EFFECTS OF KOH CONCENTRATIONS ON FAILURE MODES AND MECHANISMS OF NICKEL-HYDROGEN CELLS HAVE BEEN STUDIED USING LONG CYCLED BOILER PLATE CELLS CONTAINING ELECTROLYTES OF VARIOUS KOH CONCENTRATIONS RANGING 21 TO 36%. LIFE OF THESE CELLS WERE UP TO 40,000 CYCLES IN AN ACCELERATED LOW EARTH ORBIT (LEO) CYCLE REGIME AT 80% DEPTH OF DISCHARGE. AN INTERIM LIFE TEST RESULTS WERE REPORTED EARLIER IN J. POWER SOURCES, 22, 213-220, 1988. THE PRESENT REPORT WILL DISCUSS THE RESULTS OF FINAL LIFE TEST, END-OF-LIFE CELL PERFORMANCE, AND TEAR-DOWN ANALYSES. THESE TEAR-DOWN ANALYSES INCLUDED VISUAL OBSERVATIONS, MEASUREMENTS OF NICKEL ELECTRODE CAPACITY IN AN ELECTROLYTE-FLOODED CELL, DIMENSIONAL CHANGES OF CELL COMPONENTS, SEM STUDIES ON CELL CROSS SECTION, BET SURFACE AREA AND PORE VOLUME DISTRIBUTION IN CYCLED NICKEL ELECTRODES, AND CHEMICAL ANALYSES.

CYCLE LIFE OF A NICKEL-HYDROGEN CELL WAS IMPROVED TREMENDOUSLY AS KOH CONCENTRATION WAS DECREASED FROM 36 TO 31% AND FROM 31 TO 26% WHILE EFFECT OF FURTHER CONCENTRATION DECREASE WAS COMPLICATED AS DESCRIBED IN OUR EARLIER REPORT. FAILURE MODE OF HIGH CONCENTRATION (31 TO 36%) CELLS WAS GRADUAL CAPACITY DECREASE, WHILE THAT OF LOW CONCENTRATION (21 TO 26%) CELLS WAS MAINLY FORMATION OF A SOFT SHORT. LONG CYCLED (25,000 TO 40,000 CYCLES) NICKEL ELECTRODES WERE EXPANDED MORE THAN 50% OF THE INITIAL VALUE, BUT NO CORRELATION WAS FOUND BETWEEN THIS EXPANSION AND MEASURED CAPACITY. ALL ELECTRODES CYCLED IN LOW CONCENTRATION (21 TO 26%) CELLS HAD HIGHER CAPACITY THAN THOSE CYCLED IN HIGH CONCENTRATION (31 TO 36%) CELLS.