EMP / AIRCRAFT DIMENSIONS

An aircraft flying in the vicinity of an electromagnetic pulse (EMP) acts like a receiving antenna and picks up EMP radiation in relation to size like a dipole (or half-wavelength dipole). The electromagnetic pulse spectrum decreases above 1 MHz as shown in Figure 1, so an F-14 aircraft that is an optimum ½ wavelength antenna at ≈8 MHz will pick up less EMP voltage than a B-52 or an aircraft with a trailing wire antenna. A rule of thumb for the voltage picked up is :

V_{EMP} = 8.1 volts/ft times the maximum dimension of the aircraft in feet

This rule of thumb was generated because a single linear relationship between voltage and aperture seemed to exist and compared favorably with more complex calculations for voltage picked up by various aircraft when subjected to EMP.

Table 1 shows various aircraft and the frequencies they would be most susceptible to, using $f = c/\lambda$, where λ matches the selected aircraft dimension for maximum "antenna reception effect". This should be a design consideration when trying to screen onboard avionics from the effects of EMP.

The following is a partial listing of aircraft types vs identifying prefix letters (several are used in Table 1):

A	Attack	K	Tanker	T	Trainer
B	Bomber	O	Observation	U	Utility
C	Cargo	P	Patrol	V	Vertical or Short Takeoff and Landing (V/STOL)
E	Electronic Surveillance	Q	Special mission		
F	Fighter	R	Reconnaissance	X	Experimental
H	Helicopter	S	Anti Sub/Ship	Y	Prototype

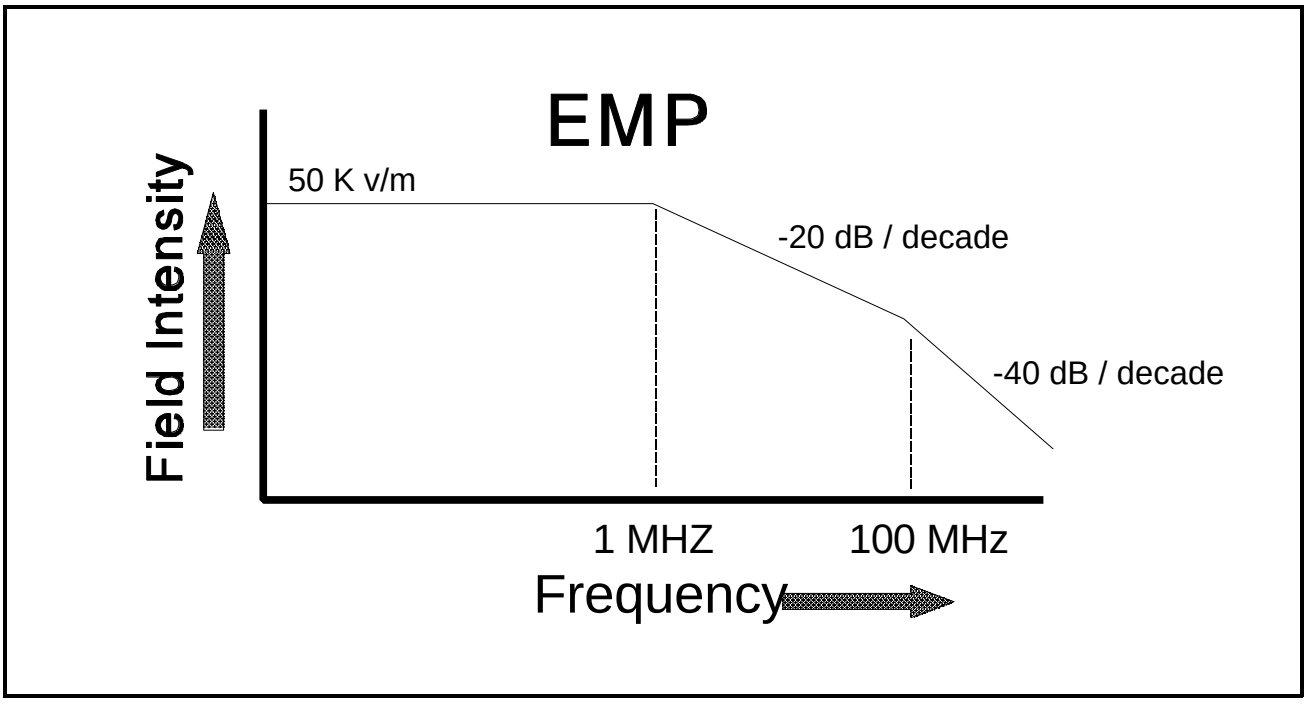

Figure 1. EMP as a Function of Frequency

Table 1. AIRCRAFT DIMENSIONS AND EQUIVALENT ANTENNA APERTURE

MISSION	AIRCRAFT TYPE	HEIGHT (ft.)	FREQUENCY (MHz)		LENGTH (ft.)	FREQUENCY (MHz)		WING SPAN (ft.)	FREQUENCY (MHz)	
		A	f	f/2	A	f	f/2	A	f	f/2
ATTACK	A-6C	15.58	63.16	31.58	54.58	18.03	9.02	53.0	18.57	9.29
	A-7E	16.00	61.50	30.75	46.07	21.36	10.68	38.73	25.41	12.71
	A-10	14.66	67.05	33.52	53.33	18.43	9.21	57.5	17.1	8.55
ELECTRONIC WARFARE	EA-6B	16.50	59.64	29.82	59.34	16.58	8.29	53.0	18.57	9.29
FIGHTER	F-4J	16.3	60.37	30.19	58.2	16.91	8.46	38.4	25.63	12.82
	F-14	16.0	61.50	30.75	62.0	15.87	7.94	64.1	15.33	7.67
	F-15	18.4	53.42	26.71	63.75	15.42	7.71	42.8	22.97	11.48
	F-16	16.66	59.00	29.5	49.25	19.96	9.98	31.0	31.71	15.85
	FA-18	15.3	64.31	32.16	56.0	17.57	8.79	40.70	24.18	12.09
	F-117	12.42	79.15	39.57	65.92	14.91	7.46	43.33	22.69	11.34
ASW	P-3C	33.75	29.16	14.58	116.42	8.45	4.23	99.67	9.87	4.94
	S-3A	22.75	43.25	21.63	54.34	18.45	9.23	68.67	14.33	7.17
	SH-3D	16.42	59.93	29.97	72.67	13.54	6.77	62.00	15.87	7.84
AEW	E-2C	18.4	53.48	26.74	56.50	17.42	8.71	80.58	12.21	6.11
V/STOL	OV-10A	15.0	65.60	32.80	41.58	23.67	11.84	40.0	24.60	12.30
	AV-8A	11.25	87.47	43.74	45.75	21.51	10.76	25.25	38.97	19.49
	AV-8B	11.64	84.45	42.23	46.3	21.23	10.62	30.3	32.44	16.22
	V-22	18.1	54.3	27.2	57.3	17.17	8.58	84.5	11.64	5.82
HELICOPTERS										
TROOP/CARGO TRANSPORT	CH-46D	16.75	58.75	29.38	84.34	11.67	5.84	50.0	19.68	9.84
	CH-53A	24.91	39.50	19.75	88.16	11.16	5.58	72.25	13.62	6.81
UTILITY	UH-1E	12.75	71.18	35.59	52.91	18.60	9.30	44.0	22.36	11.18
	UH-2A	15.41	63.85	31.93	52.5	18.74	9.37	44.0	22.36	11.18
TRANSPORT	C-2A	15.92	61.81	30.91	56.6	17.39	8.70	80.58	12.21	6.11
TANKERS	KC-130F	38.1	25.83	12.92	97.8	10.06	5.03	132.5	7.43	3.72
SPECIAL ELECTRONICS	EC-13OQ	38.5	25.56	12.78	99.34	9.91	4.96	132.58	7.42	3.71
TRAINER	T-2B	14.8	66.49	33.25	38.7	25.43	12.72	37.85	26.00	13.0
	T-39D	16.0	61.50	30.75	43.75	22.49	11.25	44.34	22.19	11.10
	TC-4C	23.34	42.16	21.08	67.9	14.49	7.25	78.34	12.56	6.28