the Mars can be very effective at cooling down a hot spot. A challenge of course is the often very short period of time available to respond to an emergency or crisis situation. A number of resources strategically located around the province that are fast and can work in many different terrain types will help to address safety risks.

- C) Value for dollars spent. Staging the Mars in a location other than Sproat lake does cost significant money. I am attaching a list of costs and support equipment for you review.. I ask that you keep in mind that all of this support equipment must be bought and kept ready by Coulson in any case. Look at your costs for establishing

retardant bases across the Province.. Under this contract Coulson provides the base and satellite bases, Yes, it costs significant money per day but when it is over it is not a cost that the Province must bear or maintain.

Reply: As you know, we have staged the Mars on Kootenay Lake this summer, and utilized the aircraft on the Perry Ridge fire in the Slocan Valley. As I mentioned above, we are prepared to use the aircraft on an as and when basis and the situation is right. The province is not in a position to direct award a contract to pay up-front fixed costs. Looking ahead to the future, versatility, serviceability and the ability to deliver various suppressants will be key requirements.

- D) Longer term utility. Fire fighting agencies around the world are updating their fleets and tools but not at the exclusion of valuable tools like the Mars. Wayne discussed the age of water or retardant aircraft in Canada and the USA.. The Mars is well maintained and has an excellent and seasoned crew and will be available for a number more fire seasons yet.

Reply: As mentioned above, we are prepared to use the aircraft on an as and when needed basis.

- E) Comparisons between the Mars and single engine air tankers (SEATs). Some quick numbers show that a minimum contract for 4 SEATs would cost s.21 over 120 days for a total of s.21 s.21 just to be on standby. The current Mars contract is s.21 for standby time. At the same time, the Mars payload is 7200 gallons whereas four seats have a combined payload of 2600 gallons.

Reply: There has been considerable discussion between CG and WMB previously concerning cost estimates. Regardless of differing views on delivered product cost it is important to keep in mind that while very important, it is only one of a number of key factors that needs to be considered. Versatility and flexibility including the ability to operate over the largest possible range of terrain in the province, deliver a range of suppressants and integrate with other fire attack operations are as important as delivered product cost for overall cost effectiveness and to meet operational needs.

While it is clear that we will not agree on all aspects of this issue, we have identified a number of errors in the costs estimates you provided.

- The Mars payload of 27,000 litres is its maximum carrying capacity. Its average first drop payload has been 18,400 drop litres (as reported by CG staff), because of fuel and altitude restrictions.

- Fuel rates are quoted as s.21 when the actual reported rates Sproat Lake, July 23 wa s.21 (cost of AV. gas on average is s.21 more provincially than jet fuel).
- Actual average hourly and availability rates for current Alberta Seats contracts differ from your figures by s.21 and s.21 availability projected over 120 days is a difference of s.21 from the CG estimate.
- Another factor that we consider is our ability to sell surplus capacity. The Seats are in demand by jurisdictions other than B.C. We have found that the Mars is not marketable outside the province except in extreme circumstances such as the Slave Lake situation. The ability to sell surplus capacity can significantly help to offset our fixed costs and is an important factor in our business analysis.

Summary.

Gary, Coulson argues that the Mars should be fully tried and tested during 2013 (if fire hazard warrants) and should remain part of your program going forward.. Coulson asks that you look at the data provided and do some economic analysis. We believe that you will find that there is no other aircraft that can do what the Mars does and that there can be no cheaper aircraft for the Province when you consider, capability, water or gel delivery and one of a kind fire suppression action.

Ken, We appreciate the perspectives that CG brings to the discussion and the long history of Mars in the province. As professional fire fighters and civil servants we have an obligation to consider all approaches to wildfire management in BC with a close eye on effectiveness and cost containment. There is no reason we would exclude the Mars from active duty other than that we have a more effective approach. This year we have used the Mars in a number of situations across the province, and it has been helpful. Looking ahead, we have concluded that a turbine, amphibious, multi-aircraft air tanker group will be a cost effective and versatile addition to the province's air tanker fleet. We will continue to utilize the Mars on an as and when needed basis as long as it is serviceable and can fit into our configuration of air attack equipment.

We appreciate the relationship, professional approach and services provided by the Coulson Group. I encourage CG to consider the RFP for the Scooper group as a new business opportunity with the province. I assure you that the procurement process will be impartial and it will be managed with the assistance of the province's procurement section in the Ministry of Citizen Services.

Gary Townsend

Assistant Deputy Minister

Integrated Resource Operations Divison

Ministry of Forests, Lands and Natural Resource Operations

07/31/2013 11:30

2503659924

PATC CENTRAL DISPATCH Fax: 2505545833

Jul 31 2013 11:55am P001/001



Ministry of
Forests, Lands
and Natural
Resource
Operations



AIRCRAFT UNSERVICEABILITY REPORT

DATE (TODAY) 13 07 27	REPORTING BASE YCG	U/S AT BASE (IF DIFFERENT FROM REPORTING BASE) SPROUT LAKE			
AIRCRAFT TAIL NO / REG. 823	ALERT OF THE DAY (COMPLETE WITH HOURS) B10-20 (upgraded to Red at ~0900)	DATE UNSERV- ICEABLE 13 07 27	TIME UNSERV- ICEABLE 12:47	HOURS FLOWN TODAY 2.5	
COMPANY NAME OR AGENCY: Coulson		INCIDENT REPORT REQUIRED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> HAZARD REPORT REQUIRED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> ATTACHED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> DISCOVERED AT LAUNCH Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> RECOMMENDED FOR BILLING Yes <input type="checkbox"/> No <input type="checkbox"/> SPARE AIRCRAFT SUBSTITUTED Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
REASON UNSERVICEABLE: Engine #4 shut down from 'blown jug'					
FAX A.S.A.P. TO (250) 554-5833 IF ANTICIPATED U/S OVER 1 DAY		NAME: Derek Sommerville TITLE: AAO 63			
L SERVICE- ABLE 13 07 30	TIME SERVICE- ABLE 15:00	TARGETS MISSED (NT/MOER) 2	REPLACEMENT AC TAIL NO.		TIME ON LINE (TIME AIRCRAFT AVAILABLE FOR DISPATCH) 15:00
COMMENTS: Repairs done were engine replacement and carburetor fix.					
SUPERVISOR AAO 63					
NOTE: Fax to (250) 554-5833 when aircraft has returned to service or a substitute is in place					
AVIATION MANAGEMENT NOTES:					
AVIATION MANAGEMENT DUTY OFFICER					



MINISTRY OF FORESTS, LANDS AND NATURAL
RESOURCE OPERATIONS
AIRCRAFT OPERATIONS AGREEMENT

STANDING OFFER FOR:
MARTIN MARS AIR TANKER SERVICES

STANDING OFFER NO.: AO13WCC009
FILE: 1070-20/COUL 13 01

THIS AGREEMENT executed and dated for
Reference the 28th day of May 2012.

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE
PROVINCE OF BRITISH COLUMBIA:

Ministry of Forests, Lands and Natural Resource
Operations, Wildfire Management Branch
("Province") at the following address:

3080 Airport Drive
Kamloops, British Columbia
V2B 7X2

Telephone No: (250) 312-3010
Fax No: (250) 554-5468
Ministry Representative: Nina Barber
Email Address: nina.barber@gov.bc.ca

AND

Coulson Airplane Ltd.
d.b.a. Coulson Flying Tankers
("Offeror") at the following address:

9350 Bomber Base Road
Port Alberni, British Columbia
V9Y 8Z3

Telephone No: (250) 723-6225
Fax No: (250) 723-6200
Offeror Representative: Wayne Coulson
Email Address: wayne.coulson@coulsongroup.com

WHEREAS:

The Offeror offers to supply, as, if and when requested, the Services described in Appendix I, to the Province.

ACCORDINGLY, the parties agree as follows:

1. DEFINITIONS

1.01 In this Standing Offer, unless the context otherwise requires:

- a) "Air Tanker Request" means any form of the Province, issued during the Operating Period that references this Standing Offer and the Services as set out in Appendix I and is sent to the Offeror
- b) "Appendix I" means the Terms and Conditions with all Schedules attached thereto;
- c) "Contract" means the binding agreement the terms of which are set out in Appendix I entered into by the Offeror and the Province which enables the Province to acquire the Services set out in the Air Tanker Request for the Fees set out in Schedule E of Appendix I;
- d) "Designated Representative" means the Assistant Deputy Minister, Operations, Ministry of Forests, Lands and Natural Resource Operations, Wildfire Management Branch; and such other Ministry employees as the Assistant Deputy Minister, Operations or the Director, Wildfire Management Branch may authorize;
- e) "Minister" means the Minister of Forests and Range or his "Designated Representative";
- f) "Ministry" means the Ministry of Forests and Range, Province of British Columbia;
- g) "Operating Period" means a period within the Standing Offer Term during which the Services will be available to the Province under the Terms and Conditions of Appendix I.
- h) "Operating Period Request" means any form of the Province that references this Standing Offer and the Services as set out in Appendix I and is sent to the Offeror, giving notice of the dates of the Operating Period. The first Operating Period is as set out in section 2.03;
- i) "Services" means the air tanker services provided by the Offeror to the Province as described in Appendix I;
- j) "Standing Offer" means the Offeror's offer to supply the Services under the Terms and Conditions of Appendix I; and

k) "Standing Offer Term" means the Term as set out in section 2.

2. TERM AND EXPIRY

- 2.01 This Standing Offer will commence on June 1st, 2012 and expire on March 31, 2013 unless withdrawn in accordance with section 5. Subject to satisfactory performance by the Contractor and availability of funding by the Province, the Parties may agree in writing to extend this Agreement for a further Term of one year. Second year rates will be reviewed and adjusted by mutual agreement.
- 2.02 This Standing Offer Term may be extended on the mutual agreement of both parties.
- 2.03 The first Operating Period will be the 90 day period commencing on **June 1, 2012 and expiring on August 29, 2012.**
- 2.04 The Operating Period may be amended or an additional Operating Period determined on the mutual agreement of both parties.

3. THE STANDING OFFER

- 3.01 The Offeror understands and agrees that:
- a) a Contract is formed on receipt by the Offeror of the Operating Period Request which has been completed and signed by a Ministry Representative;
 - b) the Operating Period Request shall form a Contract only for those Services which have been requested provided always that such request is made in accordance with the provisions of this Standing Offer;
 - c) the issue and distribution this Standing Offer does not oblige the Province to authorize or order all or any of the Services, described in this Standing Offer;
 - d) the Province's liability shall be limited to that which arises from a Contract, made prior to the expiry date described in section 2;
 - e) the Province reserves the right to procure the specified Services by any other means it deems necessary including the use of other contracts, standing offers, or by other contracting methods;
 - f) the Province reserves the right to set aside this Standing Offer, for whatever reason, and not make it available for any Operating Period Requests ;
 - g) no change to this Standing Offer will be valid unless it is by way of an addendum signed by both the Offeror and the Province; and
 - h) the Terms and Conditions set out in Appendix I will apply to each Contract.
- 3.02 If the Province provides an Operating Period Request prior to the expiry of this Standing Offer and receives the Services, then the Province will pay to the Offeror amounts payable as described in Appendix I of this Standing Offer.

4. SERVICE REQUEST MECHANISM

- 4.01 During the Operating Period, Services may be ordered by methods other than an Air Tanker Request, such as telephone, facsimile or e-mail.
- 4.02 If there is any conflict between the Operating Period Request and this Standing Offer, the provisions specifically set out in this Standing Offer will prevail and all else will be as if not written.
- 4.03 The Offeror will use all commercially reasonable efforts to fulfill any and all Operating Period Requests, which may be made before the expiry of this Standing Offer or of the notice period under section 5.01.
- 4.04 If the Offeror is unable to fulfill any request for Services, the Offeror must immediately notify the Minister.

5. NOTIFICATION OF WITHDRAWAL

- 5.01 In the event that the Offeror wishes to withdraw this Standing Offer, the Offeror shall provide no less than ten (10) days written notice to the Minister and such withdrawal of Standing Offer shall not be effective until receipt of such notification by the Minister and the expiry of such notice period.

IN WITNESS WHEREOF the undersigned extends this Standing Offer on the first date written above:

(Signed by Offeror)

Print Name and Title

Date

(Signed for the Minister of Forests and Range)

Print Name and Title

Date

1. DEFINITIONS

1.01 In this Appendix, unless the context otherwise requires:

- a) "Aircraft" means any or all aircraft, described in Schedule A covered by this Agreement;
- b) "Air Tanker Alerts" means the daily alert status for the Province's air tanker resources as prepared by the Minister during the fire season;
- c) "Aviation Occurrence" means an aviation occurrence as defined and detailed in the Transport Canada Aeronautical Information Manual (TC AIM);
- d) "BC Forest Service Fire Bombing Procedures" means the British Columbia Fire Bombing Procedures, created and maintained by the Province, outlining the Province's training requirements and operational policies and procedures in relation to aerial fire fighting;
- e) "Built-up Area" means any forest or range land occupied by houses, trailers, mobile homes, outbuildings or other manmade structures that are being threatened by, or adjacent to, or within the boundaries of, a Wildfire;
- f) "Designated Base" means the Company's usual operational base for the Aircraft;
- g) "Designated Representative" means the Assistant Deputy Minister, Operations, Ministry of Forests, Lands and Natural Resource Operations; the Director, Wildfire Management Branch; and such other Ministry employees as the Assistant Deputy Minister, Operations or the Director, Forest Wildfire Management Branch may authorize;
- h) "Day" means each calendar day during the Operating Period when Services, Personnel and Equipment are provided;
- i) "Equipment" means the Company's fire fighting Aircraft and the Specialty Equipment required in providing the Services and as described in Schedule A, and any other such equipment approved by the Minister for use in providing the Services;
- j) "Improvements" means any vehicle, equipment or other manmade structure that is occupying forest or range lands being threatened by, adjacent to, or within the boundaries of, a Wildfire;
- k) "Maintenance Manuals" means the Company's Transport Canada approved Maintenance Control and Maintenance Procedures Manuals detailing the aircraft operated by the air carrier, the maintenance criteria, procedures and schedules for each aircraft and the personnel responsible for maintenance, inspection and quality control;
- l) "Minister" means the Minister of Forests, Lands and Natural Resource Operations or his Designated Representative;
- m) "Ministry" means the Ministry of Forests, Lands and Natural Resource Operations, Province of British Columbia;
- n) "Operations Manual" means the Company's Transport Canada approved document detailing the Company's operating procedures and includes any amendments to the same as required by law;
- o) "Operating Period" means a period within the Standing Offer Term during which the Services will be available to the Province under the Terms and Conditions of Appendix 1 and as requested by the Province to the Company;
- p) "Services" means the aircraft services as described in Schedule B;
- q) "Specialty Equipment" means the Company's specialty equipment required in providing the Services and as described in Schedule A, and any other such equipment approved by the Minister for use in providing the Services;
- r) "Warm-Up" means the warming up of aircraft engines as described in Schedule C.
- s) "Wildfire" means an unplanned fire occurring on forest or range lands, burning forest vegetation, grass, brush, scrub, peatlands, or a prescribed fire set under a Burn Registration which, in the judgment of a Forest Officer threatens to spread beyond the area authorized for that burning; and
- t) "Year" means, in respect of the term of this Agreement, the period from April 1 of one year to March 31 of the following year.

2. APPOINTMENT, TERM AND SERVICES

- 2.01 The Province shall request the Services with an electronic Air Tanker Request, facsimile or e-mail confirmation to the Company.
- 2.02 The Company will provide the Services as requested in accordance with this Agreement.
- 2.03 The Company will provide the Services during the Operating Period regardless of the date of execution or delivery of this Agreement.
- 2.04 More than one Operating Period can exist prior to the expiration or withdrawal of the Standing Offer.

3. FEES AND EXPENSES

- 3.01 In consideration of the Company providing the Services, the Province will pay to the Company Fees and Expenses in the amounts and in the manner set out in this Agreement.
- 3.02 The sums described in section 3.01 constitute the maximum amounts payable to the Company for its performance of the Services and the Company will not be entitled to any additional compensation for its performance whether or not the work actually undertaken by the Company is described in the Agreement.

3.03 Notwithstanding any other provision of the Agreement, the payment of money by the Province to the Company under this Agreement is subject to:

- a) there being sufficient monies available in an appropriation, as defined in the *Financial Administration Act*, to enable the Province, in a fiscal year or part thereof when any payment of money by the Province to the Company falls due under this Agreement to make that payment; and
- b) Treasury Board, as defined in the *Financial Administration Act*, not having controlled or limited, under the *Financial Administration Act*, expenditure under any appropriation referred to in subsection (a).

3.04 The Province certifies that the property and/or Services ordered and purchased under this Agreement are for the use of, and are being purchased by, the Province with Crown funds and are therefore not subject to the Goods and Services Tax. Effective July 1, 2010, the Federal Goods and Services Tax (GST) along with B.C.'s Provincial Sales Tax (PST) is replaced with the federally administered Harmonized Sales Tax (HST). The HST has a combined tax rate of 12 percent; 5% GST and a 7% B.C. Component. The HST has the same rules as the GST, therefore if GST is applied prior to July 1st, then HST applies after July 1, 2010.

4. COVENANTS OF THE COMPANY

4.01 The Company will:

- a) observe, perform and comply with all of its obligations under this Agreement;
- b) remain an independent contractor and not the servant, employee, partner, or agent of the Province or the Minister;
- c) not, in any manner whatsoever, commit or propose to commit the Province or the Minister to the payment of any money to any person, except as contemplated by this Agreement;
- d) secure and maintain in good standing all necessary approvals and certificates for the Aircraft and Specialty Equipment described in this Agreement;
- e) equip, operate and maintain the Aircraft in accordance with all requirements of Canadian and British Columbia laws and regulations;
- f) comply with all the standards, practices, procedures and specification set out in the Company's Transport Canada approved Operations Manual; and those set out in the Company's Transport Canada approved Maintenance Manuals in conducting all Aircraft maintenance;
- g) service, repair, overhaul, test, and maintain the Aircraft in a safe and airworthy state of repair at all times in accordance with manufacturer's recommended maintenance programs and the

Company's Maintenance Manuals, to the satisfaction of the Minister;

- h) perform the Services and its obligations under this Agreement in a safe and professional manner to the reasonable satisfaction of the Minister;
- i) except with the explicit approval of the Minister, ensure that all Aircraft maintenance is performed by a fully qualified and licensed Aircraft Maintenance Engineer ("AME") who is not the Aircraft pilot;
- j) allow no pilot to fly the Aircraft and provide the Services pursuant to this Agreement, without prior approval of the Minister;
- k) provide and maintain at all times, sufficient qualified staff, facilities, materials, appropriate Specialty Equipment and approved subcontractual arrangements to fully perform the Services and its obligations under this Agreement to the reasonable satisfaction of the Minister;
- l) provide all refueling and foam or gel retardant equipment when the Aircraft is away from its Designated Base;
- m) be responsible for all charges, costs and expenses including but not limited to, Aircraft fuel, costs of lubricants, airport costs, and Aircraft parking fees, necessary for the efficient operations of the Aircraft and Specialty Equipment required for the performance of the Services under this Agreement, unless specified otherwise in this Agreement;
- n) obtain and maintain in force during the Operating Period insurance as described in Schedule D;
- o) in addition to the items contained in this Agreement, provide all living expenses and services to the Company's employees and permitted subcontractors throughout the province, together with all other expenses connected with the Company's operations; and
- p) reasonably cooperate with the Province and any other persons providing services to the Province.

5. COVENANTS OF THE PROVINCE

5.01 The Province will, at its own expense, provide the following:

- a) extraordinary charges for navigation and/or aerodrome fees (where applicable), that are necessary for the Company to perform the Services, except as otherwise provided;
- b) a bird dog aircraft as deemed appropriate to support an Air Tanker Request;
- c) at the Province's discretion, a bird dog aircraft to support the Company's training and practice exercises.

6. INDEMNITY

- 6.01 The Company will indemnify and save harmless the Province and the Minister from and against all claims, demands, losses, damages, costs and expenses made against or incurred, suffered or sustained by the Province and the Minister or either of them at any time or times (whether before or after termination of this Agreement) where the same or any of them are based upon or arise out of anything done or omitted to be done by the Company or by any employee, officer, subcontractor, or agent of the Company pursuant to this Agreement, excepting as always liability arising out of the independent negligent acts of the Province or the Minister.
- 6.02 Notwithstanding section 6.01, the Province will indemnify and save harmless the Company, its permitted subcontractors and their respective agents, servants and employees from and against any and all liability or bodily injury or damage to Improvements directly or indirectly caused by, arising from or resulting from the dropping of fire retardants, water, foam and other fire control chemicals from a Martin Mars Air Tanker by the Company or any of its permitted subcontractors, their respective agents, servants or employees under this Agreement in the vicinity of Improvements or Built-up Areas where such actions are:
- carried out at the direction of the Minister;
 - are, in the opinion of the Minister, considered to be essential to the control of Wildfires; and
 - not negligently performed by the Company.
- 6.03 The Company will cooperate with the Province and its counsel in any and all investigations, settlements and judicial determination of any claims made against the Province, the Minister or the Company relating directly or indirectly to this Agreement and will use its best effort to cause its employees, officers, subcontractors and agents to be similarly bound.

7. ASSIGNMENT AND SUBCONTRACTING

- 7.01 The Company will not assign this Agreement, nor subcontract any of its obligations under this Agreement, to any person, firm, or corporation without the prior written consent of the Province.
- 7.02 The Company will at all times be held fully responsible to the Province for the acts and omissions of its subcontractors and persons employed by them and no subcontract entered into by the Company will impose any obligation or liability upon the Province to any such subcontractor or any of its employees.
- 7.03 The Company will cause every assignee or subcontractor to be bound by the terms of this Agreement so far as they apply to the work to be performed by each subcontractor.

- 7.04 Nothing in this Agreement will create any contractual relationship between the Province and the subcontractor of the Company.

8. TERMINATION

- 8.01 The Province may, in addition to any remedy available to it at law or equity, terminate this Agreement by written notice to the Company if the Company fails to observe, perform or comply with any provisions of this Agreement.

9. NOTICES

- 9.01 Any notice, document, statement, report or demand desired or required to be given or made under this Agreement will be in writing and may be given or made by personal delivery to the party to whom it is to be given or made, or by mailing it in Canada with postage prepaid to the applicable address, or by transmitting it by facsimile to the applicable facsimile transmission number, noted for both the Province and the Company at the start of this Agreement.
- 9.02 The Company will provide to the Province, as soon as possible and by the quickest means possible the particulars and details of any Aviation Occurrence that occurs while providing the Services.
- 9.03 The Province may request the Company prepares a detailed report of the Aviation Occurrence referred to in section 9.02.

10. MISCELLANEOUS

- 10.01 This Agreement will ensure to the benefit and be binding upon the Province and its assigns and the Company and its successors and permitted agents.
- 10.02 This Agreement will be governed by, construed and interpreted in accordance with the laws of the Province of British Columbia.
- 10.03 All disputes arising out of or in connection with this Agreement will be referred and finally resolved by arbitration administered by the British Columbia International Commercial Arbitration Center pursuant to the "Rules of Procedures". The place of arbitration will be Victoria BC.
- 10.04 Each party will, upon reasonable request of the other parties, fully cooperate to the betterment of the Services provided under this Agreement.
- 10.05 This Agreement may only be amended by further written amendments executed by or behalf of the parties.
- 10.06 All the discretion and obligations of the Minister or the Province under this Agreement may be exercised or performed by the Minister, the Deputy Minister of Forests and Range or by a Designated Representative.
- 10.07 Each Schedule A to E attached to this Agreement is an integral part of this Agreement as if set out in length in the body of this Agreement.

SCHEDULE A AIRCRAFT, PERSONNEL AND SPECIALTY EQUIPMENT

During the Operating Period, the Company shall provide Aircraft, Personnel and Specialty Equipment according to the following specifications.

1. AIRCRAFT

- 1.01 The Company will supply one Martin Mars Air Tankers, suitable for aerial attack of wildfires as follows:
C-FLYL tail #823
- 1.02 The Aircraft will be located at the Company's Sproat Lake (BC) Base unless otherwise agreed by both parties.

2. PERSONNEL

- 2.01 The Martin Mars Air Tanker Air Crew will meet the following specifications:
 - a) Airline Transport License;
 - b) Transport Canada requirements;
 - c) Meet the Company's Operating certification requirement;
 - d) two years experience flying in fire bombing operations; and
 - e) personal flying history shall be made available upon the request of the Minister.
- 2.02 Maintenance Personnel
 - a) trained in accordance with the Company Maintenance Manuals; and
 - b) Aircraft Maintenance Engineers licensed in accordance with current Transport Canada requirements.

3. SPECIALTY EQUIPMENT

- 3.01 The Martin Mars Air Tanker will be equipped to meet the following communication requirements:
 - a) equipped with standard aircraft transmit and receive VHF - AM radio equipment with a minimum frequency range of 118 to 135.95 megahertz;
 - b) transmit and receive FM multi channel programmable radio equipment with a frequency range of 150 to 174 megahertz and capable of operation with continuous tone coded squelch system (CTCSS). The radio equipment must be capable of storing 50 or more channels and have operator accessibility to all CTCSS tones. The Equipment must be compatible with Industry Canada's Radio Spectrum Realignment (narrow banding) requirement;
 - c) The FM radio will have a separate guard channel;
 - d) a Global Positioning System (GPS) having a minimum of 4 channels, capable of storing up to 100 user inputted way points and having

NMEA.0183 standard output with RS232 or USB serial port and ASCII format.

- 3.02 The Aircraft will be equipped with a satellite communication system (SATCOM) which incorporates the Iridium System.
- 3.03 The Aircraft will be equipped with an Automated Flight Following (AFF) tracking system providing voice communications and data management/transfer that meets the Canadian and United States requirements.
- 3.04 The Ministry's AFF specifications are set out at www.bcwildfire.ca/FightingWildfire/Aviation/AFF.
- 3.05 The Aircraft will be equipped with all safety and survival equipment and supplies as required by federal and provincial laws and regulations.

SCHEDULE B SERVICES

1. SERVICES

- 1.01 During the Operating Period, the Company will:
 - a) provide Aircraft flight and fire bombing services;
 - b) provide all fueling and foam or gel retardant loading services necessary for the performance of the Services;
 - c) position the Aircraft at the times and locations specified by the Minister;
 - d) maintain an air readiness level as specified by the Minister;
 - e) use its best efforts to ensure that the Aircraft and flight operations Personnel adhere to the Ministry's operational procedures and instructions;
 - f) cause appropriate personnel of the Company to attend pre-and de-briefing exercises;
 - g) cause appropriate personnel of the Company to attend an end of Operating Period de-brief session;
 - h) undertake work utilizing the Martin Mars Air Tankers and appropriate personnel for third parties as directed by the Minister;
 - i) ensure that all flight operations Personnel are attired in standard apparel for either flight or maintenance as the case may be;
 - j) work co-operatively with the Province in joint training sessions; and
 - k) provide the Services in accordance with the British Columbia Forest Service Fire Bombing Procedures.

- 1.02 During the Operating Period, the Company will have in place the necessary support equipment to quickly respond should the Minister request the Aircraft be Positioned to a location other than the Company's Designated Base. This support equipment will include:
- one (1) fuel truck;
 - one (1) tractor trailer;
 - one (1) service trailer;
 - one (1) van; and
 - one (1) boat.
- 1.03 During the Operating Period or any extensions, the Company will advise the Minister of any possible opportunities or requirements for the Company's own use of the Aircraft.

SCHEDULE C FEE SCHEDULE

1. FEE SCHEDULE

- 1.01 In this Schedule, unless the context requires otherwise:
- "Fees" are as set out in Schedule E. All charges are in Canadian dollars;
 - "Flight Time" for the Martin Mars Air Tanker means the time, measured in minutes and reported in tenths of an hour as calculated and detailed in the Transport Canada Aeronautical Information Manual (TC AIM), from the aircraft leaving the buoy for the purpose of initial takeoff to the time when the aircraft comes to a complete stop at the buoy;
 - "Flying Rate" means the hourly charges for Flight Time as set out in Schedule E;
 - "Positioning" means a change in the location of the Aircraft, Personnel and Equipment at the request of the Minister;
 - "Positioning Fee" means the fee set out in Schedule E for Positioning the Aircraft;
 - "Proper Account" means a written statement of account, on Company letterhead, in a form satisfactory to the Minister, to the address set out in this Agreement or as directed by the Ministry, showing the calculation of the amounts claimed for the period, including:
 - flight slip or invoice reference number;
 - flight date;
 - pilot name;
 - Aircraft registration and type;
 - Agreement number;
 - Branch or Fire Center;
 - legs of flight, including:
 - from/to
 - up/down times
 - hours flown
 - Ministry Use Code
 - Fire or Project Number

- volume of foam or gel retardant;
 - number of drops and volumes
 - fuel and oil costs as permitted under Schedule E;
 - other applicable costs and expenses;
 - "goods and services received" signature;
 - total flight cost.
- "Release Rate" means that rate set out in Schedule E to credit the Ministry for each day the Aircraft is released by the Province to the company.
 - "Warm-Up Fee" means the flat rate charge for a Warm-Up on Days the Ministry's established alert and required response time is one half hour or less, as set out in Schedule E. These include yellow and red days but not blue and green.

- 1.02 The Province will pay the Company the following charges, as set out in Schedule E, with respect to the Services provided:
- Flight Time Charges;
 - Warm-Up Charges;
 - Daily Availability Charges;
 - Fuel Costs;
 - Foam and gel retardant costs;
 - Positioning and Expenses; and
 - Other Costs.
- 1.03 The Province will pay those fees described in section 1.02 within sixty (60) days following receipt by the Province of a Proper Account.
- 1.04 The Company will submit Proper Accounts in no less than weekly intervals.

SCHEDULE D INSURANCE

1. INSURANCE REQUIREMENTS

- 1.01 In addition to such policies as are required by Canadian laws and regulations, the Company shall, at its sole cost and expense and during the Agreement Term provide and maintain for the benefit of the Minister, his servants, agents and employees the following insurance:
- Aircraft Liability in respect of third part bodily injury and/or property damage, including passenger liability, with limits not less than ten million dollars (\$10,000,000) combined single limit, each occurrence;
 - Aviation General Liability insurance, including Premises & Operations and Products & Completed Operations liability, with limits not less than ten million dollars (\$10,000,000) combined

single limit, each occurrence and in the annual aggregate with respect to Products & Completed Operations;

- c) The insurance outlined under a) and b) above, shall include the following endorsements and/or provisions:
- i. blanket contractual liability;
 - ii. non-owned automobile insurance;
 - iii. contingent employer liability;
 - iv. personal injury liability;
 - v. employees as additional insureds; and
 - vi. a cross liability clause;
 - vii. Her Majesty the Queen in the right of the Province of British Columbia as represented by the Minister of Forests, Lands and Natural Resource Operations and any of its employees, servants or agents are to be added as an "Additional Insured"; and
 - viii. Any additional insurance which is required by law or which the Company considers necessary to cover risks not otherwise covered by insurance specified in this section.

- 1.02 All insurance will be in a form, and content and placed with an insurer or insurers duly licensed to carry on insurance business in British Columbia acceptable to the Minister.
- 1.03 The Company shall, not later than the commencement of the Agreement Term, provide to the Province a Certificate of Insurance confirming all policies and necessary endorsements to comply with the insurance requirements outlined herein.
- 1.04 The Company will ensure that the insurance may not be cancelled or materially changed in any way whatsoever without the insurers providing 30 days prior notice to the Minister.
- 1.05 The insurance will be primary and not require the sharing of any loss by any insurer of the Province.
- 1.06 The Company waives all rights of recourse against the Province with regard to damage to the Company's property.
- 1.07 The Company shall, at its own expense, obtain WorkSafe BC coverage for itself, its subcontractors, all workers and any shareholders, directors, partners or other individuals employed or engaged in the performance of the Services. The Company must comply with all conditions of the *Workers Compensation Act* and regulations

thereunder, and upon request, must provide the Province with proof of such compliance.

SCHEDULE E FEES

1. FLIGHT TIME CHARGES

- 1.01 Flight Time for the Martin Mars Air Tanker at a Flying Rate of:
- a) s.21, s.17 exclusive of fuel will be applicable for all hours of Flight Time flown to provide the Services up to a maximum of **45 hours**;
 - b) s.21, s.17 s.17, s.21 exclusive of fuel for all hours flown **exceeding 45 hours**;
 - c) Any Flight Time hours flown in a practice or training session if such sessions are at the specific written request of the Minister.

2. AVAILABILITY CHARGES

- 2.01 **Daily Availability Charges**
Daily availability charges of s.17, s.21 s.17, s.21 per day will apply for any days as calculated during the 90 day operating period. This payment will be billed by the company in three equal payments of s.17, s.21 s.17, s.21 on June 15th, July 15th and August 15th.

3. ALERT STATUS

- 3.01 The Province will advise the Company of the next Day's alert status by fax between 1300 hours and 1600 hours of the previous day.

4. FUEL COSTS

- 4.01 **Fuel Rate at Sproat Lake BC**
The cost incurred at the Company's Base of Sproat Lake BC and paid by the Company for aviation fuel used by the Company to fulfill its obligation under this Agreement will be based on rack rate Port Alberni, plus an into plane fee of 15 cents per litre. The rack rate Port Alberni should include you actual fuel costs for the particular load plus transport costs reflected as a per litre cost (this to must be auditable with back up records). If no metering system is available to provide a fuel slip, information noted on the flight slip should include, litres pumped, date of purchase, and location. The into plane fee and fuel will be noted separately per mission on each flight slip. Fuel pricing information for Port Alberni will be provided at the beginning of each month for the cost of Avgas. This information can be faxed to (250) 554-5468 or emailed to FORPCCP.AIRPWCC@gov.bc.ca.

When deployed away from Port Alberni no into plane fee will apply. Pricing information may be different at other locations, if pricing information is different, a price notification change will be submitted as above.

- 4.02 Fuel Rate Away From the Company's Base
Fuel purchases other than listed in this Schedule will be reimbursed at the actual cost incurred, supported by receipts and paid by the Company.
- 4.03 The Company will retain all supporting documentation to support the charges for the aviation fuel costs as set out in section 4.01 and participate in a post season review with the Province to reconcile actual usage and costs. The results may include a one-time payment by the Minister to the Company or a reimbursement from the Company to the Province for each year of this Agreement.

5 FOAM AND GEL RETARDANT COSTS

- 5.01 The Province will reimburse the Company for all foam and/or gel used to provide the Services under this Standing Offer.
- 5.02 The volumes must be noted on the daily flight slips or invoice and will be paid at the actual cost from the supplier(s) plus a handling fee of **s.17, s.21** on each mixed litre dropped at a 1% basis.

6 WARM-UP FEE

- 6.01 The Province will reimburse the Company for all warm-ups required as per Schedule C 1.01 h) of this Standing Offer.
- 6.02 The warm-up must be noted on the daily flight slips and will be paid at the rate of **s.17, s.21** per warm-up, inclusive of fuel.

7. POSITIONING AND EXPENSES

- 7.01 Should the Minister request the Aircraft, Flight Crew, support equipment and personnel be Positioned away from the Company's Sproat Lake Base or from one base designated by the Minister to another base designated by the Minister the following rates are payable by the Minister:
- a) A Daily Rate will be applicable for each Day Positioning or Positioned away from the Company's Sproat Lake Base as follows:
- i. A **Daily Positioning Rate** shall be payable by the Minister at **s.17, s.21**

s.17, s.21

s.17, s.21 per Day for the first and last Day of positioning away from the Company's Base; and

- ii. a **Daily Rate while Positioned** away from the Company's Base shall be payable by the Minister at **s.17, s.21** per Day based on Schedule E-7, daily minimum requirement.

- 7.02 Should the Ministry supply any accommodations and/or meals the Daily Rates set out in this section will be reduced as follows: accommodations **s.17, s.21** each and meals **s.17, s.21** for each meal).
- 7.03 Vehicle mileage allowance of **s.17, s.21** per kilometer during mobilization and demobilization when required to be away from the Company's Base for one (1) Fuel Truck, two (2) Service Vehicles.
- 7.04 Other necessary out of pocket travel expenses approved by the Ministry when the Flight and Support Crew are away from the Designated Base will be reimbursed at the actual cost incurred and supported by receipts. This may include but is not limited to additional rental vehicles or air travel.

8 OTHER

- 8.01 The Province will reimburse the Company:
- a) the actual amount paid by the Company for navigation and/or aerodrome fees required in the performance of the Services;
- b) with the prior written approval of the Province, the actual amount paid by the Company for other costs as may be necessary to provide the Services away from the Company's Designated Base.

9. RELEASE RATES

- 9.01 The rate for the Company's use of the Aircraft when released from the Company's Service Requirements by the Ministry will be at the Release Rate for each and every day the aircraft is released. The Release Rate is as agreed by the parties.

10. PENALTIES

- 10.01 For each and every hour the Aircraft, Specialty Equipment, Personnel and Services are not available for Services as required by the Minister, the Minister may assess damages in the amount of one tenth of the Daily Availability (defined in Schedule E Fees, Section 2 – Availability Charges).

Coulson Flying Tankers 2012 Positioning and Expenses (Schedule E-7)

Daily Rate Breakdown

The following shall be considered the minimum required daily accompaniment of manpower and equipment to support Coulson Flying Tankers. The rates shall be reduced accordingly for each item not used or unserviceable on the fireline. Any additional expenses required (ie expense travel or additional rental vehicles) must be pre-approved by the Ministry.

Quantity	Description	Daily Off Site Rate	Total	Comments
1	Fuel Truck			Driver included
1	Tractor Trailer			Driver included
1	Crane truck			Driver included
1	bus			Driver Included
1	Kodiak Truck			Driver Included
1	Van			Driver included
1	Rental Vehicle			On-site rentals for ground transport
1	Fuel (van, rental vehicle, Kodiak)			
2	Boats			
6	Support Employees			Wages (exclusive of drivers above)
12	Living Out – Accommodation	s.17, s.21		
12	Living Out - Meals			
7	Ferry Individuals			
1	Ferry for Fuel Truck			
1	Ferry for Tractor Trailer			
1	Ferry – Crane Truck & Trailer			
1	Ferry – Bus			
1	Ferry – Kodiak & Trailer			
1	Ferry – Van and Trailer			

COULSON AIRCRANE LTD - CONTRACT AIRCRAFT - UNSERVICEABLE DAYS - 2013

AIRCRAFT	DATE	TIME	TARGETS	ALERTS	DATE	TIME	ALERTS	REASON	REASON	U/S	total alert	total	DAYS
	U/S	U/S	MISSED	START - STOP	ONLINE	ONLINE	START - STOP	OFFLINE	UNSERVICEABLE	HRS:MINS	time u/s	alert Hrs	U/S
MARTIN MARS AIR TANKER					/DAY		Contract No: AO13WCC009						
T823	2013-07-27	12:47	2	10:00-20:00	2013-07-30	15:00	10:00-20:00	unserviceable	Blown Jug- Engine replacement and carburator fix	32:13	32.2	s.17, s.21	\$
Totals											32.2	s.17, s.21	
SUB-TOTAL Daily Availability Credit on unserviceable :													\$
GRAND TOTAL Daily Availability Credit Due on Contract No: AO13WCC009													\$



Ministry of
Forests, Lands and
Natural Resource Operations

Contract Modification
Agreement No. 1

MINISTRY CONTRACT/FILE NO.: 1070-20/COU 13 01

PROJECT NAME: AO13WCC009

THIS MODIFICATION AGREEMENT dated for reference 18th day of April 2013.

BETWEEN

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA, represented by the MINISTER OF FORESTS,
LANDS AND NATURAL RESOURCE OPERATIONS

Wildfire Management Branch
Provincial Wildfire Coordination Centre

(the "Province", "we", "us", or "our" as applicable) at the following address:
3080 Airport Drive, Kamloops, B.C. V2B 7X2

Telephone: (250) 312-3010 Fax: (250) 554-5468 E-mail Address: nina.barber@gov.bc.ca
Ministry Representative: Nina Barber

Alternate (if applicable): Michael Benson

AND

Coulson Aircrane Ltd.
dba Coulson Flying Tankers

(the "Contractor", "you", or "your" as applicable) at the following address:

9350 Bomber Base Road
Port Alberni, British Columbia
V9Y 8Z3

Telephone: (250) 723-6225 Fax: (250) 723-6200 E-mail Address: Wayne.coulson@coulsongroup.com

Contractor Representative: Wayne Coulson
Business Number: 0297018
WorkSafe BC No: 363134 and/or POP No. AQ

A. The Parties entered into an Agreement dated for reference May 28th, 2012, (hereinafter called the "Agreement"),

B. The Parties agree to amend the Agreement as follows:

2. TERM AND EXPIRY

2.01 This Standing Offer will commence on June 1st, 2013 and expire on March 31, 2014 unless withdrawn in accordance with section 5.

2.03 The Operating Period will be the 90 day period commencing on **June 3, 2013 and expiring on August 31, 2013**

**SCHEDULE E
FEES**

1. FLIGHT TIME CHARGES

- 1.01 a) s.17, s.21 exclusive of fuel will be applicable for all hours of
Flight Time flow to provide Services up to a maximum of 45 hours
- b) s.17, s.21 exclusive of fuel for all hours flown
exceeding 45 hours

2. AVAILABILITY CHARGES

- 2.01 Daily availability charges of s.17, s.21 per day will apply for any days as calculated during the 90 day operating period. This payment will be billed by the company in three equal payments of s.17, s.21 on June 15th, July 15th and August 15th.

6. WARM-UP FEE

- 6.02 The warm-up must be noted on the daily flight slips and will be paid at the rate of s.17, s.21 per warm-up inclusive of fuel. s.17, s.21

7. POSITIONING AND EXPENSES

- 7.01 i) A Daily Rate shall be payable by the Minister at s.17, s.21 per Day for the first and last Day of positioning away from the Company's Base; and
- ii) A Daily Rate while Positioned away from the Company's Base shall be payable by the Minister at s.17, s.21 per Day based on Schedule E-7, daily minimum requirement. s.17, s.21

Coulson Flying Tankers 2013 Positioning and Expenses (Schedule E-7)

Daily Rate Breakdown

The following shall be considered the minimum required daily accompaniment of manpower and equipment to support Coulson Flying Tankers. The rates shall be reduced accordingly for each item not used or unserviceable on the fireline. Any additional expenses required (ie expense travel or additional rental vehicles) must be pre-approved by the Ministry.

Quantity	Description	Daily Off Site Rate	Total	Comments
1	Fuel Truck			Driver included
1	Tractor Trailer			Driver included
1	Crane truck			Driver included
1	bus			Driver Included
1	Kodiak Truck			Driver Included
1	Van			Driver included
1	Rental Vehicle			On-site rentals for ground transport
1	Fuel (van, rental vehicle, Kodiak)			
2	Boats			
6	Support Employees	s.17, s.21		Wages (exclusive of drivers above)
12	Living Out – Accommodation			
12	Living Out - Meals			
7	Ferry Individuals			
1	Ferry for Fuel Truck			
1	Ferry for Tractor Trailer			
1	Ferry – Crane Truck & Trailer			
1	Ferry – Bus			
1	Ferry – Kodiak & Trailer			
1	Ferry – Van and Trailer			

-
- C. In all other respects, the Agreement is confirmed.
- D. Time is of the essence in this Modification Agreement.

The Parties duly execute this Modification Agreement as follows:

SIGNED AND DELIVERED on behalf of the Province by an authorized representative of the Province

(Signature of authorized Ministry Expense Authority)

Nina Barber

(PRINTED NAME of authorized representative)

Dated this _____ day of _____ 20__

SIGNED AND DELIVERED by or on behalf of the Contractor (or by an authorized signatory of the Contractor if a corporation)

(Signature of Contractor or Authorized Signatory)

Wayne Coulson

(PRINTED NAME of Contractor or authorized signatory)

Dated this _____ day of _____ 20__



Scooper Evaluation Report - 1998 Fire Season



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Report prepared by: Bruce Noble – Superintendent Operations, PATC
Gord Bell – Superintendent Flight Ops, Aviation Management
Tom Gayowski – Sr. Air Attack Officer, Williams Lake

Date: April 13, 1999

Executive Summary

The busy nature of the 1998 Fire season and deployments of the Martin Mars aircraft and CL 415's in the interior of the province presented the Provincial Airtanker Program with an opportunity to operationally assess water scooping aircraft and the litres per hour concept. These deployments provided statistical material and an opportunity to operationally assess these aircraft and their respective roles in support of fire control efforts in British Columbia's interior.

The key deliverables of the mission statement of the Provincial Airtanker Program, Safety, Efficiency, Effectiveness, and Support form the basis of our analysis.

Martin Mars conducted support action on 3 fires in the Kamloops Fire Center in 1998. A total of 121.1 hours were flown at a cost of s.21 A total of 7,041,324 liters of water and foam were delivered at a cost of s.21 This resulted in a cost per liter delivered of 22 cents.

In addition to the Kamloops Fire Center, the Martin Mars actioned 1 fire in the Northwest Fire Center and 5 fires in the Coastal Fire Center. These actions involved 39.6 hours at a cost of \$486,580.00. At the time of this writing, volumes of water and foam delivered on these fires were not available.

Government of Quebec CL415's (2) were acquired in late July under the Mutual Aid Resources Sharing (MARS) agreement. During their term in British Columbia, they actioned 12 fires in the Kamloops Fire Center and 2 fires in the Southeast Fire Center. They flew a total of 207.4 hours (including ferry to and from Quebec) at a cost of s.21 and delivered a total of 5,945,100 liters of water and foam at a cost of s.21 This resulted in a cost per liter delivered of s.21

This report contains numerous recommendations aimed at insuring the next deployment of water scooping aircraft in British Columbia meet the standards set out in our mission statement. ***"The Safe, Effective, and Efficient Fixed Wing Delivery of Fire Retardants and Suppressants in support of fire control."***

Recommendations Regarding the Use of Water Bomber A/C in BC

- Commencing in 1999, the decision to procure 'water bombing/scooper' aircraft will be based on the criteria and priority as established by this review.
- Fire support activities which involve the repositioning of the Mars outside the Island/Coastal environment, must be supervised by a certified BCFS Fixed Wing Air Attack Officer.
- In order to enhance the safety, efficiency and effectiveness of the Martin Mars operation, FIFT pilots must become conversant with BCFS fire bombing procedures and birdogging techniques. This can be achieved by their completion of Level 1 and Level 2 Air Attack Officer and Crew Resource Management training sessions.
- FIFT birdog communications package to be 'upgraded/converted' to ensure full compatibility with BCFS requirements/systems.
- FIFT to recalibrate the Mars foam injection systems to ensure consistent mixtures are achievable.
- FIFT accounting procedures and flight reports must be amended to provide mission details as follows:
 - ✓ Hours flown by date and individual target - must have: a fire number; 'roll' and 'stop' times for all missions and; include hourly fuel and oil charges.
 - ✓ Number of loads and volume of water/foam delivered - must be identified by fire number.
 - ✓ All flight slips must be signed off by an appropriate receiving authority i.e., Air Attack Officer, Fire Boss or Air Operations Boss.
 - ✓ Other costs such as fire foam, mooring charges, accommodations, meals, vehicles etc. must be clearly identified and tied to a specific fire or designated project number. When working under the direction of PATC, these costs must be reported to the Airtanker Centre on a daily basis.
 - ✓ If operations have not been supervised by an Air Attack Officer, a target summary sheet(s) for each fire worked must be attached to the invoice.
- It is suggested that future deployments of the Martin Mars should have a designated Forest Service representative assigned to the base to oversee, provide 'goods/services' verification and to ensure that Ministry policy and procedures are complied with. This on site presence/liaison is even more so critical in consideration

of the significant environmental liability both the Ministry and contractor could face should fire foam, fuel or oil be spilled at the mooring site or shoreline of the water body.

- In preparation for the 1999 season, CIFFC to be briefed regarding BCFS preferences for Canadair aircraft types and group configurations as identified in this review.
- Re: Fire Science perspective - there is a need to quantify the effectiveness of water bombing operations under fire intensity ranks of 4 +/-extreme burning conditions (very high air temperatures and very low relative humidity levels) as experienced in the interior areas of the province.
- With regard to Quebec crew rotations, while we should be minimizing the amount of times crews are being rotated in and out of B.C., this may not be possible due to agency and union policy. In any case we should ensure that two or more crews are not rotated at the same time, to avoid having the majority of the group brand new all at once. This did not happen in 1998.
- Considering the probability that several crew changes may occur with scooper crews, it is essential that all pre-operational briefings take place with the same degree of detail and effort; (i.e. not fast-tracked because of fire requirements).
- It should be made clear in all briefings and debriefings that unless there is a safety issue, all birddog instructions are to be complied with. Any deviation from the planned pattern or changes or disagreement with instructions must be discussed with the B/D crew.
- In addition to fire and terrain factors, circuit patterns and scooper separation should be determined also by the level of experience and performance of the scooper crews. It may be advantageous to have the tankers separated by 15 to 20 seconds to allow a less experienced crew to follow the more experienced crew.

Criteria for the Procurement and Deployment of Water Bomber A/C in BC

- Burning conditions are such that land based air tanker resources are being taxed by extended/multi-group actions. More than one 'spare' group of air tankers have been brought on line to maintain effective initial attack capability.
- Potential for increase in demand due to:
 - ◆ Forecast lightning.
 - ◆ Support requests for existing expanded attack fires or potential for new expanded attack fires.
 - ◆ Continuing severe burning conditions and/or the forecast breakdown of current weather systems.
- Proximity of existing fires and potential for new fire starts in/near interface zones or other high value areas. Suitable water sources are adjacent to or within 20 nautical miles of these zones/areas.
- Resources are required for a period greater than or equal to 72 hours.
- As was done in 1998 resource requests are to be made proactively. Air Tanker Centre Command Group will continue to identify the need 'early' to allow for repositioning of water bombers and briefing of air crews.

Priority for the Procurement and Deployment of Water Bomber A/C in BC

Priority for Island and Coastal Environment:

- 1/ **FIFT - Martin Mars**
- 2/ **CIFFC - Canadair Aircraft**

Interior BC:

- 1/ **CIFFC - Canadair Aircraft**
- 2/ **FIFT - Martin Mars**

General Considerations:

Mars Operations - Island and Coastal Environment:

'Normal' i.e. As required by the Coastal Fire Centre *or* at the request of an Air Attack Officer dispatched to or working a target in these areas.

Mars Operations - Interior BC:

FIFT must have addressed shortfalls identified in the recommendations of this review.

AND ONLY IF:

Other options i.e. CIFFC - Canadair Aircraft are not viable due to:

Lack of Availability *or*

'Short' Duration of Need (≤ 72 hrs.)

Rationale for Priority – Canadair Aircraft vs Mars

The Martin Mars have:

- A higher cost/liter - as identified in this review.
- Reduced efficiency and effectiveness due to load reduction as a function of high-hot (density altitude) conditions in interior.
- Inefficient tanking system - In blanketing spot fires or cooling hot spots along the fire perimeter a relatively large portion of the load is lost/ineffective due to the inability to deliver only a portion of the load.

- Limited capability/versatility for 'repositioning' - flying boat vs. amphibious configuration greatly reduces options.
- Restricted down hill run capability limits tactics to use of inefficient 'step up/down' procedure.
- 'Non-surgical' strike capability requires disruption of ground and other air support activities over one or more sectors/divisions of the fire.
- Repositioning to interior logistically complex and costly to support.
- Environmental concerns and potential liability associated with mooring, field maintenance and more significantly fueling of the aircraft.
- Minimum request to "wheels roll" or Mars take off time > 20 minutes, making "Red" alert status unattainable.

Canadair Aircraft: Priority for Procurement

Aircraft Type Rationale for Priority

CL 215 T Better 'high/hot' performance than CL 215.
Bomb tank design shows better salvo capability than CL 415 - especially when used in blanketing actions in heavy timber.

CL 415 Better 'high/hot' performance than CL 215.

CL 215 Performance limited re: 'high/hot' operations.

Canadair Aircraft: Group Configuration

- CL 215T and CL 415 → Optimum 3 airplane group.
- CL 215 → Optimum 4 airplane group.
- Air Tanker Centre Duty Officer to apply 'smart' dispatch process and should consider option of breaking up the group, as required, to enhance land based air tanker initial attack or fire support activities.

1. Safety

Aircrew Briefings (CL 415 Group): Formal pre-action briefings were conducted on at least 3 occasions between July 30th and August 15th. The group A.A.O. facilitated briefings with assistance from the Birddog Pilot. Some notes were taken and retained on file and others were left on the briefing whiteboard at the Air Tanker Centre. The following points were discussed on all briefings:

- Introductions;
- B.C.F.S. / Protection organization;
- B.C. Firebombing Procedures, terminology (in detail);
- Scooper and birddog aircraft performance, maintenance and support requirements;
- Retardant / suppressant products, limitations;
- Fueling;
- Aircrew group leader / contact in case of problems;
- Rates and charges: Aircraft, crew expenses, CIFFC exchange, slips
- Communications / mapping, dispatch;
- Safety: philosophy, debriefings, risk management, mountain environment, CRM.

Aircrew Debriefing: CL 415 debriefings were either conducted informally or formally after all missions. Formal debriefings were recorded on mission sheets. There was no opportunity for formal debriefing of Martin Mars on their missions. Informal debriefings were conducted in air upon completion of action.

Mars Group : Informal discussions were held with the Goose pilot at the Salmon Arm airport on one occasion with the Birddog 21 crew and in-air discussions over the Anstey Arm fire.

Quebec Air Crews: On the whole, the pilots and engineers with the Quebec group were very professional and adapted easily to B.C. procedures. Language was not a serious concern as all pilots spoke English to some degree. There were some minor difficulties with a Captain speaking English less fluently than his First Officer. In that case air to air communications were with the First Officer.

One problem encountered through the 2 ½ weeks that the crews were in B.C. was the frequency of pilot changes. Crews were replaced after 2 weeks on duty, which started occurring only a week into their B.C. activity. This necessitated the increase in formal briefings and also affected firebombing performance to some degree. It took several missions to get the crews to a peak firebombing performance (procedures, assessments etc.). We found that just when we would have 2 crews performing at peak efficiency, a crew would leave and be replaced by a new crew from Quebec. It would then take some time to get both crews up to the peak performance again.

Communications: Radio communications can become quite challenging when operating with scooper aircraft which was brought out on Penticton's Garnet Fire in 1994 and both the Fly Hills and Greenstone fires in 1998.

In these cases the birddog works with several scooper tankers on interface fires near airports or control zones with multiple helicopters. In addition to monitoring and communicating with airport traffic and / or the Control Tower or Flight Service Station, the birddog crew is maintaining contact with ground crews, the Fire Centre and the Air Tanker Centre. Air traffic control and traffic separation are priorities with the birddog in multi-aircraft operations over the fire. In the case of the Garnet and Greenstone fires, the scooping source was adjacent to the targets and with 4 or more aircraft to direct, the loads were constantly coming at about 2 minute intervals. It is evident with this amount of time pressure that regular communications to all parties may be hampered until a break in the action occurs (as with directing land based tankers).

2. Efficiency

Aircraft Performance and Capabilities

CL 215	Capacity	5,346 litres
	# of doors	2
	Cruise speed	150 Kts.
	Min. pick-up distance	1,700 meters
CL 215T	Capacity	5,346 litres
	# of doors	2
	Cruise speed	175 Kts.
	Min. pick-up distance	1,325 meters
CL 415	Capacity	6,130 litres
	# of doors	4
	Cruise speed	175 Kts.
	Min. pick-up distance	1,325 meters
Martin Mars	Capacity	27,240 litres
	# of doors – LYL	22 bottom dump
	# of doors – LYK	4 side dump
	Cruise speed	165 Kts.
	Min. pick-up distance	6,500 meters

Refer to Appendix 3 for complete aircraft specification sheets.

Aircraft Limitations

- Ambient air temperatures, relative humidity and operating elevations/altitude conditions (density altitude) have a direct effect on aircraft performance and operational efficiency. As air temperature and altitude increase, aircraft performance decreases. Given full/near full fuel on dispatch, the Martin Mars for example may reduce the volume of water scooped and product delivered to the fire per load by as much as 9,000 litres or 33% of the tank capacity. As fuel is burned off, proportionately more product may be delivered to the fire. Eventually full/near full capacity volumes are achieved and operational efficiency is greatly enhanced.

This factor, of course, also has a similar impact on the performance of the Canadair aircraft. These aircraft, however, and especially the turbine engine models, are able to reach optimum operational efficiency in a shorter period of time.

Company published climb rates for loaded aircraft are as follows and reflect standard day conditions:

Martin Mars	400 Feet/Minute
Canadair CL 215	1000 Feet/Minute
Canadair CL 215T	1280 Feet/Minute
Canadair CL 415	1375 Feet/Minute

Fire bombing conditions in the interior are seldom carried out under 'standard day' conditions of 15 degrees Celsius and a surface pressure of 29.92 inches of mercury at sea level. The loaded climb rates, as noted above, are significantly reduced by the high, hot and very low relative humidity conditions that are experienced in the BC interior.

Longer turn around times for load delivery occur especially when 'large' differences in elevation and or distance from water source to fire occur. Reduced performance due to the points discussed earlier compound the delay in the bomber's return to the fire with a load.

The method for reducing undue delays in litres per hour load delivery is adding more aircraft into the circuit. For 'interior' type conditions, it is preferable to operate the Mars in a two aircraft group (or support a single aircraft operation with land based airtankers and or Canadair aircraft). CL 415 or 215 T groups should be configured with three airplanes for optimum performance and the CL 215 should be configured as a four airplane group.

- Terrain conditions at the fire site not only effects our decision to carry out/not carry out fire bombing action but may also limit our options regarding the tactics we employ to meet a given objective. The effectiveness of, and or ability to run a load down hill is limited by a given aircraft's performance in maintaining a safe drop

speed when over the target. Of obvious concern as well, is the ability of the aircraft to safely exit the area after the drop. The turbine engine aircraft offer far more versatility in handling this maneuver than the piston aircraft.

For maintaining safe drop speeds and exits, the Martin Mars is performance limited to a 15 to 20 percent slope for running loads downhill. This limitation restricted Mars bombing runs to follow contours and when used for blanketing actions for spots or long narrow fingers of fire running up and down slope, requires the aircrew to employ a tactic known as 'stepping up/down' a hill. The 'stepping up/down' tactic offers a very inefficient use of the product delivered as a very large portion of the load is placed well outside the finger or spot which is being hit.

- Experience gained in using water bomber aircraft in the interior areas of BC have shown that the aircraft are used most effectively: in the cooling of hot spots along the fire edge; blanketing of spot fires ahead of the main fire or outside of established control lines and; the temporary fire proofing of values which are immediately threatened by the fire. The most effective drop types to use in these scenarios are salvos as opposed to string type drops as the salvo puts a higher concentration of product over a smaller area. Tank design has direct effect on the efficiency of the salvo's footprint. The following ranks the given aircraft drop system relative to an efficient salvo:

Martin Mars LYK - Side Dump (4 Doors)	Least Efficient
Martin Mars LYL - Bottom Dump (22 Doors)	\\
Canadair CL 415 (4 Doors)	\\
Canadair CL 215 & CL 215T (2 Doors)	Most Efficient

The rationale used for the above ratings is as follows:

Re: Mars - Once gates have been opened they cannot be closed causing a good portion of the load to be placed outside the target spot fire/area of concern.

Re: Canadair 4 door vs 2 door drop system - The four door tank is 'dirtier' than the two door system. This causes the load to 'hang' up longer and the salvo pattern is lengthened. As with the Mars, but on a far smaller scale, a portion of the load is in effect wasted.

Use of water bombing aircraft in a line building role is effective only if the loads are immediately supported by ground crews or if the loads are delivered in support of established control lines - retardant, machine guard, hand guard or other natural or man made barriers. Staff involved with the Mars deployment to Atlin BC commented that ground crews could not support more than one or two drops at a time. Any line that the Mars built beyond that was a waste, as it could not be supported in a timely fashion. It

was suggested that under these conditions the establishment of retardant lines would have been far more efficient and effective.

With regard to the deployment of the Mars to Salmon Arm BC, feedback from ground crews working fires which were supported by this aircraft indicated that there was a noticeable variance in foam consistencies from drop to drop. This potential problem with calibration and or foam injection systems has been brought to the attention of FIFT.

- The above discussion regarding performance and capabilities as well as the cost considerations provide the basis for the priority for procurement and deployment of water bomber aircraft as put forth later in this report. Other considerations such as options for deployment and logistical support requirements do, however, come into play and are worthy of discussion.
- As opposed to the flying boat configuration and mooring requirements for the Mars, the amphibious capability of the Canadair aircraft affords many options for group pre/repositioning.
- Logistics and associated costs in repositioning the Mars to the interior of the province are significant. (Refer to cost summary section for detail.)

s.17

3. Effectiveness

Summary of Operations

- **Flight Operations (CL415's):** As mentioned, scooper pilots adapted well to B.C. firebombing procedures. On a couple of occasions it appeared that crews either misunderstood instructions or may have ignored them. On one occasion, while being led into a target in steep mountainous terrain for the first time, a crew chose to line up on final at 90 degrees to the birddog run. This led to an "unplanned situation" over the target. The event was thoroughly debriefed with all crews after the mission. On a couple of other occasions while directing tanker spacing in the circuit pattern, the tankers would end up together rather than spaced apart as requested. Although we never got a clear explanation as to why, later it was felt that perhaps the crews were taking photos. Toward the end of the exchange, briefings with new crews included the point that birddog instructions were to be complied with unless safety was an issue.
- **Flight Operations (Mars):** Initial work with the Mars in the south interior took place on Fire K3-0247 Anstey Arm on August 3. Procedures used were the same as those used in normal situations on the coast. While working both the CL415's

and the Mars, the F.S. birddog selected, identified and made runs on specific targets for the CL415's and the FIFT Goose birddog. Mars bombing runs were done with lead-ins by the goose. If there were any requirement for runs on new targets, BD21 would do the runs and bombing recommenced. This system worked well with the Mars aircraft, however by August 4th the FIFT group was working independently and some operational and safety issues arose after that.

- **Drop Accuracy:** On the whole, the drop accuracy with the Mars aircraft was acceptable based on observations of 38 loads on 3 fires. Drop accuracy of the CL415's overall was good once crews settled down to the B.C. routine. This was based on observing and assessing over 950 loads on 11 fires. As in 1994 there was some input from ground sources regarding some high drops. One of the points brought out in the briefings was that scooper crews should conduct drops at heights within their own safety and comfort parameters considering terrain, fire behavior, wind and turbulence. The birddog crew was not critical of drop heights unless they were deemed to be excessive by the A.A.O. or too low.

Fire Boss Comments

K2-0382 – Greenstone Mountain

Foam was ineffective when the relative humidity was below 20%. Water/foam drops slowed the fire for less than 10 minutes. CL415 drops penetrated the canopy better and lasted longer than Mars drops. There was a need for better communications between the ground forces and the birddog of the scooper aircraft.

K3-0285 – Fly Hills

Ground forces were unable to work in close proximity to drops from the Martin Mars. When the Martin Mars was called into drop on an area, the ground crews and equipment had to be pulled off that section/division of the fire for safety reasons. A combination of the 162,000 pound gross weight (35% heavier than a loaded Lockheed Electra) and 120 knot drop speed of the Mars produces very strong wing tip vortices. As these settled into the fire area, ground forces noted a significant increase in fire behavior to the point that their on the ground control efforts were actually being compromised. These crews also felt that up to 50% of the Martin Mars drop had no effect on the ground as much of the load 'trailed' long after the release point. It is suspected that this occurs due to inadequate venting of the bomb tank and or a 'dirty' tank design. The balance of the load that actually reached the ground had marginal or no effect on fire control. CL415 drops in low or semi-open canopies were effective. All drops (CL 415 and Mars) into closed canopy situations were not effective.

K4-0427 – Fintry

CL415's were very effective in assisting with control objective. The ground forces were able to work in close proximity to the drop areas supporting the water/foam drops. Excellent in actioning hot spots.

Direction/Supervision

Airborne coordination of drops with the CL415's were controlled by a Birddog with a Forest Service Air Attack Officer onboard. Coordination of the Martin Mars (for the most part) was through the Grumman Goose (Birddog Yellow – no F.S. Air Attack Officer) and the ground crew or Rotary Wing Birddog. This caused some confusion and lack of firm direction for the Martin Mars.

Fire Science Perspective

Aircraft delivery of water and foam will have no impact on the BUI and little or no impact on the FFMC when 92 or greater. Any benefit is measured in minutes.

Notes of Interest re: Fire Science Perspective and Direction/Supervision Issues

Excerpted from the 'Interim Guidelines for Aerial Application of Foam on Forest Fires [1989 - Forestry Canada/Alberta Forest Service/GNWT - Department of Renewable Resources]:

'Foam effectiveness is generally limited to fires or fire perimeters with flame lengths of less than 2.5 meters or frontal fire intensities of about 2,000 kW/m.' (i.e. High end of Rank 3/Low end of Rank 4)

In many instances last season water bombers were employed when conditions were such that these parameters were exceeded. This lends support for two requirements:

- 1/ There is a need to quantify the effectiveness of the litres per hour concept as applied to severe burning conditions/very high temperature-very low relative humidity situations as are often experienced in BC's interior.
 - 2/ There is a need to ensure that under these conditions, all water bomber activity (including the Martin Mars) is supervised and directed by a certified Air Attack Officer. This will help to ensure that:
 - ✓ lack of effectiveness is recognized and action is stopped or redirected as appropriate;
 - ✓ proper drop heights are maintained according to the foam ratios being employed i.e.:
 - 75 Feet for Wet Foams (0.1% to 0.3%)
 - 150 Feet for Dry Foams (0.4%+)
- and;

- ✓ timely feedback is received from ground crews regarding proper foam ratios and over all drop effectiveness.

Intangibles

Without a doubt, deployment of the Martin Mars flying boats to action fires in the interior areas of the province where significant interface values are at risk is an extremely effective public relations tool. On the other hand, it is a huge challenge to our protection program to be asked to weigh this value versus the relatively high dollar cost and, in some cases, marginal effectiveness of these aircraft as employed in the 1998 season.

4. Support

Logistical Requirements

The Government of Quebec CL 415's under the MARS Agreement arrived in British Columbia self sufficient. All expenses, transportation and accommodation were included in their per diem/hourly rates. The CL 415's are amphibious aircraft, therefore can utilize hard surfaced runways or a water landing areas. This coupled with the self sufficiency aspect offers many options for pre-positioning the aircraft to effectively reduce dispatch distances for both the initial attack or fire support role.

The Martin Mars were not as self sufficient or versatile. Arrangements had to be made for moorage, fuel, accommodations, and transportation. The support staff that accompanied the deployment was sizable. Exclusive of fuel and oil charges, support cost for the Salmon Arm deployment were in excess of s.21 Due to the aircraft size and requirements, change of basing was not a consideration once the original arrangements had be made. This is one aspect can be streamlined.

Record Keeping

The Quebec CL415's completed flight slips on a daily basis. These included up and down times, total hours, load volumes, foam concentration by fire worked. Their paper work was clean and simple. Completed flight tickets were signed and handed in at the end of each day. There were no problems or recommendations regarding these records.

The Martin Mars flight tickets lacked sufficient information for data entry or even simple analysis. Changes required include up and down times per flight leg, total time per leg, volume of load dropped per leg, percent concentration of foam used per drop, extra charges such as oil, fuel, etc. For Martin Mars operations based outside of Sprout Lake, a daily cost sheet will be required outlining all other associated costs not include on the flight ticket. All flight tickets must be signed off daily by a designated Forest Service employee and submitted the same day to the Provincial Airtanker Center.

Accounts

Quebec CL415 invoices were lump sum billed to Victoria for payment, based on flight tickets previously signed off by a Forest Service Air Attack Officer.

Martin Mars invoices were not summarized. Invoices for flights, were followed by invoices for fuel and oil, accommodation, moorage and transportation. This made reconciliation of costs very difficult. The Martin Mars records can be improved easily by compiling a daily cost summary sheet including all associated costs with the project and submitting this to PATC at the end of each working day.

Rates

A/C Type	Basing/Day	Hourly	Fuel & Oil	Accom./Meals/Vehicles
CL215			Included	Included in basing
CL 215T			Included	Included in basing
CL 415		s.21	Included	Included in basing
Martin Mars			Cost plus	Cost plus

APPENDIX 1: Summary of Fire Actions

Quebec CL 415's Ferry to and from Quebec: 44.7 hrs = s.21

K2-0367		K2-0376	
1.8 hours	=	2.0 hours	=
5,700 Litres	=	91,000 Liters	=
Total Cost	=	Total Cost	=

K2-0379		K2-0382	
6.4 hours	=	19.2 hours	=
199,500 Liters	=	581,400 Liters	=
Total Cost	=	Total Cost	=

K3-0247		K3-0285	
36.3 hours	=	12.4 hours	=
1,385,100 L.	=	336,300 Liters	=
Total Cost	=	Total Cost	=

K3-0376		K3-0379	
6.1 hours	=	4.3 hours	=
273,600 Liters	=	96,900 Liters	= s.21
Total Cost	=	Total Cost	=

K3-0434	s.21	K4-0386	
9.3 hours	=	35.1 hours	=
279,300 Liters	=	1,755,600 L.	=
Total Cost	=	Total Cost	=

K4-0427		K5-0509	
14.6 hours	=	5.3 hours	=
535,800 Liters	=	307,800 Liters	=
Total Cost	=	Total Cost	=

N4-0093		N4-0188	
5.2 hours	=	5.0 hours	=
39,900 Liters	=	57,000 Liters	=
Total Cost	=	Total Cost	=

Summary

14 Fires
 207.4 hours =
 5,945,100 L. =
 Total Cost =
 Cost/liter delivered = s.21

APPENDIX 2: Summary of Fire Actions

Martin Mars

K2-0382 3 Days Actions
14.4 hours =
791,388 Liters = s.21
Total Cost =

K3-0285 16 Days Actions
106.7 hours =
6,249,936 L. = s.21 includes s.21 support costs
Total Cost =

Summary K2-0382 and K3-0285

121.1 hours =
7,041,324 L. = s.21
Total Cost =
Cost/Liter delivered = s.21

R9-0076
21.9 hours = s.21
No Recorded Volumes

V5-0137
6.7 hours = s.21
No recorded volumes

V7-0175
1.1 hours = s.21
No recorded volumes

V1-0087
4.0 hours = s.21
No recorded volumes

V6-0056
1.6 hours = s.21
No recorded volumes

V9-0081
4.4 hours = s.21
No recorded volumes

NOTE: Only statistics from K2-0382 and K3-0285 were used as these fires had the most complete records.

APPENDIX 3: Aircraft Specifications



AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Canadair CL 215T

A/C ROLE: Airtanker - Scooper, Amphibious

AGENCY: Quebec

A/C SPECIFICATIONS:

Length: 65' 1"

Wingspan: 93' 11"

Height: 29' 5"

Gross Weight: 45,250 lbs.

Approx. Empty Wt.: 26,595

POWERPLANT:

Engine(s): Two Pratt &

Whitney 123AF

Turboprop

Horsepower (Each): 2380 H.P.

FUEL:

Type: Turbine Jet "A", "B"

Capacity: 10,250 lbs.(5796 litres)

Consumption: 1600 lbs./hr. (905 litres / hr.)

Operational Endurance: 4.5 Hrs.

PERFORMANCE:

Cruise Speed: 175 Kts.

Target / Drop Speed: 105 Kts.

Stall Speed (Operating Wt.): 66 Kts.

Loiter Speed:

Minimum Field Length: 4000 ft.

Minimum Pick Up Dist.: 4300 ft.

TANKING SYSTEM:

Tank Type: Compartmented with probes

Max. Capacity: 5346 litres, Scoop time – 15 sec.

Number of Doors / Compartments: 2

DROP SPECIFICATIONS:

TYPE	APPROX. LENGTH @ C.L. 1	TYPE	APPROX. LENGTH @ C.L. 1
1X1	75 Metres	1X2	130 Metres
2X1	90 Metres		

COMMENTS: Operational Crew : 2 pilots. Inflight foam injection.





AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Canadair CL 215
A/C ROLE: Airtanker - Scooper, Amphibious

AGENCY: N.W.T., Alta. Sask., Man.,
 Ont., Quebec, Nfld.

A/C SPECIFICATIONS:

Length: 65' 0"
 Wingspan: 93' 10"
 Height: 29' 3"
 Gross Weight: 43,500 lbs.
 Approx. Empty Wt.: 27,750 lbs.

POWERPLANT:

Engine(s): Two Pratt & Whitney
 R2800 Piston Radial
 Horsepower (Each): 2100 H.P.



FUEL:

Type: Avgas 100
 Capacity: 9400 lbs. (5910 litres)
 Consumption: 1440 lbs./ hr. (905 litres / hr)
 Operational Endurance: 4 Hrs.

PERFORMANCE:

Cruise Speed: 150 Kts.
 Target / Drop Speed: 110 Kts.
 Stall Speed (Operating Wt.): 70 Kts.
 Loiter Speed: N/A
 Minimum Field Length: 4500 ft.
 Minimum Pick Up Dist.: 5500 ft

TANKING SYSTEM: [CL 215 & 215T] .

Tank Type: Compartmented with probes
 Max. Capacity: 5346 litres
 Number of Doors / Compartments: 2

DROP SPECIFICATIONS: [CL 215 & CL 215T]

TYPE	APPROX. LENGTH @ C.L. 1	TYPE	APPROX. LENGTH @ C.L. 1
1X1	75 Metres	1X2	130 Metres
2X1	90 Metres		

COMMENTS:

Operational Crew : 2 Pilots. Inflight foam injection.



AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Canadair CL 415
A/C ROLE: Airtanker - Scooper, Amphibious

AGENCY: Quebec, Ontario

A/C SPECIFICATIONS:

Length: 65' 1"
 Wingspan: 93' 11"
 Height: 29' 5"
 Gross Weight: 46,000 lbs.
 Approx. Empty Wt.: 28,353 lbs.

POWERPLANT:

Engine(s): Two Pratt & Whitney 123AF
 Turboprop
 Horsepower (Each): 2380 H.P.



FUEL:

Type: Turbine Jet "A", "B"
 Capacity: 10,250 lbs.(5796 litres)
 Consumption: 1600 lbs./hr.(905 l/hr.)
 Operational Endurance: 4.5 Hrs.

PERFORMANCE:

Cruise Speed: 175 Kts.
 Target / Drop Speed: 105 Kts.
 Stall Speed (Operating Wt.) :66 Kts.
 Loiter Speed:
 Minimum Field Length: 4000 ft.
 Minimum Pick Up Dist.: 4300 ft

TANKING SYSTEM: [CL415]

Tank Type: Compartmented with probes
 Max. Capacity: 6130 litres Scoop Time – 15 sec.
 Number of Doors / Compartments: 4

DROP SPECIFICATIONS: [CL415]

TYPE	APPROX. LENGTH @ C.L. 1	TYPE	APPROX. LENGTH @ C.L. 1
1X1	75 Metres	1X4	175 Metres
2X1	100 Metres	4X1	120 Metres

COMMENTS: Operational Crew : 2 pilots. Inflight foam injection.



AIRTANKER / BIRDDOG SPECIFICATIONS AND PERFORMANCE

A/C TYPE: Martin Mars

A/C ROLE: Airtanker - Scooper, Waterbased

AGENCY: Private - Forest Industries
Flying Tankers (F.I.F.T.) Ltd.

A/C SPECIFICATIONS:

Length: 120' 3"
Wingspan: 200' 0"
Height: 47' 11"
Gross Weight: 162,000 lbs.
Approx. Empty Wt.: 88,000 lbs.

POWERPLANT:

Engine(s): Four Wright R3350-24
Piston Radial
Horsepower (Each): 2500 H.P.



FUEL:

Type: Avgas 100
Capacity: (Normal) 21,600 lbs. (13,600 litres)
Consumption: 3950 lbs./hr. (2500 litres)

PERFORMANCE:

Cruise Speed: 165 Kts.
Target / Drop Speed: 120 Kts.
Stall Speed (Operating Wt.): 89 Kts.

Operational Endurance: 5.5 Hrs.

Loiter Speed: N/A
Minimum Field Length: N/A
Pick Up Time: 20 – 30 sec.

TANKING SYSTEM:

Tank Type: Compartmented with probes
Max. Capacity: Tank - 27,240 litres, Foam concentrate capacity – 2270 litres
Number of Doors: Mars LYL (Bottom Dump) - 22
Mars LYK (Side Dump) - 4

DROP SPECIFICATIONS:

TYPE	APPROX. LENGTH @ C.L. 1	TYPE	APPROX. LENGTH @ C.L. 1
LYL Salvo	180 Metres	LYK Salvo	150 Metres

** [Both A/C - Drops normally full salvo but can split loads into 2 drops if requested]

COMMENTS: Operational Crew: 2 Pilots and 2 Flight Engineers. In-flight foam injection allows for 21 drops @ 0.4%. Salt or fresh water pick-ups.



Ministry of
Forests, Lands and
Natural Resource Operations

Contract Modification Agreement No. 2

MINISTRY CONTRACT/FILE NO.: 1070-20/COU 13 01

PROJECT NAME: AO13WCC009

THIS MODIFICATION AGREEMENT dated for reference 29th day of May, 2013.

BETWEEN

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF
BRITISH COLUMBIA, represented by the MINISTER OF FORESTS,
LANDS AND NATURAL RESOURCE OPERATIONS

Wildfire Management Branch
Provincial Wildfire Coordination Centre

(the "Province", "we", "us", or "our" as applicable) at the following address:
3080 Airport Drive, Kamloops, B.C. V2B 7X2

Telephone: (250) 312-3010 Fax: (250) 554-5468 E-mail Address: nina.barber@gov.bc.ca

Ministry Representative: Nina Barber

Alternate (if applicable): Michael Benson

AND

Coulson Air crane Ltd.
dba Coulson Flying Tankers

(the "Contractor", "you", or "your" as applicable) at the following address:

4890 Cherry Creek Road
Port Alberni, British Columbia
V9Y 8E9

Telephone: (250) 723-6225 Fax: (250) 723-6200 E-mail Address: Wayne.coulson@coulsongroup.com

Contractor Representative: Wayne Coulson
Business Number: 0297018
WorkSafe BC No: 363134 and/or POP No. AQ

A. The Parties entered into an Agreement dated for reference May 28th, 2012, (hereinafter called the "Agreement"),

B. The Parties agree to amend the Agreement as follows:

1. The Company shall provide to the Province for the sake of safety and efficiency, a pre-identified list of all suitable water bodies in British Columbia that the Martin Mars bomber can operationally scoop from. The list will contain names and coordinates of each water body and will be accompanied by a map at a scale of 1:1,000,000 identifying the locations of the water bodies.
2. The Company shall provide to the Province a list of suitable water bodies that the Martin Mars bomber can base out of. The list will contain names and coordinates of each water body and will be accompanied by a map at a scale of 1:1,000,000 identifying the locations of the water bodies (this map may be the same as identified in #1 above).

In all other respects, the Agreement is confirmed.

C. Time is of the essence in this Modification Agreement.

The Parties duly execute this Modification Agreement as follows:

SIGNED AND DELIVERED on behalf of the Province by an
authorized representative of the Province

(Signature of authorized Ministry Expense Authority)

Nina Barber

(PRINTED NAME of authorized representative)

Dated this _____ day of _____ 20____

SIGNED AND DELIVERED by or on behalf of the Contractor (or
by an authorized signatory of the Contractor if a corporation)

(Signature of Contractor or Authorized Signatory)

Wayne Coulson SUSAN MERIVITA

(PRINTED NAME of Contractor or authorized signatory)

Dated this 18 day of July 2013.

Coulson Aircrane Ltd. Addendum 2 Mars contract July 2013

Coulson Flying Tanker- Mars - Lakes designated as suitable for scooping water

Lake	Latitude	Longitude	Elevation
Adams	51°15'0.00"N	119°28'60.00"W	1340'
Alice	50°28'0.00"N	127°25'0.00"W	180'
Alouette	49°19'53.46"N	122°25'16.60"W	420'
Anderson	50°37'0.00"N	122°25'0.00"W	870'
Atlin	59°31'60.00"N	133°43'0.00"W	2200'
Azure	52°23'5.34"N	120° 3'19.75"W	2250'
Babine	54°43'60.00"N	125°58'60.00"W	2340'
Bonanza	50°22'0.00"N	126°46'0.00"W	890'
Bonaparte	51°15'30.63"N	120°33'3.60"W	3870'
Bowser	56°25'26.47"N	129°31'2.21"W	1210'
Buttle Lake	49°45'0.00"N	125°34'60.00"W	730'
Campbell	50° 1'25.94"N	125°27'26.21"W	590'
Carpenter	50°52'0.00"N	122°34'0.00"W	2150'
Charlie	56°19'38.41"N	120°58'29.93"W	2280'
Charlotte	52°12'0.00"N	125°19'60.00"W	3850'
Cheslatta	53°44'25.21"N	125°21'2.85"W	2530'
Chilko	51°16'0.00"N	124° 4'0.00"W	3860'
Choelquoit	51°42'16.22"N	124°11'54.69"W	3820'
Christina	49° 5'26.15"N	118°13'54.26"W	1480'
Chuchi	55°10'42.89"N	124°30'15.75"W	2860'
Clearwater	52°16'0.00"N	120°13'0.00"W	2250'
Cold Fish	57°40'0.00"N	128°46'60.00"W	4040'
Comox	49°37'17.10"N	125° 9'51.81"W	450'
Cry	58°44'35.85"N	129° 1'47.34"W	3860'
Dease	58°32'0.03"N	130° 2'59.18"W	2480'
Decker	54°17'60.00"N	125°50'60.00"W	2300'
Downton	50°50'16.42"N	122°59'1.56"W	2460'
Eagle (Murphy)	52° 2'60.00"N	121°15'0.00"W	2850'
Euchu	53°25'9.86"N	125°23'47.34"W	2810'
Eutsuk	53°13'60.00"N	126°29'60.00"W	2820'
Fantail	59°37'8.30"N	134°32'22.40"W	2300'
Fortress	52°22'12.08"N	117°47'42.95"W	4380'
Francois	54° 1'2.19"N	125°22'14.26"W	2360'
Fraser	54° 5'17.50"N	124°41'39.22"W	2220'
Gladys	59°49'60.00"N	132°48'0.00"W	2860'
Great Central	49°21'0.00"N	125°17'60.00"W	280'
Gwillim	55°21'16.77"N	121°19'32.32"W	2570'
Harrison	49°31'60.00"N	121°49'0.00"W	40'
Henderson	49° 4'46.51"N	125° 1'47.12"W	20'
Hobson	52°36'0.89"N	120°14'25.57"W	2840'
Horsefly	52°24'17.54"N	121° 2'11.98"W	2590'

Indata	55°19'18.93"N	125°15'8.90"W	2880'
Johnny	53° 7'22.34"N	125°26'3.87"W	3090'
Kamloops	50°45'30.72"N	120°42'2.73"W	1100'
Kinaskan	57°35'26.30"N	130° 8'35.04"W	2910'
Kinbasket	51°55'42.72"N	118° 0'42.82"W	2480'
Kitchener	57° 2'60.00"N	127°25'0.00"W	4330'
Kitsumkalum	54°45'9.70"N	128°47'29.99"W	490'
Kootenay	49°33'2.67"N	116°49'26.04"W	1750'
Lac La Hache	51°48'53.45"N	121°31'27.21"W	2650'
Lake Cowichan	48°52'60.00"N	124°18'0.00"W	540'
Lakelse	54°22'26.63"N	128°33'39.19"W	250'
Link	52°25'2.55"N	127°40'32.75"W	160'
Lower Arrow	49°27'59.16"N	118° 6'25.25"W	1450'
Mabel	50°35'28.33"N	118°43'1.15"W	1300'
Mara	50°47'19.26"N	119° 0'25.53"W	1140'
Meziadin	56° 3'20.87"N	129°16'49.36"W	810'
Moberly	55°49'0.00"N	121°47'60.00"W	2290'
Morice	54° 1'0.00"N	127°34'60.00"W	2510'
Muncho	58°59'10.23"N	125°46'45.12"W	2710'
Myrtle	52° 7'25.82"N	119°38'48.18"W	3510'
Nanika	53°46'41.05"N	127°39'16.55"W	3090'
Natalkuz	53°27'0.00"N	125°15'0.00"W	2810'
Nicola	50°10'0.03"N	120°31'45.35"W	2060'
Nimpkish	50°22'60.00"N	126°58'0.00"W	90'
Nitinat	48°45'0.00"N	124°43'60.00"W	10'
Nome	59°40'5.50"N	130°53'58.34"W	3920'
Northwest Arm	55°11'42.97"N	125°50'58.76"W	2260'
Okanagan	50° 4'0.00"N	119°28'0.00"W	1130'
Ootsa	53°45'11.05"N	126° 0'37.02"W	2810'
Osoyoos	49° 2'60.00"N	119°28'0.00"W	910'
Owikeno	51°40'9.71"N	126°52'30.12"W	40'
Pinchi	54°35'11.47"N	124°22'16.40"W	2360'
Pitt	49°26'42.35"N	122°32'16.07"W	20'
Powell	49°58'60.00"N	124°31'60.00"W	190'
Qualcho	53° 1'60.00"N	125°53'60.00"W	2950'
Quesnel	52°31'58.40"N	121° 3'34.63"W	2400'
Revelstoke	51°18'10.21"N	118°17'50.71"W	1870'
Seton	50°41'9.08"N	122° 7'21.02"W	800'
Shuswap	50°56'34.51"N	119°16'30.49"W	1140'
Skaha	49°24'60.00"N	119°34'60.00"W	1120'
Slocan	49°54'8.93"N	117°24'26.99"W	1780'
Sproat	49°16'10.78"N	125°3'50.41"W	100
Stave	49°22'0.00"N	122°16'60.00"W	280'
Stuart	54°28'60.00"N	124°27'0.00"W	2240'
Surprise	59°40'16.91"N	133°14'54.69"W	3000'
Tachick	53°57'0.00"N	124°13'0.00"W	2340'
Tagish	59°32'60.00"N	134°16'60.00"W	2160'

Tahtsa	53°40'54.98"N	127°31'13.07"W	2810'
Taitapin	54°18'35.09"N	125°18'15.58"W	2850'
Takla	55°23'2.15"N	125°50'49.66"W	2260'
Tatla	51°58'9.45"N	124°26'44.33"W	2980'
Tatlayoko	51°31'53.21"N	124°24'42.78"W	2720'
Tchentlo	55°10'60.00"N	125° 1'60.00"W	2860'
Tchesinkut	54° 5'49.50"N	125°38'30.40"W	2440'
Teslin	59°52'0.00"N	132°18'0.00"W	2250'
Tezzeron	54°41'6.64"N	124°24'35.51"W	2520'
Tochcha	54°55'0.00"N	125°52'60.00"W	2800'
Trembleur	54°50'51.08"N	125° 5'50.84"W	2270'
Troitsa	53°33'53.77"N	127°16'57.98"W	2960'
Tsayta	55°27'15.65"N	125°24'34.67"W	2890'
Tutshi	59°55'0.00"N	134°46'0.00"W	2350'
Tuya	59° 4'29.89"N	130°35'27.81"W	3680'
Uncha	53°54'53.73"N	125°35'37.36"W	2540'
Upper Arrow	50°25'39.19"N	117°55'40.01"W	1450'
Upper Campbell	49°56'40.55"N	125°37'3.97"W	730'
Victoria	50°22'0.00"N	127°22'60.00"W	320'
Whalen	53°13'0.00"N	128°55'60.00"W	400'
Whatshan	50° 2'18.15"N	118° 6'9.39"W	2110'
Whitesail	53°29'46.98"N	126°58'23.70"W	2810'
Williston	55°58'51.67"N	123°56'23.11"W	2210'
Witch	55° 7'20.27"N	124°30'57.74"W	3030'
Woss	50° 6'55.84"N	126°36'30.81"W	490'

Coulson Flying Tankers JRM-3 Mars Lakes designated as suitable for aircraft basing July 2013

Sample Basing Lakes	Latitude	Longitude	Comments
Atlin	59°34'2.10"N	133°42'42.91"W	
Charlie	56°17'8.35"N	120°57'26.66"W	
Dease	58°31'8.54"N	130° 2'19.43"W	
Fraser	54° 3'50.68"N	124°51'1.06"W	Used previously as a base .
Kamloops	50°45'24.59"N	120°51'19.90"W	
Kootenay	49°31'19.37"N	117°15'38.10"W	Used previously as a base .
Lac La Hache	51°50'47.99"N	121°34'58.99"W	
Meziadin	56° 3'9.59"N	129°15'4.06"W	
Okanagon	49°51'50.35"N	119°30'54.85"W	Several locations used previously
Osoyoos	49° 4'8.47"N	119°30'52.34"W	
Penticton	49°30'32.22"N	119°36'12.23"W	
Shuswap	50°43'44.86"N	119°18'15.10"W	Used previously as a base
Stuart	54°26'56.94"N	124°16'21.25"W	
Upper Arrow	50°14'9.80"N	117°47'59.52"W	Nakusp

Note: Basing locations are not limited to the coordinates provided, but are a sample for suitable lakes. For lakes not previously used for Mars basing, coordinate locations may be changed due to local bylaws or for access to fuel and thermo gel re-filling or secure tie-up buoy placements.