

Lead-Acid Aircraft Batteries for Military Applications



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Outline

- Concorde History/Accomplishments
- Uses of Aircraft Batteries
- Types of Aircraft Batteries
- Overview of Concorde's VRLA Technology
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- Other Military Aircraft Batteries
- Bipolar Aircraft Batteries
- Summary



Concorde History / Accomplishments



- Founded in 1977 – 45 years of experience designing and manufacturing aircraft batteries
- Located in West Covina, CA (near Los Angeles)
- Concorde obtained first QPL approval of flooded lead-acid aircraft batteries in 1979
- Concorde's first FAA-PMA obtained in 1981 (CB Series)
- Concorde was the first company to QPL the sealed D8565/5-1 and D8565/5-2 in 1986
- Concorde's received FAA-PMA for its first sealed RG® Series aircraft battery in 1987
- Currently qualified for all part numbers in D8565 Series (except the /10-1 Nicad)
- Opened second manufacturing facility in 2015 in Austell, Georgia

Aircraft Batteries Are Used For:

- Engine Starting
 - Turbine Engines
 - Reciprocating Engines
- Emergency/Back-up Power
- Transient Fill-In Power
- DC Buss Regulation

Types of Aircraft Batteries

- Lead-Acid
 - Lowest Acquisition Cost
 - Lowest Maintenance Cost
 - Exempt from HazMat Shipping
- Ni-Cd
 - More Expensive
 - MUST Be Serviced Regularly
 - HazMat Shipping Required
- Li-Ion
 - Very Expensive
 - High Energy / Low Weight
 - HazMat Shipping Required
 - Safety Concerns

Description of Concorde's VRLA Technology

- Valve-Regulated Lead Acid (VRLA) Battery
 - Copper Terminals
 - Improve high rate discharge
 - Quick connect/disconnect
 - Intercell Connections
 - Over-the-partition connectors
 - Robust Shock and Vibration Tolerance
 - Electrodes
 - Quantity / surface area determine battery capacity
 - Thin plates for high rate discharge (engine starting)



Description of Concorde's VRLA Technology

- No free electrolyte (non-spillable)
 - Soaked into plates and AGM
- Oxygen from positive plate diffuses through AGM and recombines on negative plate
- Internal pressure is regulated by a pressure relief valve



Pressure Relief Valve (PRV)

D8565 Batteries QPL'd by Concorde

Battery Part No.	Capacity Rating	Aircraft Used On
D8565/1-2	1.5 Ah	CH-53, EA-6B, E-2C
D8565/3-3	15 Ah	CV-22A
D8565/4-1	10 Ah	F-117, F/A-18A/B/C/D, H-46
D8565/5-1	30 Ah	C-130, P-3
D8565/5-2	30 Ah	C-2, P-3
D8565/6-1	1.5 Ah	E-2C, V-22
D8565/7-2	24 Ah	AV-8B, TAV-8B, V-22, VH-60
D8565/8-1	15 Ah	T-45
D8565/9-1	24 Ah	T-34B/C
D8565/11-1	10 Ah	C-141, CH-47, F-5A/B/E, T-38
D8565/13-1	10 Ah	C-5, C-130J, KC-135, P-3
D8565/14-1	15 Ah	E-2D, F/A-18E/F
D8565/15-1	35 Ah	C-130J, KC-135
D8565/16-1	5 Ah	UH-60
D8565/17-1	0.33 Ah	EA-6B
D8565/18-1	10 Ah	F-5N
D8565/19-1	15 Ah	F-16 (Block 10/15/25/30)
D8565/20-1	17 Ah	F-16 (Block 40/50)



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Military Aircraft Batteries

Valve Regulated Sealed Lead Acid



P-3 Orion



D8565/5-1



D8565/5-2

C-130J Super Hercules



D8565/15-1

F-16 Fighting Falcon



D8565/19-1




D8565/20-1





Other Batteries for Military Aircraft



Non-Standard Battery				
	B-1B	6140-01-417-3244	15 Ah	10.5 x 8.78 x 6.4
		RG-B1B		50 lbs



Commercial Batteries				
	T-1A	RG-380E/40L	38 Ah	10.4 x 11.8 x 10.2
				84 lbs
	C-21	RG-380E/44K	42 Ah	10.4 x 11.7 x 10.2
				89 lbs



Bipolar Aircraft Batteries

- Concorde recently awarded a contract by DLA to demonstrate the feasibility of bipolar VRLA aircraft batteries
- Target Batteries: 5-1/5-2, 7-2, 11-1, 14-1, 15-1, 19-1, 20-1

Bipolar Aircraft Batteries

D8565 P/N	Max Wgt per MIL-SPEC (Lbs)	Standard Battery Wgt (Lbs)	Bipolar Battery Wgt (Lbs)	Battery Wgt Difference (BP vs STD)	Battery Wgt % Reduction (BP vs STD)
5-1	80.2	78.9	60.3	18.6	23.6
5-2	80.2	79.0	60.3	18.7	23.7
7-2	63.9	63.2	55.5	7.7	12.2
11-1	34.8	28.7	24.5	4.2	14.6
14-1	41.2	38.9	33.6	5.3	13.6
15-1	90.0	87.0	71.1	15.9	18.3
19-1	50.0*	46.2	39.7	6.5	14.1
20-1	50.0*	44.8	38.3	6.5	14.5

* Min. Wgt = 44.5

Summary

- VRLA Aircraft Batteries are in widespread use in Military Aircraft
- VRLA Aircraft Batteries provide:
 - High Reliability
 - Low Total Cost of Ownership
 - High Level of Safety
- No major shift away from VRLA is expected in the Near Term
- Bipolar VRLA aircraft batteries offer the potential for 12-24% weight savings versus standard VRLA aircraft batteries



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