

APPENDIX IV-A

ALVIN POWER EVOLUTION

Notes:

1. C/L is Cycle Life
2. WW is total Water Weight of battery tanks
3. Cost is for installed cells only, no spares for rotation

1964-1966

- Tanks: 3
- Cells: (75) 2v cells (Olympic)
- (30) 12v cells (Exide)
- Cap: 2v = 05ah, 12v=60ah (37.35kwh total)
- Volts: 30/30/60 (9.45kwh sci/6.3kwh cont./21.6kwh prop.)
- C/L: <50 cycles
- WW: 1600#
- Cost: ?

Comments:

1. As delivered design
2. Separate batteries for science, control and propulsion functions

1967-1985

- Tanks: 3
- Cells: (45) 6v batteries
- Cap: 150 ah (40.5 kwh total)
- Volts: 30/60 (13.5 kwh cont./27.0kwh prop.)
- C/L: >200 cycles
- WW: 1740#
- Cost: \$3,760

Comments:

1. Greater capacity
2. Simplified circuitry (science/control combined and prop)
3. Better tank design (less ground potential)
4. Common battery throughout
5. Longer life
6. Heavier batteries

1986-1987

- Tanks: 3
- Cells: (I 50) 225ah 2v cells, (I 5) 150ah 2v cells (Exide tubular)
- Cap: 450ah@120v propulsion/450ah@30v control/150ah@30v reserve (67.50kwh)
- Volts: 120/30/30 (54kwh propulsion, 13.5kwh control 4.5kwh reserve)
- C/L: >200
- WW: 3545#
- Cost: \$19,035

Comments:

1. Heavier batteries
2. Added -1 000# of foam flotation
3. Removed reserve steel ballast
4. Increased propulsion power
5. Changed propulsion to electric thrusters

1988

- Tanks: 3
- Cells: (I 50)200ah 2v cells (KW tubular plate), (I 5) 150ah 2v Exide tubular
- Cap: 400ah @120, 400ah@30v, 150ah@30v, (60.0kwh useable)
- Volts: 120/30/30 (48kwh propulsion/12kwh control/ 4.5kwh reserve)
- C/L: >200
- WW: 3145#
- Cost: \$8,721

Comments:

1. Exide source unreliable, changed to KW tubular plate
2. Increased payload
3. Decreased cost
4. Decreased propulsion power
5. Still have control/propulsion imbalance

1989

- Tanks: 2
- Cells: (120) 200ah 2v cells (KW tubular)
- Cap: 400ah @ 120v (48kwh useable)
- Volts: 120 (all useable as mission demands)
- C/L: >200
- WW: 2500#
- Cost: \$5,670

Comments:

1. Added 120vdc-24vdc converters to eliminate 30V battery requirement
2. Reduced weight
3. Reduced power
4. All power available as required

1991-present

- Tanks: 2
- Cells: (120) 190ah 2v cells (Douglas flat plate)
- Cap: 380ah@120v (45.6kwh useable)
- Volts: 120
- C/L: >200
- WW: 2900#
- Cost: \$7,169

Comments:

1. KW tubular plate stopped production (EPA), Douglas 190ah flat plate closest fit
2. 1991 design study of battery configuration alternatives (*Appendix A*)

3. Unsuccessful pressure tolerant controller effort to reduce weight for third battery
4. Increased weight
5. Reduced power
6. Instituted battery rotation program (four MO in service, not six MO) to maintain capacity.
7. Large equipment growth (cameras, HMI's, Mesotech, video equipment)

1997-Future options

	Trojan Pb	Cl Can. Pb	Saft NiCd	Ovonic NiMH
Tanks:	2	2	2	3
Cells:	(120)2v	(120)2v	(200)1.2v	(60)12v
AH/cell	260	180	208	90
Cap:	62.4kwh	43.2kwh	49.9kwh	64.8kwh
Volts:	120	120	120	120
CL:	>1000	>1000	>1000	>600
WW	2600	1950	2000	1400
Cost:	\$9,168	\$11,213	\$140,000	\$42,000
Risk:	low	low	high	very high