

DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE  
LITHIUM-ION BATTERY



Contract # N00014-94-C-0141  
ARPA Order # 9332004arp01/13 APR 1994/313ES

**DISTRIBUTION STATEMENT M**  
Approved for public release:  
Distribution Unlimited

19951017 102

R & D Status Report #5

Reporting Period: 16 February - 15 March, 1995

Submitted by:

The Electrofuel Manufacturing Company Inc.

# DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE LITHIUM-ION BATTERY

## R&D STATUS REPORT 1931-1005/0

ARPA Order No.: 9332004arp01/13APR1994/313ES  
Program Code No.: ARPA-BAA93-32  
Contractor: The Electrofuel Manufacturing Company Inc.  
Contract No.: N00014-94-C-0141 Contract Amount: \$1271728.  
Effective Date of Contract: August 15, 1994  
Expiration Date of Contract: February 14, 1996  
Principal Investigator: J.K. Jacobs  
Telephone No.: (800) 388-2865  
Short Title of Work: Lithium-ion Battery Development  
Reporting Period: February 16, 1995 to March 15, 1995

### Description of Progress:

Work continued on this battery on a number of critical areas. The electrolyte/solvent material is very expensive and is typically supplied in small quantities. The requirement for water content is very strict as well as for the presence of any organic impurities. A technique of purifying low cost technical grade electrolyte materials was developed by using zeolites. The water was analyzed by Karl Fisher titration, and the first treatment removed the water content to 50 ppm. A second treatment lowered the water content to below 10 ppm. These purified materials will be tested by using them in button cells.

A documentation was prepared which could be used to discuss the planar lithium ion battery with potential users for their design input and to stimulate discussion.

The prototype flexible manufacturing line construction is continuing and it is expected that the line will start operating by late June 1995. The line will have the features whereby it can produce cell with width varying from 1" to 8". Furthermore the flexible production line can make cells of any length, and it will also have the novel stacking procedure, whereby cells can be stacked without having the bulged edge effect (dog bone).

Various miscellaneous unit operations are also being constructed or assembled. These includes, various grinders, sieves for particle sizing etc.

<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Justification	
By <i>per attached</i> Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

Work on various handcrafted cells continue. Various thin electrode cells have been produced which mimic the cells to be produced from the flexible manufacturing line. These cells are being cycled to provide design data.

The cycle life of these cells appear to be high. After the initial fade in the first cycle, the fade almost stops, and the cells are expected to last over 1000 cycles, which is much greater than the number needed.

Change in Key Personnel: None

Summary of Substantive Information Derived from Special Events:  
None:

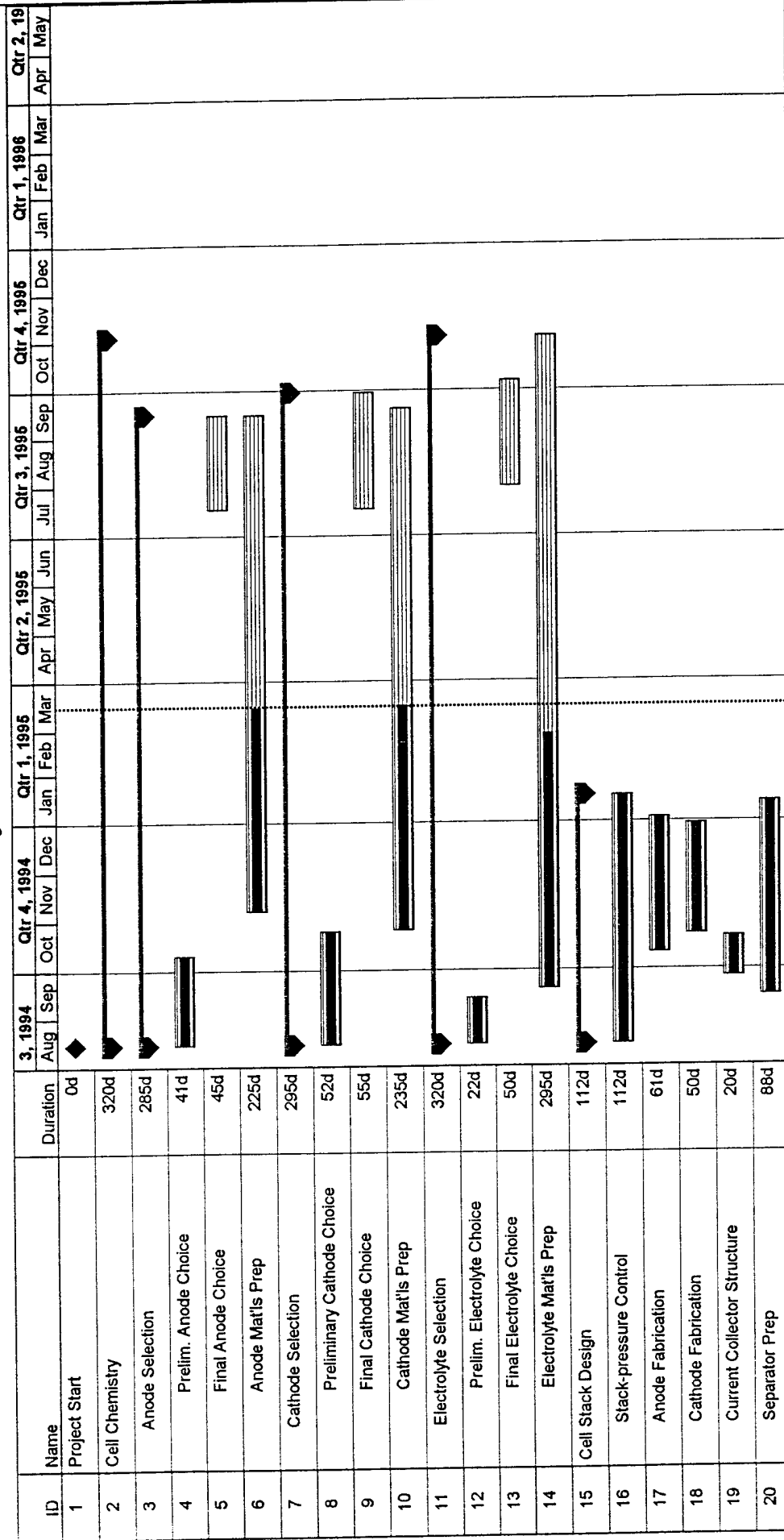
Problems Encountered and/or Anticipated: None

Action Required by the Government: None

Fiscal Status:

	Total Est- imate of Program	US Govt Funding Obliga- tion	Electro fuel Contri- bution
(1) Amt. currently provided on contract:	\$1630421	\$1271728	\$358693
(2) Expenses & commitments to date:	\$ 378318	\$ 295088	\$ 83230
(3) Funds required to complete work:	\$1252103	\$ 976640	\$275463

Figure 4: Gantt Chart



Project: Li-Ion Battery  
Date: 4/27/95







 Progress  
 Critical  
 Noncritical  
 Milestone  
 Summary  
 Rolled Up

Figure 4: Gantt Chart

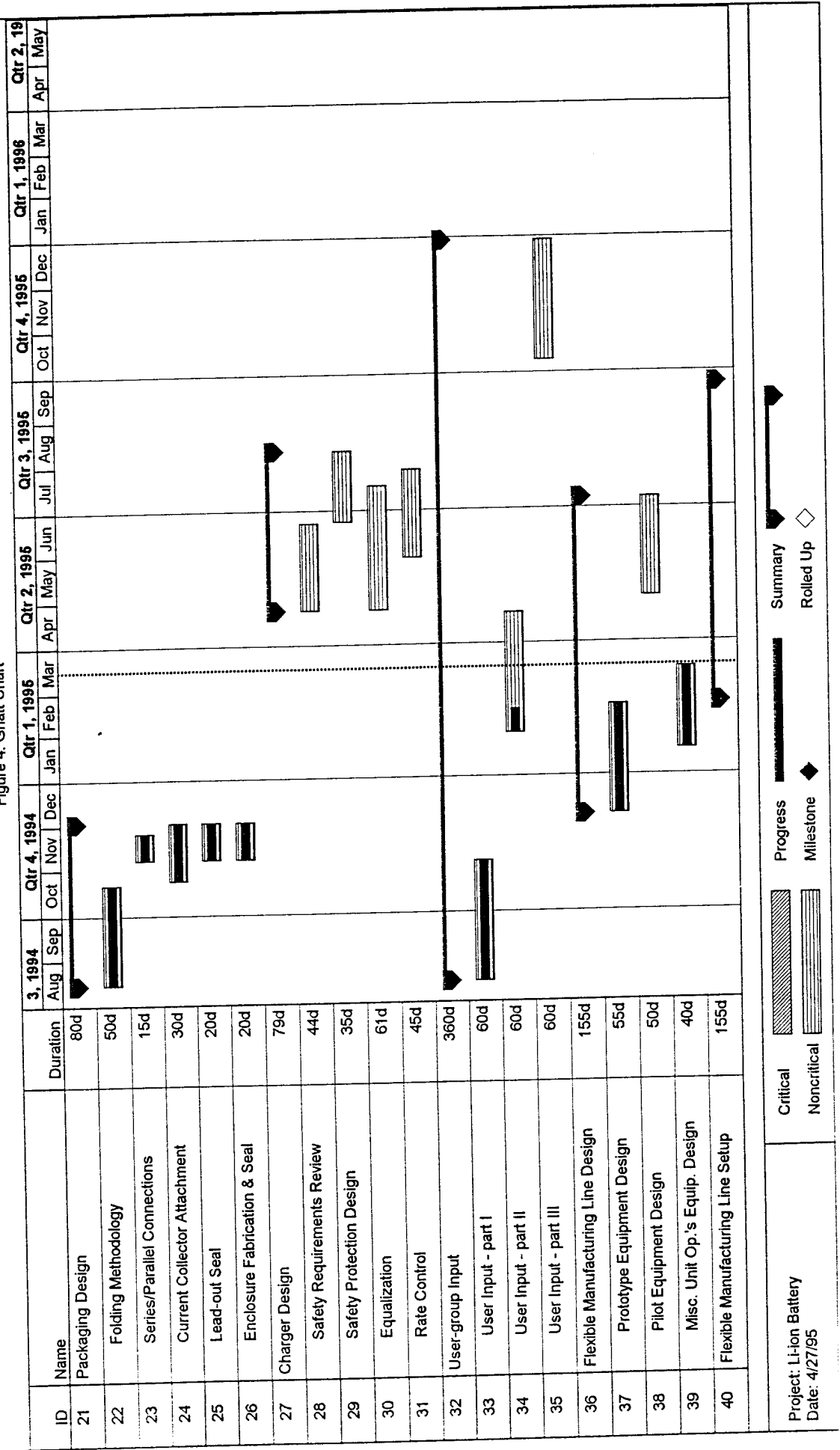
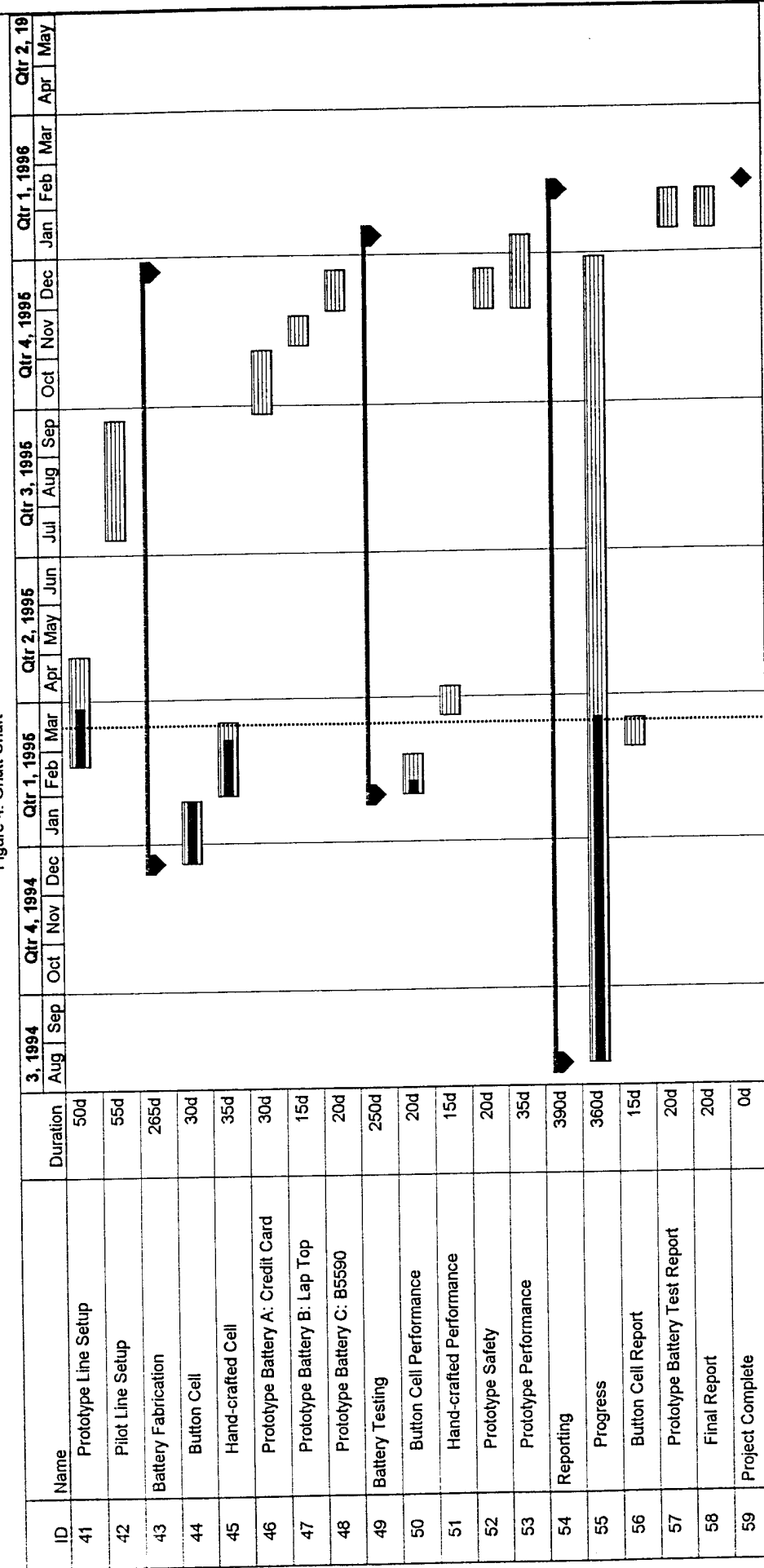


Figure 4: Gantt Chart



Project: Li-ion Battery  
Date: 4/27/95

Critical  
Noncritical

Progress  
Milestone

Summary  
Rolled Up