DURING LOW RATE TRICKLE CHARGING NICKEL-HYDROGEN BATTERY STATE OF CHARGE
CONT'D

Prelaunch Ambient Environment

Temperature during low rate trickle charging, in a simulated

Today's presentation addresses steady state battery capacity and

The 1995 ISECCEC Battery Workshop and low rate trickle charging was discussed at

The adiabatic charging technique was presented at the 1994 NASA

- Low rate trickle charging

- Adiabatic charging, and

Cooling, utilizing

The overall conclusion of these investigations is that high state

Launch operations, in the absence of active cooling

Nickel-hydrogen battery state of charge, during prelaunch and

The AXAF-I program has been investigating techniques for managing

BACKGROUND
BACKGROUND

PRELIMINARY AMBIENT ENVIRONMENT

TEMPERATURE DURING LOW RATE T0DAY'S PRESENTATION ADDRESS.

THE 1995 IECCE

BATTERY WORKSHOP AND LOW RATE

THE ADIABATIC CHARGING TECHNOLOGY

- LOW RATE TRICKLE CHARGING

- ADIABATIC CHARGING, AND

COOLING, UTILIZING

OF CHARGE CAN BE ACHIEVED AND

THE OVERALL CONCLUSION OF THESE

LAUNCH OPERATIONS, IN THE ABSENCE

NICKEL-HYDROGEN BATTERY STATE.

THE AXAF-I PROGRAM HAS BEEN INVI
OPERATIONS.

BATTERY WOULD EXPERIENCE IN THE SPACECRAFT. DURING MOUNTED IN A STRUCTURE SIMULATING THE THERMAL ENVIRONMENT CHARACTERSISTICS, WAS DESIGNED AND FABRICATED. THIS ACCORDINGLY A SIX-CELL MODULE, SIMULATING BATTERY TO THE AMBIENT AIR IS DIFFICULT TO MODEL.

HEAT TRANSFER FROM THE BATTERY, AS INTEGRATED INTO THE AXAF-1 BATTERY MOUNTING CONFIGURATION PROVIDES THE THERMAL ISOLATION IN TERMS OF CONDUCTIVE AND RADIA TRANSFER. BATTERY COOLING, IN THE PRELAUNCH ENVIRONMENT. BATTERY HEAT CAPACITY, DISSIPATION, AND COOLING.

PREDICTION OF BATTERY TEMPERATURE REQUIRE KNOWLEDGE OF CHARGE STATE OF BATTERY TEMPERATURE IS IMPORTANT THE ABILITY TO PREDICT BATTERY TEMPERATURE IS IMPORTANT.
<table>
<thead>
<tr>
<th>POSITIVE</th>
<th>PRECHARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1010</td>
<td>WEIGHT (gms)</td>
</tr>
<tr>
<td>AXIAL</td>
<td>TERMINAL CONFIGURATION</td>
</tr>
<tr>
<td>YES</td>
<td>STRAIN GAUGE</td>
</tr>
<tr>
<td>475</td>
<td>OPERATING PRESSURE (psi)</td>
</tr>
<tr>
<td>31</td>
<td>ELECTROLYTE (% final)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ZIRCAR, 2 LAYERS</th>
<th>SEPARATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.030&quot;, SLURRY</td>
<td>POSITIVE ELECTRODE</td>
</tr>
<tr>
<td>BACK-TO-BACK</td>
<td>STACK CONFIGURATION</td>
</tr>
<tr>
<td>30</td>
<td>RATED CAPACITY (Ah)</td>
</tr>
</tbody>
</table>

| RHN 30-9 | CELL PART NUMBER |

**Test Cell Definition**

Flight battery steady state thermal characteristics testing was performed on a six-cell module designed to simulate test articles.
Temperature Increase
C/500 Rate Trickle Charge
SELF DISCHARGE
OPEN CIRCUIT STAND
TRICKLE CHARGE RATE C/X

FUNCTION OF TRICKLE CHARGE RATE AND TEMPERATURE

STEADY STATE CAPACITY
Temperature Increase as a Function of Trickle Charge Rate

For these cells, 15% C/750 is the self-discharge rate.
SUMMARY

**Battery Temperature**

- Temperature fluctuations only a few degrees (F) higher than observed during periods of open circuit stand.
- Significant trickle charge rates (≈ C/500) result in battery discharge.
- Test results indicate:
  - Test setup simulating the anticipated axaf-1 environment has been determined experimentally, using a six-cell battery.
- Battery temperature increase due to low rate trickle charge.