Aircraft Enroute Command and Control
Comms Redesign Mechanical Documentation

by Steven P Callaway
NOTICES

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Aircraft Enroute Command and Control
Comms Redesign Mechanical Documentation

by Steven P Callaway

Computational and Information Sciences Directorate, ARL

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The Next Generation Joint Command and Control System pallet systems serves as an enroute command center, stowed in the rear of a C-17 or C-130 aircraft. They original system, designed by the US Army Research Laboratory had been used extensively and required updating. Based on customer specified requirements the uninterrupted power supply, frequency converter, DC power supply, and monitor mount were updated.
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1. Introduction

Joint Command and Control System (JC2S) pallets serve as a mobile command system for commanders. A single system is comprised of 3 463L aircraft pallets, loaded into the rear cargo area of a C-17 and C-130 aircraft. Two of the pallets, deemed planner’s pallets, feature 6 opposing desk stations on each pallet, for a total of 12 user stations in each system. Each desk station includes network, communications (comms), and power interfaces for each user to be able to conduct battle command while en route.

The third pallet, the comms pallet, is where all of the necessary comms and power equipment is secured. Custom racks, with 8 server rack bays, are mounted to the pallet, with 2 desk stations for equipment operators, responsible for keeping the comms equipment running as necessary during the mission.

The initial system, designed and fabricated at the US Army Research Laboratory (ARL), has served thousands of hours on hundreds of missions. After a long period of service, the customer wanted to update to newer equipment and eliminate unnecessary features, evident after the extensive field experience.

2. Mechanical Requirements

Three main mechanical subsystems were redesigned in the Next Generation JC2S (NG-JC2S) COMMS System: the uninterrupted power supply (UPS) and frequency converter, the DC power supplies, and the flat panel displays.

The UPS and frequency converter act as a battery backup and power conditioning for the network equipment. The frequency converter converts 115/200 V AC, 400-Hz, 3-phase aircraft power to 120 V AC, 60-Hz, single-phase power so that it can be used by conventional rack equipment. Equipment in the original system was larger and heavier than the new equipment selected for the NG-JC2S. Battery backup was required by the customer for specific network equipment in the event of a power interruption. The UPS and frequency converter were required to be mounted so that they could be easily removed by the user in the case of equipment failure.

The DC power supply sub system supplies 24 V DC power to the necessary equipment. The wiring for these power supplies needed to be shielded to protect the user, but also easily accessible for maintenance purposes. The equipment also needed to be easily removable in the event of equipment failure. Surplus rack space available in the NG-JC2S system allowed for a new power supply mounting
approach, making the equipment more easily serviceable and lowering the center of gravity of the system.

The flat panel displays, positioned off of the end of the comms pallet facing the Planner’s pallets, were upgraded in the NG-JC2S COMMS System from four 23 inch flat panel displays to two 26 inch flat panel displays and one 32 inch flat panel display. The displays needed to be mounted with an overall height no greater than 108 inches and inside the outer envelope of the pallet.

3. Drawing Package

The following drawing package (Table 1) was used for the fabrication of parts for the NG-JC2S COMMS System. The package was also consulted by ARL technicians for system assembly. The individual drawings are provided in the Appendix.

<table>
<thead>
<tr>
<th>SK549241 Falcon UPS Frequency Converter Bottom Mount</th>
<th>SK549243 DC P/S Mount</th>
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</thead>
<tbody>
<tr>
<td><strong>Dash No.</strong></td>
<td><strong>Drawing Title</strong></td>
</tr>
<tr>
<td>-11001</td>
<td>UPS Bottom Mount, Tray</td>
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<tr>
<td>-11002</td>
<td>UPS Bottom Mount, Rail Guide</td>
</tr>
<tr>
<td>-11003</td>
<td>UPS Bottom Mount, Crossmember</td>
</tr>
<tr>
<td>-11004</td>
<td>UPS Bottom Mount, Rear Block 2.1</td>
</tr>
<tr>
<td>-11005</td>
<td>UPS Bottom Mount, Rear Block 2.2</td>
</tr>
<tr>
<td>-11006</td>
<td>UPS Bottom Mount, Retainer Shim</td>
</tr>
<tr>
<td>-11007</td>
<td>Battery Hawker Bracket, Right</td>
</tr>
<tr>
<td>-11008</td>
<td>Battery Hawker Bracket, Left</td>
</tr>
<tr>
<td>-11009</td>
<td>Battery Hawker Bracket, Rear</td>
</tr>
</tbody>
</table>
Table 1  NG-JC2S COMMS System drawing package (continued)

<table>
<thead>
<tr>
<th>SK549265 Installation, Flat Panel Display</th>
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<tbody>
<tr>
<td><strong>Dash No.</strong></td>
</tr>
<tr>
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</tbody>
</table>

4. Conclusion

After extensive use, the JC2S pallet required updating. The NG-JC2S system was developed at ARL based on new requirements and specifications from the customer. Capabilities and equipment were either updated or eliminated based on the customers experience with the system. The UPS, frequency converter, DC power supply mount, and monitor mount were redesigned and updated. Initial system deployment is ongoing.
Appendix. NG-JC2S Comms System Drawings
1. MATERIAL: ALUMINUM RIGID-PLATE ARCHITECTURAL
   - L: CHANNEL, 2.00 x 2.00 x .500 MICRICAL
2. REMOVED ALL BURRS AND BREAK SHARP EDGES
3. CHEMICAL CONVERSION COATING RED N. & 0.50/4 CLASS 2, YELLOW

DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED:

TOLERANCES:
- .005
- .003
- .003
- .003

US ARMY RESEARCH LABORATORY
2900 MONARCH HILL ROAD
FORT PLEASANT, MD 20790

26 Inch Monitor Mount + Frame, Right

DRAWN BY: [Signature]
CHECKED BY: [Signature]
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.
1. MATERIAL: USE ALUMINIUM METAL SHEET STOCK, 0.030 IN. THICKNESS.
2. REMOVAL OF BURRS AND BURR REMOVAL:
3. ALL BEND RADIUS TO BE 1.00 IN. UNLESS OTHERWISE NOTED.
4. CHEMICAL CONVERSION COATING PER MIL-C-68507 CLASS 5, YELLOW.
1. MATERIAL: USE ALUMINUM BILLET ALLOY TUBE STOCK, 1.00 OD x 0.065 WALL, THICKNESS.

2. REMOVE ALL BURRS AND düNE KAMP BEAKS.

3. CHEMICAL CONVERSION COATING PER MIL-STD 814 CLASS 3, YELLOW.
NOTES:
1) MATERIAL: 6061 T6 ALUMINUM ALLOY ARCHITECTURAL
   L: CHANNEL 2 X 2.38 X .200 MPUMLE
2) REMOVE ALL BURRS AND BREAK SHARP EDGES
   3) CHEMICAL CONVERSION COATING PER MIL-F-85415 CLASS 3; YELLOW

DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED.

TOLERANCES:
    .001 (.01) OVER .003 (.03) UNLESS OTHERWISE NOTED.

32 INCH MONITOR MOUNT - FRAME, LEFT

US ARMY RESEARCH LABORATORY
2800 MONROE FELL ROAD
ANNAPOLIS, MD 21402

DATE: 1302

DRAWN: C. J. C. 1302

CHECKED: C. J. C. 1302

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.
1) MATERIAL: ALUMINUM 6061 T6 ALLOY ARCHITECTURAL
2) CHANNEL, 200 X 2.89 X 0.20 MILD STEEL
3) REMOVE ALL BURRS AND EXCESS GAP BEADS
4) CHEMICAL CONVERSION COATING RED ENV 6006 CLASS 3 YELLOW

DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED
TOLERANCES
0.02 TO 0.03
PLUS OR MINUS 0.005 UNLESS OTHERWISE NOTED

32 Inch Monitor Mount - Frame, Right

US ARMY RESEARCH LABORATORY
2800 MONROE ROAD
ADELPHI, MD 20783-1303

SHEET 1 OF 4
NOTES:
1. MATERIAL: USE ALUMINUM ALLOY SHEET STOCK, 0.035 THICKNESS
2. REMOVE ALL BURRS AND CLEAN EDGE ROUGHNESS
3. CHEMICAL CONVERSION COATING PER MIL-C-55411, CLASS 1, YELLOW
1. MATERIAL USE ALUMINUM FOR 6061-T6 STOCK, 0.120 THICKNESS.
2. REMOVE ALL BURRS AND BREAT ORNATE EDGES.
3. ALL BEND RADII TO MEASURE 0.10 UNLESS OTHERWISE NOTED.
4. CHEMICAL CONVERSION COATINGS PER MIL-C-16449, CLASS 5, YELLOW.

- Dimensions in inches, unless otherwise noted.
- TOLERANCES: ±0.01, +0.005, -0.005, UNLESS OTHERWISE NOTED.

US ARMY RESEARCH LABORATORY
3800 PORTER HILL ROAD
ANNAPOLIS, MD 21402

Report Date: 37 Inch Monitor Mount - Lower Vertical Support
Prepared by: [Redacted]

[Signature]
[Name]

Distribution A
Approved for public release; distribution unlimited.
1. Attach bracket to lower vertical support using 3-1/2" sheet metal fasteners, 6-32 UNF, 32 places.
1. MATERIAL: USE ALUMINUM BILLET ALLOY SHEET STOCK, HR 2000.
2. REMOVE ALL BURRS AND BULKER SNARE EDGES.
3. CHEMICAL CONVERSION COATING PER MIL-0-20731, CLASS 3, YELLOW.

Dimensions in Inches, Unless Otherwise Noted.

Tolerances: .02 -.33, .02 -.34, .02 -.35, Unless Otherwise Noted.
1) MATERIAL: ALUMINUM ALLOY.
2) CHANNEL: 300 x 0.03 x 325 MICRO.
3) REMOVE ALL BURRS AND BURR SHAPED EDGE.
4) CHEMICAL CONVERSION COATING RED NO. 654 GLASS 5666 YELLOW.
1. MATERIAL: use aluminum 6061-T651 sheet stock, as thickness.
2. REMOVE all BURRS and BREAK SHARP EDGES.
3. CHEMICAL CONVERSION COATING in MIL-C-81703 TYPE III, YELLOW.
NOTES:
1. MATERIAL: USE ALUMINUM ALLOY SHEET STOCK, .060 THICKNESS
2. REMOVE ALL BURRS AND BRUSH SHARP EDGES
3. CHEMICAL CONVERSION COATING PER MIL-C-8563 TYPE E, YELLOW
1. MATERIAL: USE ALUMINUM ALLOY RECTANGULAR TUBE.
   SIZE X 0.375 X 0.125 WALL THICKNESS WITH SQUARE CORNERS

2. REMOVE ALL BURRS AND BEND SHARP EDGES
NOTES:
1. MATERIAL: USE POLYCARBONATE (KIRK SHEET) STOCK, CLEAR, .08 THICKNESS
2. REMOVE ALL BURRS AND BREAK SHARP EDGES
3. ALL BEND RADII TO MEASURE .08 UNLESS OTHERWISE NOTED
NOTES:
1. MATERIAL USE ALUMINUM 2024 ALLOY BAR STOCK, .25 TOLERANCE
2. REMOVE ALL BURRS AND BREAK SHARP EDGES
3. ANODIZE PER MIL-D-85255, BLACK, LUSTERLESS
4. DIMENSIONAL TOLERANCES APPLY AFTER ANODIC FINISH

DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED
TOLERANCES .005, .01, .025, UNLESS OTHERWISE NOTED

3/4 CYP 5/16-24 - Power Supply Plate Retainer

US ARMY RESEARCH LABORATORY
2800 MONROE HILL ROAD
ARMY RESEARCH LABS

DT
date

REV.
revision

Sweet
print

Sheet 1 of 4
NOTE:
1. MATERIAL: USE ALUMINUM WIRE ALLOY STOCK, .023 THICKNESS
2. REMOVE ALL BURRS AND BREAK SHARP EDGES
3. ALL BEND RADIUS TO MEASURE .125 UNLESS OTHERWISE NOTED
4. CHEMICAL CONVERSION COATING PER MIL-C-8408 TYPE E

DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

US ARMY RESEARCH LABORATORY
2800 MONROE MILL ROAD
ANDERSON, SC 29625

ASSISTANT
C

PRINTED: 10/24/94

0650-49243-1061
1. MATERIAL: USE ALUMINUM 2014-T31 ALLOY COLD FINISHED ROD
   STOCK, 1/8" DIAMETER.

2. REMOVE ALL BURRS AND BREAK SHARP EDGES.

3. CHEMICAL CONVERSION COATING PER MIL-STD-1314, CLASS 3, YELLOW.
1. MATERIAL: USE 0.010 SHEET STOCK, 201 TREATED, BLACK

2. REMOVE ALL BURRS AND BRAKE SHARP EDGES
1. MATERIAL: USE ALUMINUM I BE ROLL STOCK, .050 THICKNESS

2. REMOVE ALL BURRS AND BREAK SHARP EDGES

3. CHEMICAL CONVERSION COATING PER MIL-C-5545 TYPE II

DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED

TOLERANCES
2E ±.01
.005 ±.003
UNLESS OTHERWISE NOTED
1. MATERIAL: ALUMINUM ALLOY BAR STOCK, 0.060 THICKNESS
2. REMOVE ALL BURRS AND BREAK SHARP EDGES
3. CHEMICAL CONVERSION COATING PER MIL-C-51414 TYPE D
NOTES:

1. MATERIAL: USE ALUMINUM ALLOY BAR STOCK, 3/8" THICKNESS

2. REMOVE ALL BURRS AND BURP SHARP EDGES

3. CHEMICAL CONVERSION COATING PER MIL-C-55174 TYPE I D
INTENTIONALLY LEFT BLANK.