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AVRO AIRCRAFT LIMITED

MALTON - ONTARIO

TECHNICAL DEPARTMENT (Aircraft)

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AIRCRAFT: ARROW 2

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TITLE:

COMPARISON OF ARROW 2 AND BOMARC IN
THE AIR DEFENSE OF EASTERN CANADA

PREPARED BY

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COMPARISON OF ARROW 2 AND BOMARC IN
THE AIR DEFENSE OF EASTERN CANADA

	ARROW 2	BOMARC
1. <u>PHYSICAL DATA</u>		
Length	77.8 ft.	47 ft.
Wing Span	50.0 ft.	18 ft.
Planform	Delta	Cropped Delta
A.U.W.	70,000 lb.	15,000 lb.
Power Plant	2 X Orenda Iroquois 2	2 X 25" Marquardt Ramjets + Rocket Boosters
Armament	2 Genie Rockets	H.E. or nuclear warhead
Radar Search Pattern	Various modes, from narrow band with central positioning from ground control, to wide angle search between antenna limits	$\pm 15^\circ$ in azimuth and elevation centred about expected bearing of target
Antenna Traverse Limits	$\pm 70^\circ$ Azimuth $+75^\circ -45^\circ$ Elevation	$\pm 70^\circ$ in azimuth and elevation (?)
2. <u>PERFORMANCE</u>		
Cruise altitude (Subsonic)	35,000 ft.	-
(Supersonic)	50,000 ft.	65,000 ft.
Combat speed and altitude	M = 2.0, 50,000 ft.	M = 2.5, 60,000 ft.
★ Manoeuvrability at combat condition	3.6 g	7.0 g
(Subsonic)	600 n.m. combat at M = 1.5	-
(Cruise)	500 n.m. combat at M = 2.0	-
★★ Radius of action	(Supersonic)	300 n.m. Cruise and combat
(Cruise)	M = 2.0	280 n.m. at M = 2.5
A.I. Radar Range	25 n.m.	8 n.m.
★ In both cases the limitation is aerodynamic and not thrust.		
★★ Preliminary investigation of the aircraft configuration when carrying 2 Genies indicates that the additional fuel capacity required to give these radii is available.		
3. <u>GROUND ENVIRONMENT</u>		
SAGE	Can be used: Not essential	Essential
Close control, manual operation	Can be used: Not essential	Marginally Adequate
Broadcast control	Adequate	Completely Inadequate
Data Link	Might be used. Not preferred	Essential
Voice Link	Adequate and preferred	Completely Inadequate
Condition for launch or take-off	Any time a possible target appears	Close control target track established



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	ARROW 2	BOMARC
3. <u>GROUND ENVIRONMENT</u> (Cont'd)		
Quality of ground tracking data required	Moderate quality adequate (radar has full search capability)	High quality essential (Seeker is directed from the ground)
4. <u>EFFECTS OF ECM</u>		
Against ground radars	Interception can proceed with minimum of data	SAGE unworkable. Bomarc capability doubtful.
Against data/voice link	Sporadic information adequate	Disastrous if used in the closing phases of midcourse guidance
Against AI radar	Up to 30 secs. available for application of CCM. By alternate lock-on and home on jam, OBS/AI can concentrate on single target.	CCM facilities must be applied in less than 10 secs. Programmed pattern jamming by multiple targets makes home or jam useless.
Against fuze	Time fuze-unaffected	Could result in premature detonation of proximity fuze.

5. AREA DEFENSE COVERAGE

Fig. 1 - Area defended using present radar network

Fig. 2 - Area defended with close control radars at Mid Canada Line.

Target Speeds - M = 0.9 and 2.0

Target Heading- Due south.

The charts show that with the present radar cover the Arrow is able to intercept considerably farther north than Bomarc. For Bomarc to make full use of its range when operating from northerly bases, Mid Canada Line must be brought within the close control network and SAGE extended to include these bases.



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5. AREA DEFENSE COVERAGE (Cont'd)

	ARROW 2	BOMARC
Scramble or launch	5 minutes after target leaves southern fringe of Dew Line (Allows 25-50 mins for scramble).	2 minutes after target detection by Pinetree Line.
Loiter - with present radar network	200 n.m. south of Mid Canada Line	-
- with close control radars at Mid Canada Line	100 n.m. south of Mid Canada Line	-
Configuration	Full Internal Fuel	Full internal fuel plus rocket boosters

6. STRATEGIC ADVANTAGES OF THE ARROW

- a) Versatility Capable of the following missions:-
- High speed interception
 - Long range interception
 - Patrol mission
 - Long range identification mission
 - Single or two-pass attacks
 - Tactical capabilities for limited warfare overseas
 - Possible development for defense against ICBM
- b) Operation Requires a minimum of ground control.
Is not dependant on SAGE, which is highly vulnerable to ECM.
Can attack targets at altitudes up to 70,000' and speeds up to M = 2.0.
Having search radar, it does not need to be told precisely wher to look for target.
- c) Aircrew Capability With an aircrew of two:-
- Human intelligence is brought to bear directly in the ECM situation.
 - The intrinsic human filtering capability can be used when noisy steering signals are displayed.
 - Component malfunctions can be detected and corrected or allowed for.
 - Stand-off bombs can be detected and attacked if dropped during an engagement.



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6. STRATEGIC ADVANTAGES OF THE ARROW (Cont'd)

- d) Recoverability In a doubtful situation, the cost of dispatching interceptors to investigate is negligible, whereas Bomarcs must be written off if launched.

- e) Training Programs The use of Arrows in training programs raises no problems, and such programs can be made realistic. However, the high cost of launching Bomarcs means that operational training must be done by simulation techniques only. The same is true of system evaluation.