Replacement Of Main Aircraft Batteries In The Hu-25 Aircraft Essay, Research Paper

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INTRODUCTION: HU-25 AIRCRAFT MAIN DC BATTERY REPLACEMENT

In todays aircraft it is essential we utilize the latest technology to eliminate costly maintenance procedures, safety concerns, and still maintain reliable performing equipment. The Tesla Dry-Cell battery is a candidate to replace the SAFT 2376 Nickel Cadmium (NICAD) battery presently utilized in the HU-25 aircraft. The Tesla Dry-Cell battery can meet all of the performance specifications of the SAFT 2376 NICAD battery. The Tesla battery also provides additional long term dollar savings, maintenance man hour savings, and safety benefits that are substantial enough to be considered as a viable replacement.

METHODOLOGY FOR EVALUATING THE TESLA DRY-CELL BATTERY

In evaluating the Tesla Dry-Cell Battery to determine if it is a suitable replacement for the SAFT 2376 NICAD battery I used several methods of gathering information. To determine if it met the performance specifications required I utilized Technical manuals on each respective battery. To determine if the Tesla battery will provide substantial savings in cost, maintenance man hour expenditures and areas of safety. I utilized the Federal Stock System price data base, Coast Guard (CG) Aircraft Computerized Maintenance System (ACMS), Material Safety Data Sheet (MSDS), and technical publication NAVAIR 17-15BAD-1, (1991) . I also utilized The Telsa Industries Inc. TI4676 Micro Power Unit technical publication, (1998).

STUDY 1

Method

Subjects. National Stock system prices for both the SAFT 2376 NICAD and Tesla Dry-Cell Battery. USCG HU-25 Prime Unit personnel for information on form and fit requirements to switch to the Tesla battery. Reviewed ACMS

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historical data base for replacement parts cost data on the SAFT 2376 NICAD battery. A Tesla Industries representative provided tesla battery overhaul costs data.

Battery Unit Item Cost

SAFT 2376 NICAD each $848.00

Tesla Dry-Cell each $3,300.00

Cost for Tesla upgrade installation each $0.00

Battery Unit Replacement parts cost

SAFT 2376 NICAD

Cells(19 per battery) each $361.00

Misc each $75.00

Tesla Dry-Cell

Parts (none)

Overhaul each $300.00

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STUDY 2

Method

Subjects. Reviewed CG ACMS data base for maintenance man hours expended on SAFT NICAD batteries. Researched Tesla TI4676 Micro Power Unit (MPU) Dry-Cell battery technical manual for testing and troubleshooting procedures.

Aviation Training Center Mobile, AL Man/Hour cost analysis

Aircraft Year Total Man/Hours Hourly Rate Total Man/Hour Costs

HU-25 1998 886 $16.00 $14,176.00

HU-25 1997 860 $16.00 $13,760.00

HU-25 1996 914 $16.00 $14,624.00

Tesla TI4676 MPU Dry-Cell battery is a maintenance free battery

STUDY 3

METHOD

Subjects. Reviewed SAFT 2376 NICAD battery and Tesla TI4676 MPU Dry-Cell MSDS specification sheets and technical manual for each respective battery.

NICAD BATTERY

1. Cadmimum & Cadmium Hydroxide

2. Nickel & Nickel Hydroxide

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3. Potassium Hydroxide or Sodium Hydroxide

4. Cobalt Hydroxide

TESLA DRY-CELL BATTERY

1. No Hazardous Material

MSDS for the NICAD battery see appendix A.

DISCUSSION

Description of Batteries

The SAFT 2376 NICAD battery has been used in the HU-25 aircraft since 1981. It has been a reliable and competent battery. The objective for replaceing the NICAD battery is not due to a failing component or lack of parts in stock system to maintain them. It is a matter of newer technology that will provide an equivalent performance while eliminating maintenance man/hour costs, hazardous material, and safety concerns.

The Tesla TI4676 Micro Power Unit (MPU) Dry-Cell battery meets all specifications required for HU-25 aircraft main battery operation and meets or exceeds all performance characteristics of the NICAD battery. See appendix A for TI4676 MPU output voltage and maximum output current charts.

Study 1 lists data to support short and long term costs related to converting to the Tesla Dry-Cell battery. The initial cost to purchase seventy Tesla Dry-Cell batteries to support the Coast Guards fleet of 24 HU-25 aircraft and supply

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units with spares equivalent to the number presently in the system. This data shows that the initial cost to make the conversion will be very expensive costing $231,000. Tesla Industries Inc. stated that the Coast Guard would not need to have as many spare batteries in the HU-25 fleet as they could guarantee that when we sent a battery out for overhaul we would receive a replacement within 48 hours. This would have to be looked into further, but may allow a small savings on the initial purchase. Replacement part costs are also a reacurring expense that was looked at to determine if the Tesla battery would be subject to high costs in this area. The data shows that in this area costs are comparable and perhaps slightly lower for the Tesla Dry-Cell battery. This is an arbitrary conclusion though since no one can predict when either battery is going to fail. Tesla Industries Inc. provided the overhaul cost data and the NICAD battery parts cost were researched in the Federal Stock System data base.

Study 2 lists data to support long term costs related to maintenance man/hours. The Tesla battery is maintenance free if it fails it can be recharged in two to three minutes in the aircraft or in a shop in 1.25 hours using just standard 115VAC 60 Hz power. If the Tesla battery still fails after recharge it is sent to Tesla Industries Inc. for overhaul. The NICAD battery is much more labor intensive and my research of its maintenance history was done using the Coast Guard Aircraft Computerized Maintenance System data base records for one air station that is Aviation Training Center Mobile. While this is not a complete history of all units I did take records from over a three year period to ensure the numbers were consistent. I also did not include man/hours for removal/installation (since this is something the Tesla battery may be subject to, however I do not feel it would not occur at the same repetition) nor did I track hours it takes to deep cycle/recharge batteries when it is purely a function of a using an Automatic Reflex Charger – Analyzer and man/hours are not actually expended. The dollar costs for man/hours to maintain the NICAD battery is very expensive, for ATC Mobile

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which operates five HU-25 aircraft the one year costs for 1998 were $14,176.00. If I divided that number by five and then multiplied it by 24 the number of HU-25 aircraft in the fleet I come up with (2835.20 x 24) $68,044.80 as a annual cost for the entire fleet of HU-25 aircraft in the Coast Guard. It becomes clear that the initial purchase price of $231,000.00 to procure the Tesla batteries could be offset over a matter of three – four years. In addition to the dollar savings we would also have additional personnel man/hours that could now be utilized for other tasks if NICAD battery maintenance tasks were eliminated.

Study 3 lists data to support the elimination of hazardous materials and safety concerns associated with them. The Tesla battery being a Dry-Cell battery does not have nor create any hazardous materials. The NICAD battery has hazardous materials and is cited in appendix B on the Material Safety Data Sheet (MSDS). The MSDS lists all hazardous substances associated with the NICAD battery, related health hazards, special protection information, etc. Another safety concern associated with the hazardous material in a NICAD battery is Thermal Runaway. Thermal Runaway is a condition in which the current for a fully charged nickel-cadmium battery rises out of all proportion to the impressed voltage (NAVAIR 17-15BAD-1, 1991). In laymans terms a Thermal Runaway condition may occur due to low electrolyte level, electrolyte contaminants, etc in the NICAD battery which causes excessive heat build up. The excessive heat build up then causes the battery voltage to begin to drop and battery current then rises. If temperature continues to rise then you continue in a vicious cycle of voltage drop, current increase, temperature increase and it can lead to the battery exploding and being an explosion and fire hazard. In flight this may lead to a very dangerous emergency situation. The Tesla battery being a Dry-Cell type it is not capable of a thermal runaway condition, therefore this safety hazard would also be eliminated with the Tesla battery.

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In summary the replacement of the HU-25 main aircraft NICAD batteries with the Tesla TI4676 Micro Power Unit Dry-Cell battery is a step towards upgrading to the advanced technology available today. It would present a high initial procurement cost that would be offset by the reduction of maintenance man/hour costs related to battery maintenance. It also will free up personnel for other maintenance tasks. Additionally, The Tesla battery elimanates all hazardous material concerns and eliminates the possibility of a thermal runaway safety mishap. The next step to take would be to submit an Aircraft Configuration Control Board Item to request the purchase of four Tesla TI 4676 Micro Power Unit Dry-Cell batteries and install them into an HU-25 aircraft for a six month prototype evaluation.