



**DEPARTMENT OF THE AIR FORCE  
AIR FORCE INSTITUTE FOR OPERATIONAL HEALTH (AFMC)  
BROOKS CITY-BASE TEXAS**

22 May 2007

MEMORANDUM FOR RSW/BSSG

ATTN: MR MIKE TAPPAN  
2640 LOOP ROAD WEST, BLDG 557  
WRIGHT- PATTERSON AFB OH 45433-7106

FROM: AFIOH/SDR  
2350 Gillingham Drive  
Brooks City-Base TX 78235-5103

SUBJECT: Consult Letter, IOH-SD-BR-CL-2007-0074, Follow Up Radio Frequency Radiation Hazard Survey for the Compass Call Electronic Counter Measure Systems, Tail Number 73-1588.

1. Introduction:

a. RSW/BSSG, Wright-Patterson AFB OH tasked the Air Force Institute for Operational Health, Radiation Surveillance Division, Health Physics Consulting Branch (AFIOH/SDRH) to measure the radio frequency (RF) power densities generated by the EC-130H Compass Call aircraft in-flight and on the ground. The ground measurements were accomplished and reported in the 4 Jun 06 consult letter, IOH-SD-BR-CL-2006-0043, Radio Frequency Radiation Hazard Survey for the Compass Call Electronic Counter Measure Systems.

b. Capt Piper Williams and SSgt Nyaunuwi Brown performed the in-flight portion of the radio frequency radiation survey from 5-9 Mar 07 at Fort Huachuca AZ. (See Attachment 1 for instrumentation used) The purpose of the survey was to measure both electric field (E-Field) and magnetic field (H-Field) power densities generated by the different Electronic Counter Measure transmitters installed on the aircraft. These emitters included the UST-105, low band, mid band, high band and Special Purpose Emitter Array (SPEAR) systems. Power densities did not exceed the controlled Permissible Exposure Limit (PEL) of  $1.0 \text{ mW/cm}^2$  in areas of occupancy. However, some measurements along the seam of the cargo bay floor ramp did exceed the PEL.

2. Background:

a. Air Force Occupational Safety and Health Standard (AFOSH STD) 48-9 *Radio Frequency Radiation (RFR) Safety Program*, establishes PELs for all sources of RF owned and operated by the US Air Force (USAF) or under USAF control.

b. The Compass Call aircraft is an EC-130H consisting of an Offensive Counter Information (OCI) platform weapon system that performs electronic attack to deny, disrupt, or degrade adversary Command, Control and Communications (C3) systems. Recent upgrades to the system include the following: 1) a new operating system; CCOS V3.1, 2) new Mid-Band Antenna and corresponding transmitter power change, 3) a dual band SPEAR transmitter, 4) and extended and overlapping frequency ranges to increase target capability.

### 3. Methodology:

a. Radio frequency measurements were taken to determine if any leakage was present. The areas of concern included the following: 1) mission crew positions in the cargo compartment, 2) the flight deck, 3) transmit equipment racks, 4) transmission lines, 5) the general vicinity where transmission lines exit the fuselage, 6) paratrooper doors, and 7) cargo bays. (Atch 2) These areas were selected based on regular occupancy of crew members during flights.

b. Each RFR emitter transmitted a frequency within its optimal range that resulted in the most conservative PEL while at maximum power. All emitters were broadcast simultaneously to create a worst-case scenario because of the limited available survey time. Measurements were taken at each survey location during transmission. Additional E-Field and H-Field power densities were measured on the ground while the mid band transmitter radiated at maximum power. It was not functioning at maximum power during the original survey.

### 4. Results:

a. No RFR leakage was detected from the equipment racks or transmission lines within the aircraft.

b. Although a few power density measurements were above background, none exceeded the controlled PEL of  $1.0 \text{ mW/cm}^2$  at the aircrew locations.

c. As referred to in the previous survey "Consult Letter, IOH-SD-BR-CL-2006-0043, Radio Frequency Radiation Hazard Survey for the Compass Call Electronic Counter Measure", the paratrooper doors and the seam of the cargo bay floor-ramp threshold had elevated readings when probes were in contact with or inserted into the hinges around the seams. Elevated readings are defined as power densities above background. Since the hinges are not large enough to insert anything larger than a hand, at the most the crew members may potentially receive a partial body exposure. Due to time constraints, the elevated readings taken at the seam of the cargo bay floor-ramp threshold were not narrowed down to a specific antenna(s). The scenario was replicated on the ground but similar elevated readings were not indicated. Attachment 3 contains photos with detailed measurement results.

5. Recommendations:

a. Personnel should not touch or grab any transmission line while transmitting.

b. If changes are made to the standard operating procedures, in which personnel are required to work along the cargo bay floor, or, if there are any changes to the emitters, a survey should be conducted by qualified personnel. Otherwise, additional testing of the current system is not required.

6. If you have any questions, please contact SSgt Nyaunuwi Brown at DSN 240-5571, send an email to Nyaunuwi.Brown@brooks.af.mil, or call the ESOH Service Center at 1-888-232-ESOH. To assist us in improving our services, please complete and return the attached critique form. (Atch 4)

//signed//

SCOTT M. NICHELSON, Lt Col, USAF, BSC, CHP, CIH  
Chief, Radiation Surveillance Division

Attachments:

1. Personnel Contacted and Instruments Used
2. Seating and Measurement Locations
3. Locations of Hot Spots on EC-130H, Tail Number 73-1588
4. Critique

Attachment 1  
Personnel Contacted and Instruments Used

**Personnel Contacted:**

Louis Winder, Project Manager  
Det 4 645 MATS, L-3 Communications, Waco, TX

**Instrumentation Used:**

Narda Meter: 8715, SN 20014, Cal Date Due Feb 08

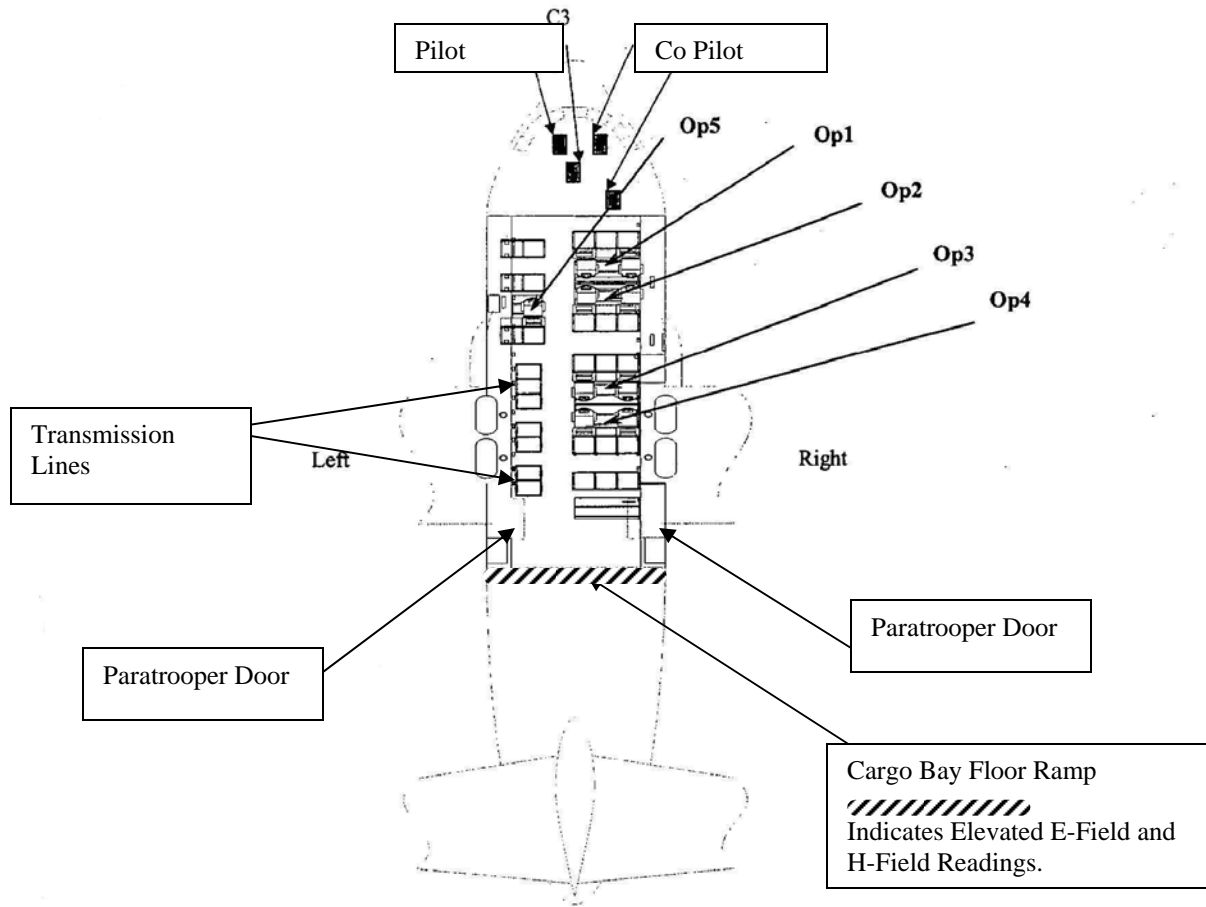
Narda Probes: (E-Field) 8723D, SN 18202, Cal Date Due Feb 08

Narda Meter: 8715, SN 20015, Cal Date Due Feb 08

Narda Probes: (E-Field) 8764D, SN 09004 and 8723D, SN 18018, Cal Date Due Feb 08  
(H-Field) 8733D, SN 15007 and 8752D, SN 09010, Cal Date Due Feb 08

Attachment 2

Seating and Measurement Locations



Attachment 3

Locations of Hot Spots on EC-130H, Tail Number 73-1588

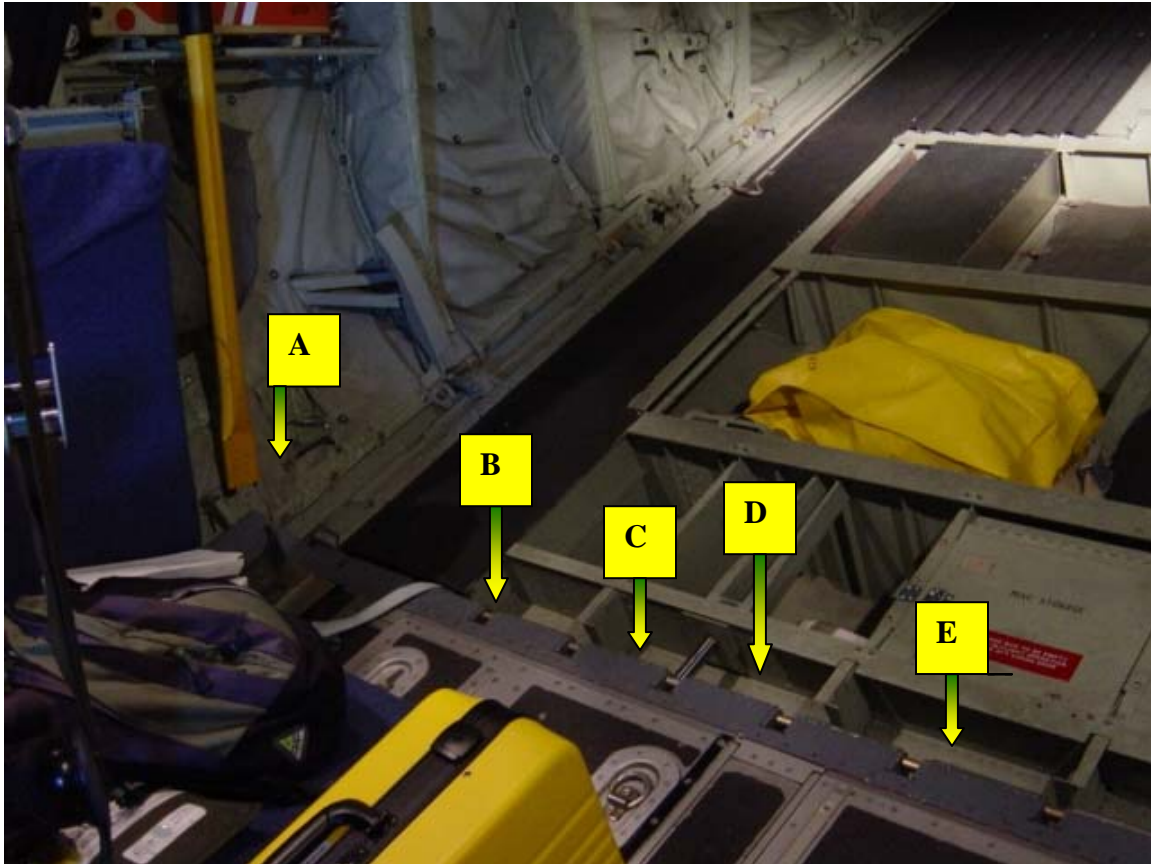


Figure 1. Left Side of Rear Cargo Bay Floor Seam

Location	H-Field Readings (mW/cm <sup>2</sup> )	Location
A	34	6" above corner seam
B	9	Inside seam
C	8	Inside seam
D	7	Inside seam
E	2	Inside seam

Distance	E-Field Readings Range (mW/cm <sup>2</sup> )	Maximum Reading (mW/cm <sup>2</sup> )
6" Above Seam	0.1	0.1
Flush with Seam	0.2-2	2
Inside Seam	2-10	10

E Field readings were constant along entire length of cargo floor seam.

Attachment 3

Locations of Hot Spots on EC-130H, Tail Number 73-1588

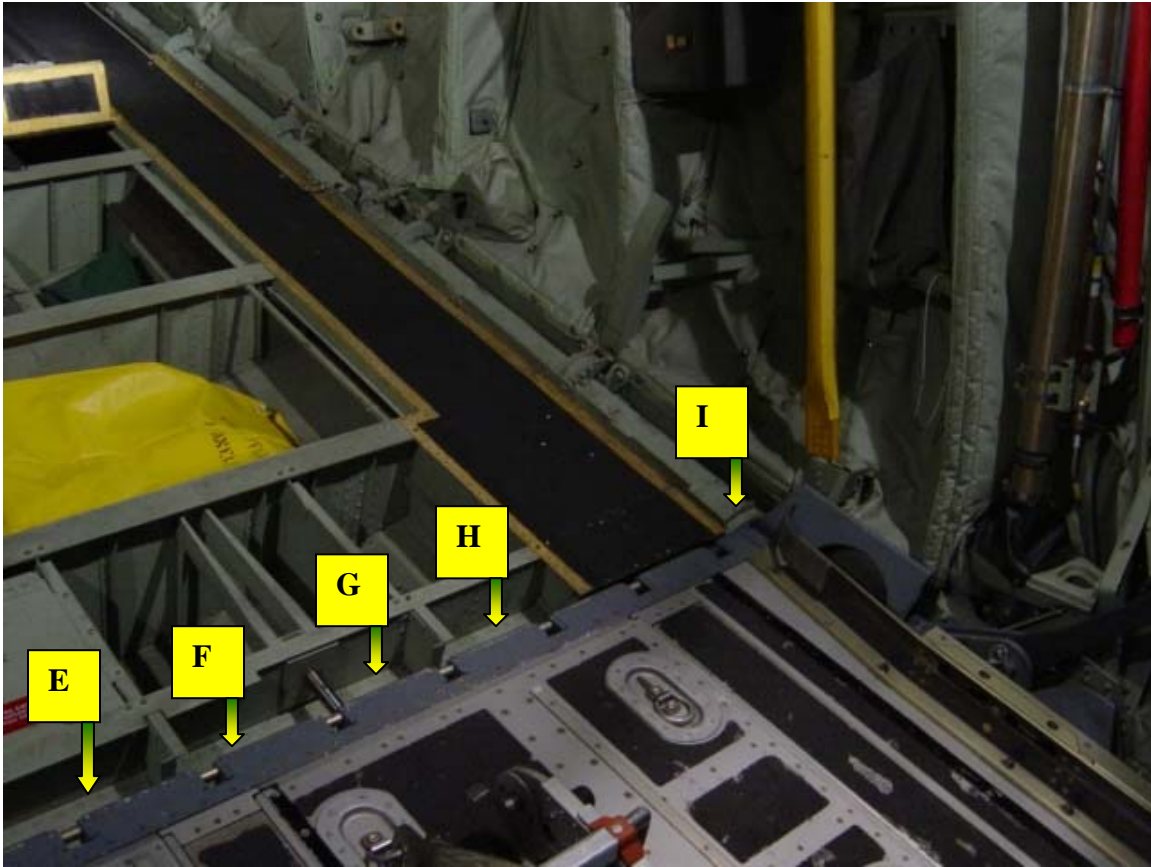


Figure 2. Right Side of Rear Cargo Bay Floor Seam

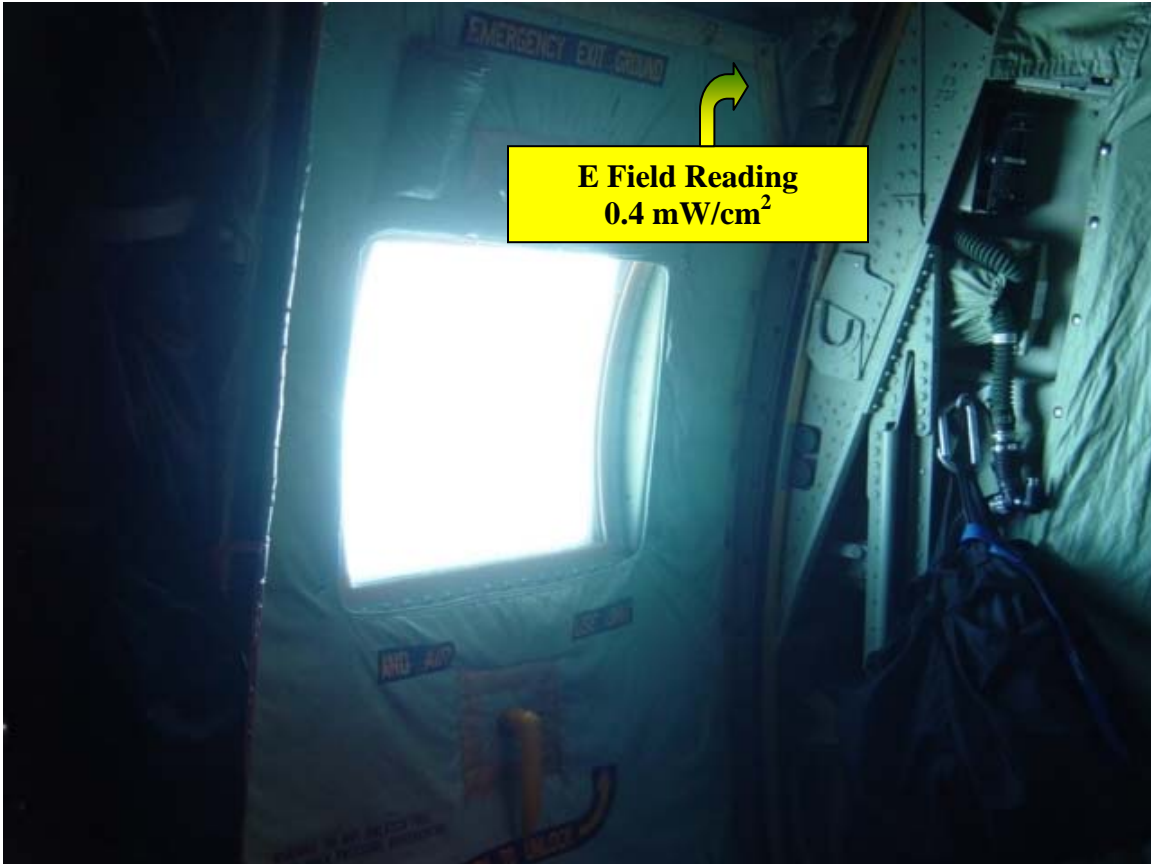
Location	H-Field Reading (mW/cm <sup>2</sup> )	Location
E	2	Inside seam
F	7	Inside seam
G	8	Inside seam
H	10	Inside seam
I	45	Corner Seam

Distance	E-Field Readings Range (mW/cm <sup>2</sup> )	Maximum Reading (mW/cm <sup>2</sup> )
6" Above Seam	0.1	0.1
Flush with Seam	0.2-2	2
Inside Seam	2-10	10

E Field readings were constant along entire length of cargo floor seam.

Attachment 3

Locations of Hot Spots on EC-130H, Tail Number 73-1588



**Figure 3. Paratrooper Door**

The E-Field reading was above background; however, the  $1.0 \text{ mW/cm}^2$  PEL was not exceeded.

Attachment 4

<b>POINT OF CONTACT:</b>	<b>SSgt Nyaunuwi Y. Brown</b>	<b>BASE NAME:</b>	<b>Brooks City-Base</b>
<b>POC PHONE:</b>	<b>DSN 240-5571</b>	<b>DIVISION:</b>	<b>AFIOH/SDRH</b>
<b>STINFO NUMBERS:</b>	<b>IOH-SD-BR-CL-2007-0074</b>		

This survey is used to help us improve our service to you. Your answer will be held in confidence and will significantly impact on how we allocate resources to meet your needs. Please return this completed form promptly.

**Grading Scale:**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Slightly Satisfied	Satisfied	Extremely Satisfied

A	Timeliness: Did you receive your results within the published time limits?	1	2	3	4	5	6
B	Accuracy: Is the report in the proper format? Are your address and other data correct?	1	2	3	4	5	6
C	Content: Does the report answer your questions and provide the necessary data? Are our services per dollar adequate when compared to civilian sector?	1	2	3	4	5	6
D	Customer Support: Have we been courteous and helpful in meeting your special needs (priority service, reporting, format, etc.)?	1	2	3	4	5	6
E	Consult Service: Have we answered your questions and provided necessary materials or reviewed to support your mission requirements?	1	2	3	4	5	6
F	Overall Rating: How would you rate our overall service to you?	1	2	3	4	5	6

**Comments / Suggestions:** Are there other services that you would like provided in the future? Are there any specifics of your current service you would like to discuss? (Use additional pages if more space is required)

**Please return to:**

AFIOH/SDR  
 Attention: Lt Col Scott M. Nichelson  
 Chief, Radiation Surveillance Division  
 2350 Gillingham Drive  
 Brooks City-Base TX 78235-5103