

INTRODUCTION

Early in 1998, ARINC went on line with the first station of a planned global network for HF Data Link (HF DL) to provide a long range data link communication service for commercial aircraft. These follow several years of trial operation and data collection with a 3 station prototype network, and also years of work on industry standards as documented in ARINC specifications 635 and 753. Roughly 16 to 19 stations are planned to go on line in the next 2 years, to establish global coverage.

Several Airlines have shown strong interest in HF DL and several have participated in the trials. HF DL is viewed as a potential low-cost alternative and/or complement to SATCOM data link, for both non-essential and critical communications. Actual data link performance however remains unknown and its approveability for critical data link communications will remain in question until further work is done to validate and/or improve its performance.

PURPOSE

For the reasons mentioned above, Boeing plans to set up an HF DL radio station facility for development testing and performance evaluations. This radio station installation will also support FAA certification activities on all Boeing commercial aircraft. Current program commitments require Boeing to begin testing activities in the 4th quarter of '98. Subsequent evaluations are expected to continue off-and-on for the next 3 to 5 years.

SPECTRUM PLANNING INFORMATION

Transmitter Frequency Band

Frequency: 2.000 to 30.0000 MHz
 Channel Spacing: 1.0 KHz
 Channel Bandwidth 2.15 KHz
 Mode: Single Side Band Suppressed Carrier

The actual frequency used by the system is determined automatically by the system. It will only operate on frequencies on which it can hear valid data link traffic from HF data link ground stations. This effectively limits its use to those frequencies within the band above, which have already been allocated for HF data link purposes. Although capable of HF voice communication there is currently no intention to transmit any voice traffic from the radio station.

RF Power Output

Transceiver output = +26 dBW. max
 EIRP = +26 dBW - 2 dB (Cable loss) + 5 dBi (max ant gain) = +29 dBW (Mean)

Antenna

The antenna used will be a vertical monopole with a length of 24 feet. The horizontal radiation pattern of the antenna will be omni-directional. Peak antenna gain is typically 5 dBi at all azimuth angles. This is the estimated gain approximately between 0 and 10 degrees elevation. The gain begins to roll off at 10 degrees elevation and above 60 degrees elevation is more than 25 dB lower than the peak gain.

Emission Type

The emission types as listed in Table 1 below will be used. Refer to FCC rule making reports section 2.201 emission type definitions.

| Emission Type | Modulation Type | Symbol Rate |
|---------------|-----------------|-------------|
| 2K40G1D | 2-PSK | 150 |
| 2K40G1D | 2-PSK | 300 |
| 2K40G1D | 2-PSK | 600 |
| 2K40G1D | 4-PSK | 1200 |
| 2K40G1D | 8-PSK | 1800 |

Table 6 Emission Types

Site Data

The antenna will be located on the roof of Building 36 (3 story building) and will extend 24 ft above the existing structure. The transmitter and associated equipment will be located on the 2nd floor of building 36 directly below the antenna in an existing laboratory facility.

TECHNICAL DESCRIPTION

The radio station will be identical to the airborne equipment (except for the antenna) but will be installed in a fixed based laboratory facility. The installation will be in compliance with ARINC (Aeronautical Radio Incorporated) characteristics 753 "High Frequency Data link (HF DL) System" and 635 "HF Data Link Protocols" as developed for long-range digital communications for commercial aircraft.

Figure 1 below is a block diagram of the radio station installation. The installation can be implemented with either Collins or AlliedSignal equipment as listed in Table 1 below.

| Quantity | Description | Manufacturer | Type or Part Number |
|----------|---------------|--------------------------|------------------------------|
| 2 | HF Data Radio | Collins or Allied Signal | 822-0990-002 or 964-0452-012 |
| 2 | HF Coupler | Collins or Allied Signal | 822-0987-002 or 964-0453-011 |
| 1 | HF Antenna | Collins | Vertical Monopole |

Table 7 Radio Station Equipment Utilization

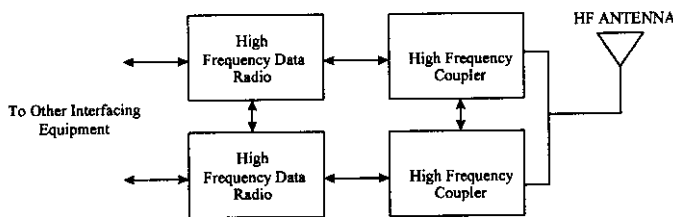
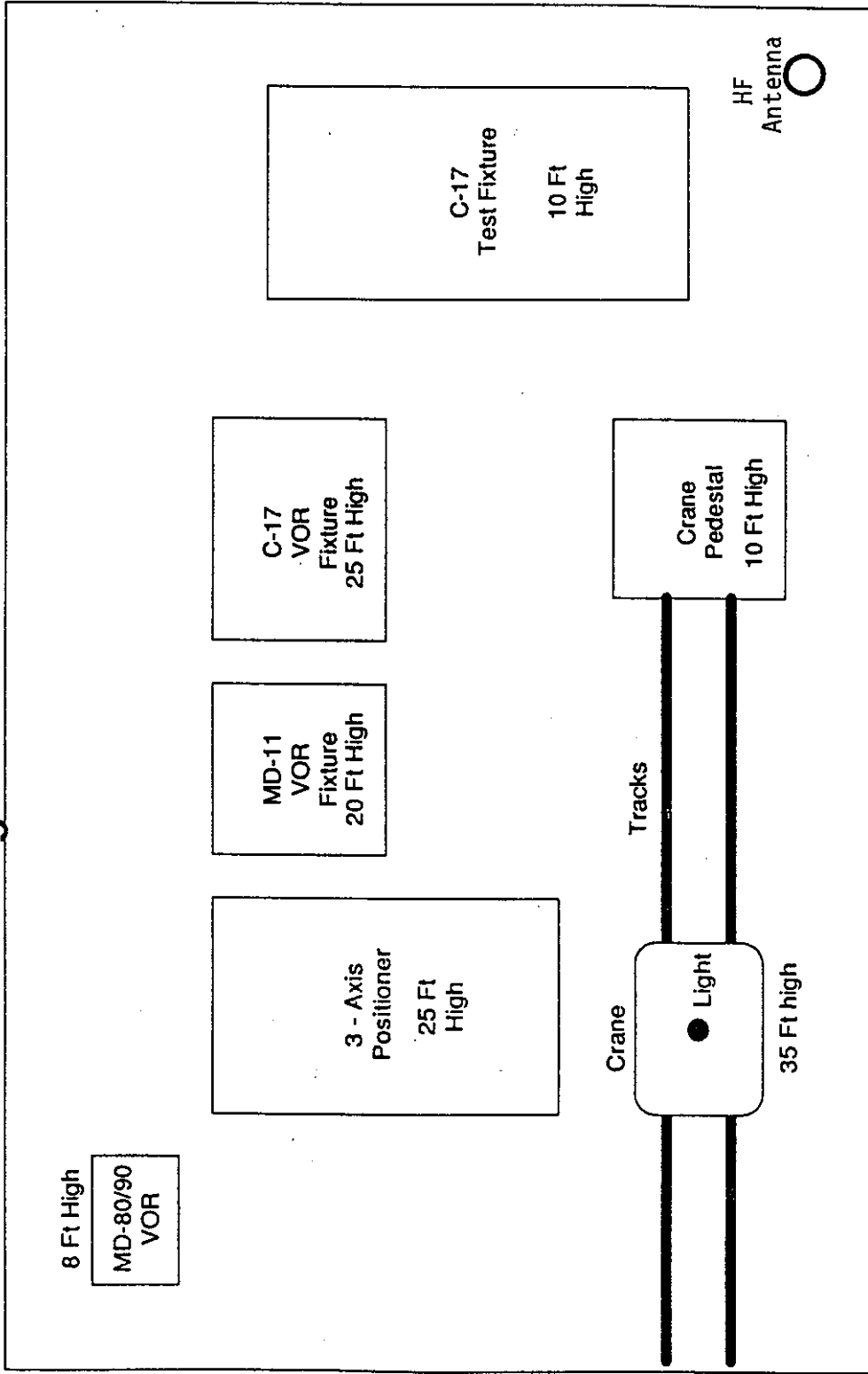


Figure 2 High Frequency Data Link (HF DL) System Block Diagram

Bldg 36 Roof Plot Plan



Building 36 approximately 250 by 440 feet.
Building is block/brick type construction.
Fixtures are wood and wire mesh construction.

Dwg Not To Scale

EXHIBIT 2

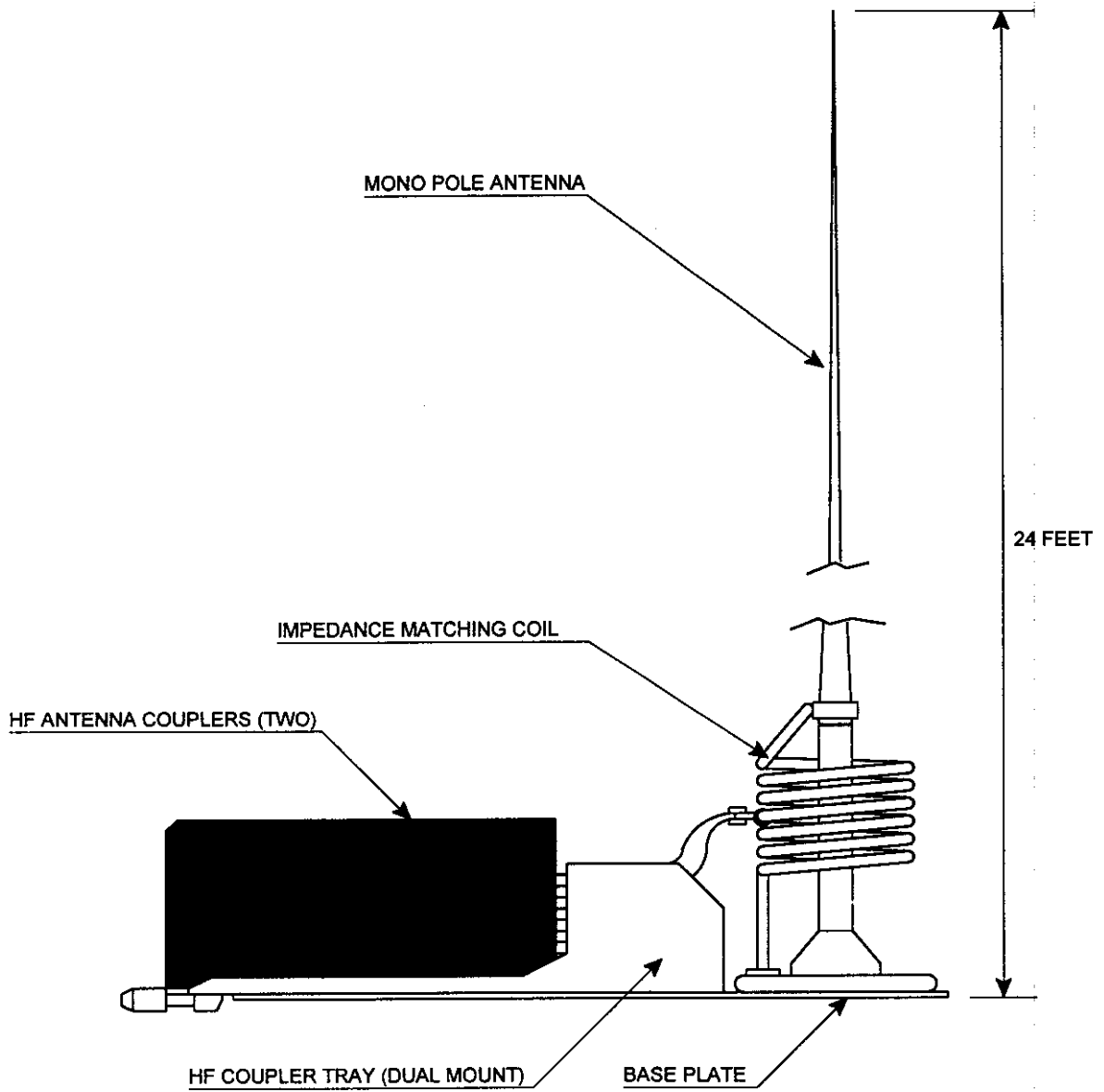


Figure 3 Vertical Mono Pole Antenna with HF Coupler Mounting Tray

US Department of Transportation
Federal Aviation Administration

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

Aeronautical Study Number
93-AWP-CSS1-06

1. Nature of Proposal

| | | |
|--|---|------------------------------|
| A. Type | B. Class | C. Work Schedule Dates |
| <input type="checkbox"/> New Construction <input type="checkbox"/> Alteration | <input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Temporary (Duration _____ months) | Beginning _____ End _____ |

2. Complete Description of Structure

- A. Include effective radiated power and assigned frequency of all existing, proposed or modified AM, FM, or TV broadcast stations utilizing this structure
- B. Include size and configuration of power transmission lines and their supporting towers in the vicinity of FAA facilities and public airports
- C. Include information showing site orientation, dimensions and construction materials of the proposed structure

See Attachment 1 for Plot Plan

3A. Name and address of individual, company, corporation, etc. proposing the construction or alteration. (Number, Street, City, State and Zip Code)

(714) 229-5157
area code Telephone Number

TO
 McDonnell Douglas Radio Services Corp
 Attn: James M. Olson M/S 206-7
 10775 Business Ctr Dr
 Cypress, CA 90630

B. Name, address and telephone number of proponent's representative if different than 3 above.

(if more space is required, continue on a separate sheet.)

4. Location of Structure

| | | |
|--|--|---|
| A. Coordinates (To nearest second) | B. Nearest City, Town and State | C. Name of nearest airport, heliport, flight park, or seaplane base |
| 33° 49' 43" Latitude 118° 09' 09" Longitude | Long Beach, CA | Long Beach |
| (1) Distance to 4B | (1) Distance from structure to nearest point of nearest runway | (2) Direction from structure to airport |
| 0 Miles | 1,160 ft | South |
| (2) Direction to 4B | (2) Direction from structure to airport | |
| Inside city limits | South | |

5. Height and Elevation (Complete to the nearest foot)

| | |
|--|------|
| A. Elevation of site above mean sea level | 40' |
| B. Height of Structure including all appurtenances and lighting (if any) above ground, or water if so situated | 71' |
| C. Overall height above mean sea level (A + B) | 111' |

D. Description of location of site with respect to highways, streets, airports, prominent terrain features, existing structures, etc. Attach a U.S. Geological Survey quadrangle map or equivalent showing the relationship of construction site to nearest airport(s). (if more space is required, continue on a separate sheet of paper and attach to this notice.)

See Attachments 2 & 3. Coordinates corrected per phone call with Jim Olson 5/21/93

Notice is required by Part 77 of the Federal Aviation Regulations (14 C.F.R. Part 77) pursuant to Section 1101 of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1101). Persons who knowingly and willingly violate the Notice requirements of Part 77 are subject to a fine (criminal penalty) of not more than \$500 for the first offense and not more than \$2,000 for subsequent offenses, pursuant to Section 902(a) of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1472(a)).

I HEREBY CERTIFY that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to obstruction mark and/or light the structure in accordance with established marking & lighting standards if necessary.

| | | |
|-------------|--|-----------------------|
| Date | Typed Name/Title of Person Filing Notice | Signature |
| April 29 93 | James M. Olson | <i>James M. Olson</i> |

FOR FAA USE ONLY NAD83 FAA will either return this form or issue a separate acknowledgement.

The Proposal: 33-49-34.05
118-08-38

Does not require a notice to FAA.

Is not identified as an obstruction under any standard of FAR, Part 77, Subpart C, and would not be a hazard to air navigation.

Is identified as an obstruction under standards of FAR, Part 77, Subpart C, but would not be a hazard to air navigation.

Should be obstruction MARKED.

Lighted per FAA Advisory Circular 70/7460-1, Chapter(s) _____

Obstruction marking and lighting are not necessary.

Supplemental Notice of Construction FAA Form 7460-2 is required any time the project is abandoned, or

At least 48 hours before the start of construction.

Within five days after the construction reaches its greatest height.

Expiration expires on January 29, 1994 unless:

The construction is revised or terminated by the issuing office.

A construction permit is made to the FCC on or before the above expiration date. In that case, the determination expires on the date prescribed by the FCC for completion of construction, or on the date the FCC denies the application.

NOTE: Request for extension of the effective period of this determination must be postmarked or delivered to the issuing office at least 15 days prior to the expiration date.

If the structure is subject to the licensing authority of the FCC, a copy of this determination will be sent to that Agency.

Remarks: *James had given written assurance that in hand ground clearance will be below 10448 on who measured at FAA receiving station*

| | | |
|------------------|-----------------------|------------------|
| Issued In | Signature | Date |
| <i>Southwest</i> | <i>John H. Skiles</i> | <i>July 1993</i> |