

---

***“Aircraft High Frequency  
Communications”***

***2-9-17 HIARC***

# ***Yes, Aircraft Have HF***

---

- ***Aircraft must be in contact, even over oceans***
- ***VHF won't reach so HF***
- ***Aircraft HF coms is thriving, unlike maritime which was married to CW***
- ***Typical traffic: Clearance delivery, course deviations, 30 min posn reports, WX / SIGMETS, patches, emergency reporting***
- ***Easily monitored, USB + sound card data***



## ***Why Aircraft HF***

---

- ***Cheap. Satcom is a \$1.00 a minute***
- ***Legacy, the way we've always done it***
- ***Works***
- ***Polar coverage***
- ***Simple compatible international***
- ***ARINC***

# ITU Aeronautical Band Allocations

2.1 HF frequency allocations are regulated by the ITU Radio Regulations (Art. 5) as follows:

kHz 2850–22000		
Allocation to Services		
Region 1	Region 2	Region 3
2 850–3025	AERONAUTICAL MOBILE (R) 5.111 5.115	
3400–3500	AERONAUTICAL MOBILE (R)	
4650–4700	AERONAUTICAL MOBILE (R)	
5450–5480	5450–5480	5450–5480
FIXED		FIXED
AERONAUTICAL MOBILE (OR)	AERONAUTICAL MOBILE (R)	AERONAUTICAL MOBILE (OR)
5480–5680	AERONAUTICAL MOBILE (R) 5.111 5.115	
6525–6685	AERONAUTICAL MOBILE (R)	
8815–8965	AERONAUTICAL MOBILE (R)	
10005–10100	AERONAUTICAL MOBILE (R) 5.111	
11275–11400	AERONAUTICAL MOBILE (R)	
13260–13360	AERONAUTICAL MOBILE (R)	
17900–17970	AERONAUTICAL MOBILE (R)	
21924–22000	AERONAUTICAL MOBILE (R)	
<b>Footnotes:</b>		
5.111 The carrier frequencies 2182 kHz, 3023 kHz, 5680 kHz, 8364 kHz and the frequencies 121.5 MHz, 156.8 MHz and 243 MHz may also be used, in accordance with the procedures in force for terrestrial radio- communication services, for search and rescue operations concerning manned space vehicles. The conditions for the use of the frequencies are prescribed in Article 31 and Appendix 13.		
The same applies to the frequencies 10003 kHz, 14993 kHz and 19993 kHz, but in each of these cases emissions must be confined in a band of $\pm 3$ kHz about the frequency.		
5.115 The carrier (reference) frequencies 3 023 kHz and 5 680 kHz may also be used, in accordance with Article 31 and Appendix 13 by stations of the maritime mobile service engaged in coordinated search and rescue operations.		

# Major World Air Route Areas / Radio Zone

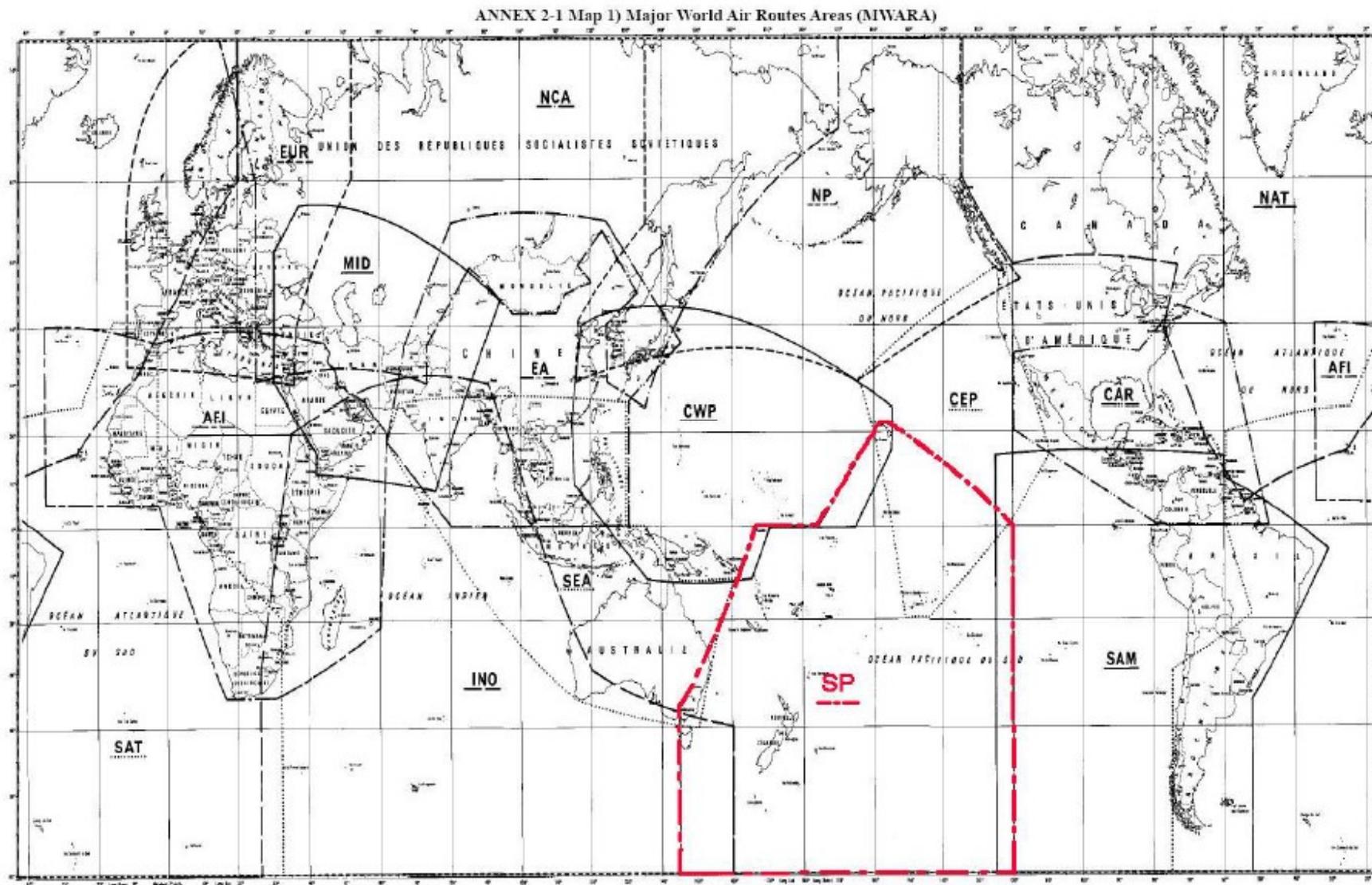
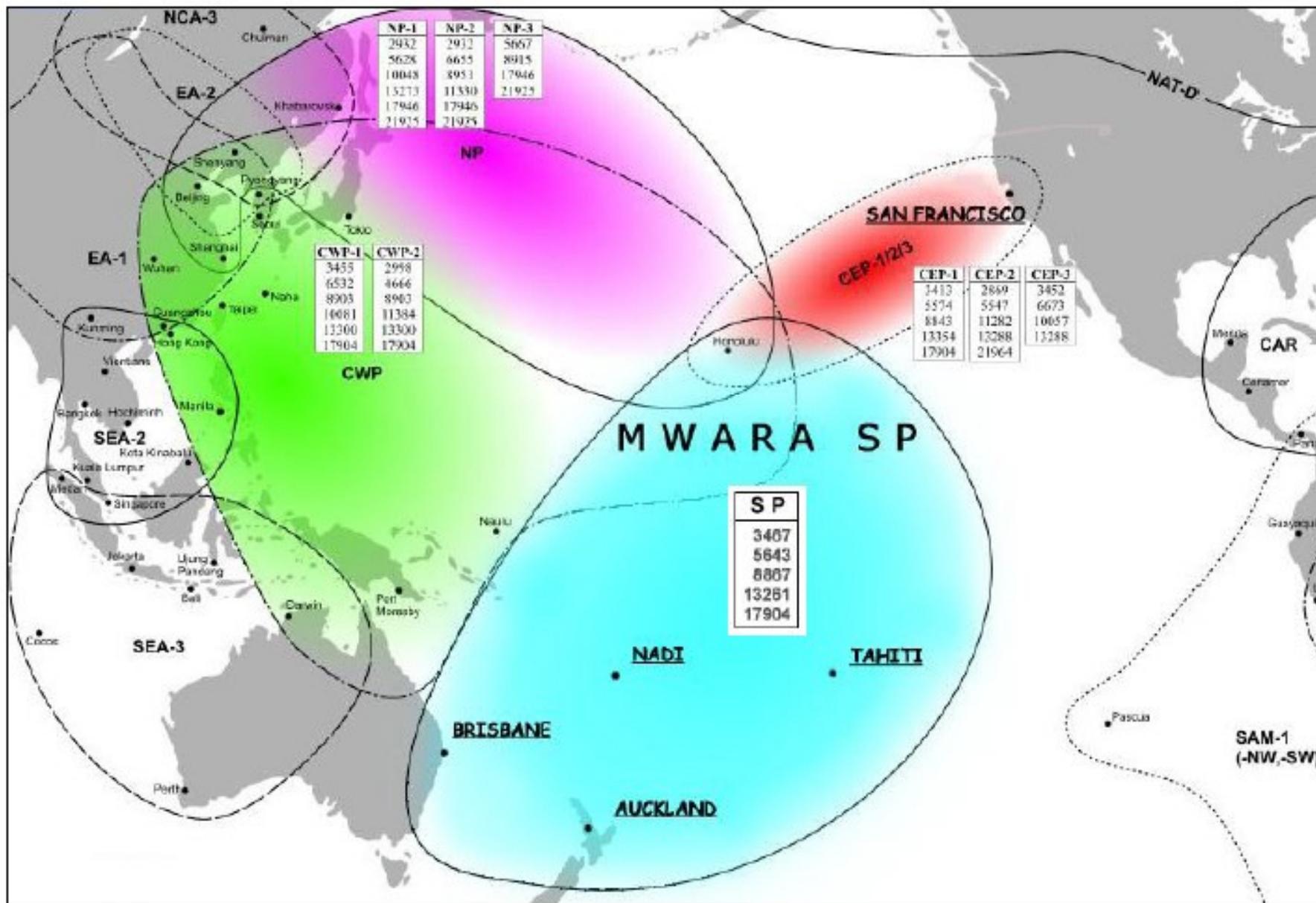


Figure 1 : MWARA – SP (Ref. ITU Appendix 27 Aer2)

# Pacific Air Route Areas / Radio Zones



# ***Worldwide Frequency Assignments***

Area	Frequency bands (MHz)										
	3	3.5	4.7	5.4 (Reg. 2)	5.6	6.6	9	10	11.3	13.3	18
	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz	kHz
AFI	2 851 2 878	3 419 3 425 3 467	4 657		5 493 5 652 5 658	6 559 6 574 6 673	8 894 8 903		11 300 11 330	13 273 13 288 13 294	17 961
CAR	2 887	3 455			5 520 5 550	6 577 6 586	8 846 8 918		11 387 11 396	13 297	17 907
CEP	2 869	3 413	4 657		5 547 5 574	6 673	8 843	10 057	11 282	13 300	17 904
CWP	2 998	3 455	4 666		5 652 5 661	6 532 6 562	8 903	10 081	11 384	13 300	17 904
EA	3 016	3 485 3 491			5 655 5 670	6 571	8 897	10 042	11 396	13 297 13 303 13 309	17 907
EUR		3 479			5 661	6 598		10 084		13 288	17 961
INO		3 476			5 634		8 879			13 306	17 961

.....  
Table 1 – Partial allotment plan

## ***My Loggings***

---

***NY Radio Carribean Service Area: 3455, 5550, 6577, 8918, 11330, 13297 kc. Strong signals.***

***NY North Atlantic: 8903, 11330***

***San Francisco Radio: 10057, evening DX***

***Gander Radio Shanwick, Santa Maria Azore (Perfect Mid-Atlantic Accent),***

***Polar Radio (South Pole) 8995 kc, evening DX our winters***

# ***Frequency Planning: All Clear Channel***

---

INTERNATIONAL CIVIL AVIATION ORGANIZATION



SUMMARY REPORT ON THE  
FREQUENCY MANAGEMENT WORKSHOP  
(Dakar, Senegal, 28-30 September 2009)

*Prepared by the ICAO Eastern and Southern African Office*

[http://www2010.icao.int/ESAF/Documents/meetings/2009/AFI\\_Frequency\\_MG1/FREQ\\_MGMT\\_Workshop\\_Summary.pdf](http://www2010.icao.int/ESAF/Documents/meetings/2009/AFI_Frequency_MG1/FREQ_MGMT_Workshop_Summary.pdf)

# ***Communications Plan***

---



INTERNATIONAL CIVIL AVIATION ORGANIZATION  
ASIA AND PACIFIC OFFICE

**HIGH FREQUENCY MANAGEMENT GUIDANCE MATERIAL FOR  
THE SOUTH PACIFIC REGION**

Version 1.0

(Adopted by APANPIRG/21 – September 2010)

[http://www.icao.int/APAC/Documents/edocs/cns/HF\\_radio\\_GM%20\\_ISPACG\\_Ver1.pdf](http://www.icao.int/APAC/Documents/edocs/cns/HF_radio_GM%20_ISPACG_Ver1.pdf)

# ***Typical exchange***

---

English (or something resembling it...)

This is United 123 reporting posn blue at time XXXX Z, flight level 350, heading 85 (deg), winds 30 (knots) at (heading) 120, fuel on board XXXX (pounds). Expect (next posn) at time XXXX. Ride smooth choppy moderate turbulence

The readback from ARINC

# ***Phone Patches***

---

## ***Business only 8933 kc***

AVS Operating Procedures Handbook

Phone Patch Procedures

### **3 Phone Patch Procedures**

---

#### **3.1 General**

Phone patches are designed to provide direct voice communications between a flight crew and their company operational offices. Patches should only be used in cases of great urgency concerning nonroutine matters related to the operation of the aircraft including the crew, passengers and cargo.

☞ **Note:** Public correspondence (personal message traffic) to/from passengers or crew members is not permitted.

#### **3.2 Phone Patch Connections**



http://www.arinc.com/resources/contact/ Contact

ly Harris Personalized E... Patent Images (4) Patent Images (3) Patent Images (2) Patent Images Suggested Sites

Rockwell Collins' ARINC Customer Service — For ARINC product/service information, contract requests, invoice inquiries or general questions. Monday-Friday 7:30 a.m. – 5 p.m. EST

**Phone**  
North America +1 800.633.6882 (select option 2)  
International [Sprint Access Code](#) +1 800 633 6882 (select option 2)  
Fax +1 410.266.2329

To contact a specific Rockwell Collins facility, see our [office locations map](#).

---

**Rockwell Collins' ARINC Headquarters** 2551 Riva Road  
Annapolis, MD 21401  
+1 800.633.6882

---

**Rockwell Collins' ARINC Regional Headquarters**

Asia Pacific: 8 Temasek Boulevard  
Suntec Tower Three #10-01  
Singapore 038988  
Phone +65 6224.4152  
For more information about our Asia Pacific office, use our online form to [contact AP](#).

Europe, Middle East, & Africa: Pegasus One, Pegasus Place  
Crawley, West Sussex, RH10 9AY, UK  
Phone +44 1293.641200

For more information about our EMEA office, use our online form to [contact EMEA](#).

---

**Rockwell Collins' ARINCDirect™ Business Aviation Solutions Operations Center**

**Phone**  
United States +1 866.321.6060  
International +1 410.266.2266  
**Fax**  
United States and International +1 410.266.2020  
**Email** [flightops@arinc.com](mailto:flightops@arinc.com)

---

**Communications Centers**

**New York (NYC)**  
Administrative Office +1 631.244.2480 (business hours only, EST)  
Radio Room +1 800.645.1095 or 631.244.2483 (24 hours)  
Email [nycradio@arinc.com](mailto:nycradio@arinc.com)  
SATCOM Voice 436623 or 631.244.2492

**San Francisco (SFO)**  
Administrative Office +1 925.294.8400 (business hours only, PST)  
Radio Room +1 800.621.0140 or 925.294.8297 (24 hours)  
Email [sforadio@arinc.com](mailto:sforadio@arinc.com)  
SATCOM Voice 436625 or 925.371.3920

**Aviation Voice Services Operational Questions**  
ARINC Service Desk +1 800.633.6882 or 703.637.6360

<http://www.arinc.com/resources/contact/>

# Aircraft HF Radios

## Typical Fleet HF Installations

Aircraft Make / Model	Equipment	Voice	Data	Peak Power
Boeing 737-800	Rohde & Schwartz-Honeywell XK516D	USB/AM	1.8kbps	400W
Boeing 757-200	Rohde & Schwartz-Honeywell XK516D Collins HFS-700	USB/AM	1.8kbps None	400W
Boeing 757-300	Rohde & Schwartz-Honeywell XK516D	USB/AM	1.8kbps	400W
L-1011-3853	Collins 618T	USB/AM	None	100W
DC-10-30	Collins 628T	USB/AM	None	400W

VHF ACARS has a limited range, and is not available over remote areas such as polar regions and over oceans. That is where High Frequency Data Link protocol becomes vital to long range aircraft operators. HF DL is defined in ARINC specification 635-3, and it is operated by ARINC as GLOBALink service through a worldwide network of HF stations. HF DL is actually a blanket term to describe signals of similar format and purpose:

1. Transmissions on HF are in USB on a sub carrier of 1440 Hz with a symbol speed of 1800 baud.
2. Modulation is 2-PSK, 4-PSK or 8-PSK with effective bit rates of 300, 600, 1200 or 1800 bits/sec.
3. Several ground stations provide global network coverage and system status updates.

On board the aircraft, a pilot simply sets one of the HF radios to "DATA" after takeoff, and the HF DL seamlessly integrated into the flight management system.

<https://www.ab9il.net/aviation/hf1.html>

# ***Cockpit Control Head***

---



USAF GCS on active channel, East Atlantic Civilian ATC (Santa Maria Azores) on standby channel

# ***Aircraft HF Radios***

---



**Boeing 757 Electronic Equipment Bay Collins HF Radios**

## ***Amateur contacts***

---

Pilots get on amateur bands once in a while!

***VOLMET Voice Weather, New York / Gander /  
Trenton Military***

---

***Easy to log:***

***3485, 6604, 10051, 13271 KC***

# ACARS Data Frequencies

Software which can receive HFDL signals:

1. PC-HFDL - Version 2.01 written by Charles Brain G4GUO.
2. PC-HFDL - Version 1.01 (free) written by Charles Brain G4GUO.
3. HOKA Software

Note: PC-HFDL is by far the most popular decoding software, but the system tables must be updated to reflect the current network configuration. Users are advised to do a Google Search for the latest "pchfdl.dat" and "pchfdl.txt" files. There is plenty of configuration information on the internet for the software. PC-HFDL also works well in virtual machines and in Linux (under WINE). Other software is much less well supported.

**Table 34 of the ARINC HFDL System**

Node ID	Xmtr Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
01	San Francisco CA	21934	17919	13276	11327	10081	8927	6559	5508	4672	2947										
02	Molokai, HI	21937	21928	17934	17919	13324	13312	13276	11348	11312	10081	8936	8912	6565	6559	5514	5463	4687	3434	3019	294
03	Reykjavik, ISL	17985	15025	11184	8977	6712	5720	3900	3116												
04	Riverhead, NY	21934	21931	17952	17934	17919	13276	11387	11354	11315	10027	8912	8885	8831	6661	6652	6646	5652	5523	3428	341
05	Auckland, NZL	21949	17916	13351	11327	10084	8921	6535	5583	3404	3016										
06	Hat Yai, THA	21949	17928	13270	10066	8825	6535	5655	4687	3470											
07	Shannon, IRL	11384	10081	8942	8843	6532	5547	3455	2998												
08	Johannesburg, AFS	21949	13321	8834	4681	3016															
09	Barrow, AK	21937	21928	17934	17919	11354	10093	10027	8936	8927	6646	5544	5538	5529	4687	4654	3497	3007	2992	2944	
11	Albrook PAN	21940	17901	10063	6589	5589	2902														
13	Santa Cruz, BOL	21997	21988	21973	21946	17916	13315	11318	8957	6628	4660	3467	2983								
14	Krasnoyarsk, RUS	21990	17912	13321	10087	8886	6596	5622	4679	2905	2878										
15	Al Muharraq, BHR	21982	17967	13354	11312	10075	8885	5544	2986												
16	Agana, GUM	17919	13312	11306	11288	8927	6652	5451													
17	Telde, Gran Canaria, CNR	21955	17928	13303	11348	8948	6529	5589	2905												

Wa  
Ch  
Ex  
Se  
Gr

# Aircraft High Frequency Data Link Software (HFDL), Sound Card Monitoring

RadioReference.com  
Your Complete Reference Source

Scanners, Software and Accessories at Great Prices  
RadioReference recommends  
SCANNER MASTER

Home Databases Live Audio Forums Wiki Classifieds Submit Info About

Wiki Home  
Page  
View source  
History

Important Links

- Recent Changes
- Wiki Help
- Wiki User Guide

3  
Recommend

Personal Tools

- Log in

Search the Wiki

Search

Toolbox

- What links here
- Related changes
- Special pages
- Printable version
- Permanent link

## HFDL

Please see the SigIDWiki definition for [HFDL](#) for a technical description, software and additional information

A waterfall for HFDL can be found [here](#)

## PC-HFDL

PC-HFDL is a Windows software to decode HFDL data traffic and has been written by Charles Brain. Just feed the HF receiver speaker's output into the soundcard of a Windows PC. It can be downloaded from the [HFDL Yahoo group](#).

The best monitoring results will be achieved with the following PC-HFDL settings:

- PREAM ON - to control the audio offset of the receiver
- SPDU OFF - only needed temporarily ON to see the squitters of a new unknown ground station
- MPDU ON - see the MPDU packets
- LPDU ON - see the LPDUs within the MPDUs
- BDU ON - see the BDUs
- VERB ON - see more details
- HFNPDU ON - see the routine position reports
- HEX OFF - only needed for debugging purposes

So in short, with all options ON except SPDU and HEX, the complete session can be seen: LOG-ON of the aircraft to the ground station giving its 24bit ICAO-ID, the assignment of the 1byte sequence ID number to the given ICAO-ID by the ground station referenced in all subsequent traffic, clear distinction of MPDU packets containing more than just one LPDU, and full traffic details.

The HFDL Yahoo group can be found [here](#). Version 2.042 can be downloaded from this [stub page](#)

The .dat file that can be used with the registered version of PC-HFDL can be had by joining the [HFDL Yahoo group](#) and requesting one via private mail. It will NOT work with the free version.

PC-HFDL screen

Categories: [HF Modes](#) | [RR Glossary](#) | [HF Glossary](#) | [Signal Analysis and Decoding Glossary](#) | [Software Glossary](#)

# ***Military Aircraft Use HF: USAF GCS***

---

***4724, 6739, 8992, 11175, 13200, 15016 kc***

***SSB USB***

[http://wiki.radioreference.com/index.php/USAF\\_High\\_Frequency\\_Global\\_Communications\\_System](http://wiki.radioreference.com/index.php/USAF_High_Frequency_Global_Communications_System)

***Inmarsat***

---

***Dial up the ARINC Service Center as  
an alternative to HF***

# Propagation

http://digisonde.com/ LDI, Lowell Digisonde Inter... x

y Harris Personalized E... Patent Images (4) Patent Images (3) Patent Images (2) Patent Images Suggested Sites

**LDI** LOWELL DIGISONDE INTERNATIONAL

HOME LDI DIGISONDE SERVICES NEWS/EVENTS CONTACT

Lowell Digisonde International manufactures and markets the **Digisonde-Portable-Sounder-4D (DPS4D)**, the latest model in the DIGISONDE® series of advanced ionosondes built in Lowell since 1969. The Digisonde is an ionospheric radar that uses high-frequency radio waves for the remote sensing of the ionosphere, the ionosonde technology pioneered by Sir Edward Appleton in the late 1920s. DIGISONDE stands for "Digitally Integrating Goniometric IonoSONDE". The DPS4D is the only commercially available ionosonde system that measures all parameters of the ionospherically reflected HF radio signals, and automatically calculates the local ionospheric electron density profile in real time.

[View our new DPS4D brochure](#)

**Featured LDI News:**

**November 20, 2014**  
Bodo Reinisch was Awarded the International Kristian Birkeland Medal Read More >

The International Space Weather and Space Climate Center presents this certificate of the International Kristian Birkeland Medal for Space Weather and Space Climate 2014.

Awarded to Professor Bodo Reinisch  
For his outstanding scientific results in the field of Space Weather.

**GLOBAL MAP OF LOWELL DIGISONDES** Status: Aug 2016

**GIRO**  
Existing Digisonde GIRO Sensors  
Upcoming Digisonde Installations

Map locations include: Thule, Eielson, Tromsø, Norilsk, Zhigansk, Yakutsk, Sarockson, Loring, St. Petersburg, Moscow, Irkutsk, Mohe, Beijing, I-Cheon, Misawa, Idaho National Lab., Alpena, LGDC, Fairford, Pruhonice, Rome, Belgrade, Kyrgyzstan, Xixiang, Jeju, Boulder, Albuquerque, Millstone Hill, Wallops Is., El Arenosillo, Athens, Nicosia, Multan, Islamabad, Wuhan, Kaduna, Wafu Is., Pt. Arguello, Austin, Metrose, Egin, Puerto Rico, Ramey, Soto Cano, Ali al Salem, Dhaka, Karachi, Ahmedabad, Hainan, Guam, Kwajalein, Ilorin, Djibouti, Trivandrum, Boa Vista, Sao Luis, Fortaleza, Ascension Is., Diego Garcia, Jitamarca, Cachimbo, Campo Grande, Cachoeira Paulista, Tucuman, Louisvale, Madimbo, Learnmonth, Hermanus, Grahamstown, Port Stanley, Zhong Shan, Casey.

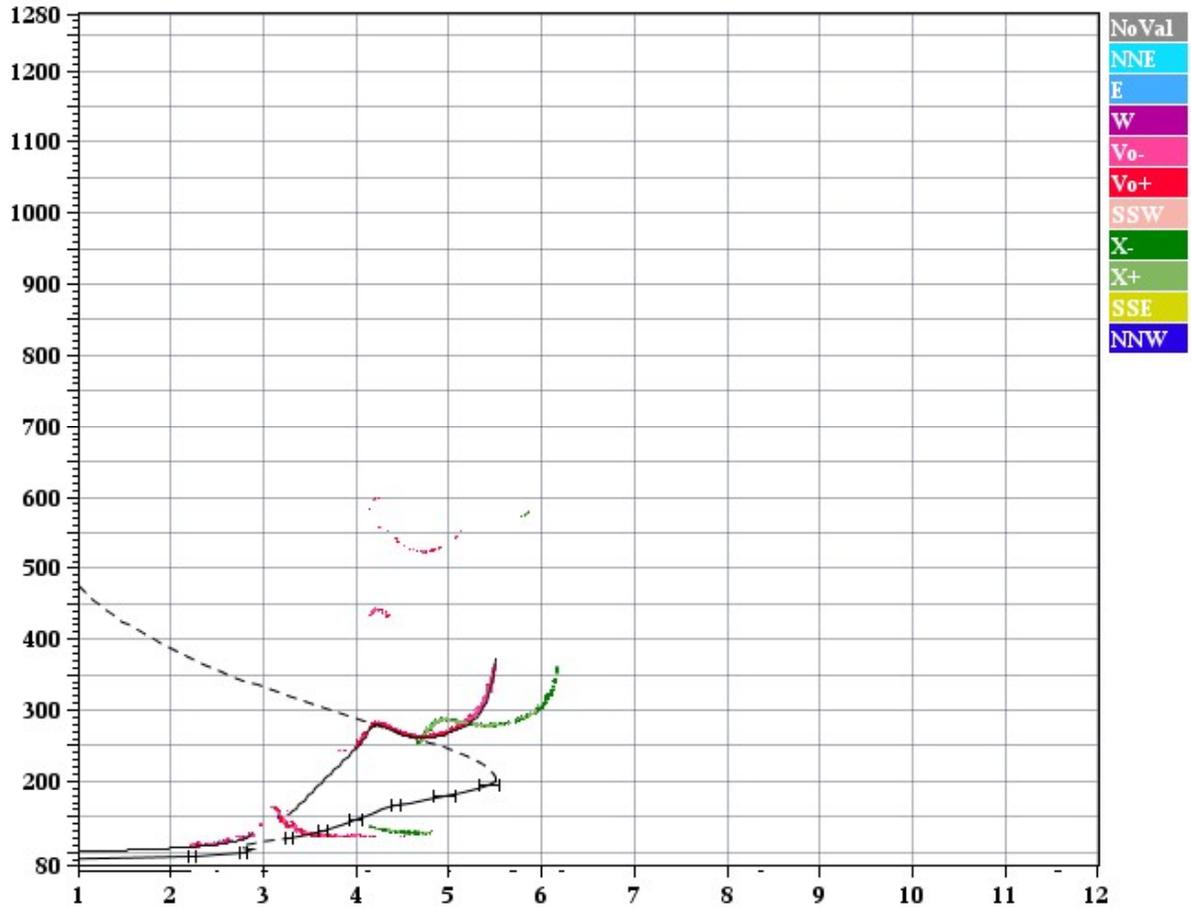
# Propagation, Eglin AFB FL 17:00 Z 2-8-17

Back to statistics for [2017.02.08 \(039\)](#)



Station YYYY DAY DDD HHMMSS P1 FFS S AXN PPS IGA PS  
 Eglin AFB 2017 Feb08 039 170000 RSF 1 713 100 03+ 79

foF2	5.512
foF1	4.21
foF1p	4.38
foE	2.88
foEp	3.19
fxI	6.23
foEs	N/A
fmin	1.00
MUF(D)	19.73
M(D)	3.59
D	N/A
h`F	152.5
h`F2	262.5
h`E	101.2
h`Es	N/A
hmF2	201.7
hmF1	156.8
hmE	103.3
yF2	47.9
yF1	48.6
yE	13.0
B0	78.4
B1	1.43
C-level	11
Auto:	
Artist5	
500200	



D	100	200	400	600	800	1000	1500	3000	[km]
MUF	6.1	6.2	6.5	7.0	7.7	8.8	11.8	19.7	[MHz]

48765189.tmp / 440fx512h 25 kHz 2.5 km / DPS-4D EG931 084 / 30.5 N 273.5 E

ShowIonogram v 1.0

# New York Radio Facilities

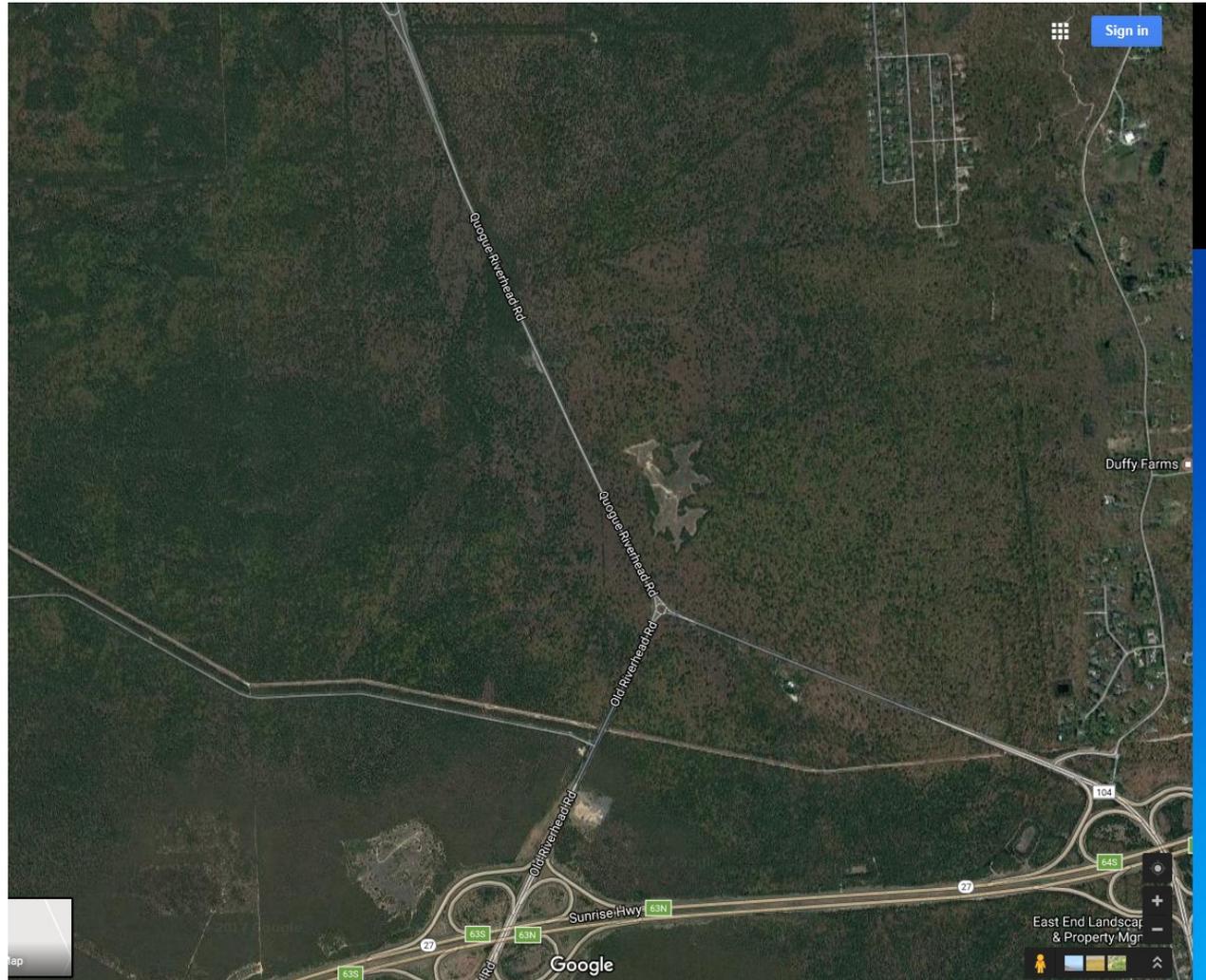
## Appendix B-4 - NEW YORK Radio Station Information

<b>Station Name:</b>		<b>New York Radio</b>							
<b>Country:</b> United States of America				<b>State:</b> New York					
<b>City:</b> Bohemia, Long Island				<b>Geographic Location:</b> 40.46.79N0730572W					
<b>AFTN Address:</b> KNYCXAAG				<b>Aircraft in Flight Address:</b> KNYCZZX					
<b>SATCOM SHORT CODE Nr. :</b> 436623									
<b>Facilities</b>									
<b>Transmitter site</b>					<b>Receiver site</b>				
<b>Location:</b> Riverhead, (40.52.52N072.38.52W)					<b>Location:</b> SouthHampton (40.55.15N072.23.41W)				
<b>Equipment</b>					<b>Equipment</b>				
7 Cubic CTX-5000 (5 KW) 2 HF DL transmitters 3 Grainger log periodic antennas (2.8-32 MHz) 2 Grainger log periodic antennas (5.4-32 MHz) 2 Grainger log periodic antennas (6.5-32 MHz) 1 TCI log periodic antenna 2 Tuned dipole antennas (HF DL) 1 TCI omni-log periodic antenna (4-28 MHz) 1 Dipole for CAR-B 3455 MHz 1 Cubic Transmitter (1 KW) Standby					36 Cubic LCD2000 receivers 6 Aerocom 2215 receivers for LDOCF 2 HF DL receivers 3 Aerocom 2217 used only by maintenance 1 Log periodic north-east antenna 1 Log periodic south antenna 1 Omni directional antenna (Each antenna has a multi-couple for distribution of signals to the receivers)				
<b>Class of Emission:</b> 1K40H2B/2K80J3E					<b>SELCAL:</b> 14 Baker Units				
<b>Frequencies</b>									
<b>Family</b>	<b>Frequency bands</b>								
	3 MHz	3.5 MHz	5.6 MHz	6.6 MHz	9 MHz	11.3 MHz	13.3 MHz	18 MHz	22 MHz
<b>A</b>	3016		5598		8906		13306	17946	21964
<b>E</b>	2962			6628	8825	11309	13354	17952	
<b>CAR A</b>	2887		5550	6577	8846	11396	13297		
<b>CAR B</b>		3455	5520	6586	8918	11330		17907	
<b>VOLMET</b>		3485		6604		10051	13270		
<b>LDOCF</b>		3494		6640	8933	11342	13330	17925	
<b>Station Manager</b>					<b>On Duty Supervisor</b>				
<b>Name:</b> Peter Henschke					<b>Post Address:</b>				
<b>Post Address:</b> New York Communications Center 613 Johnson Ave Bohemia, Long Island, NY 11716-2696					New York Communications Center 613 Johnson Ave Bohemia, Long Island, NY 11716-2696				
<b>Phone:</b> + 1 631 244 2480					<b>Phone:</b> + 1 631 244 2480				
<b>Fax:</b> + 1 631 563 2412					<b>Fax:</b> + 1 631 563 2412				
<b>Email:</b> <a href="mailto:phenschk@arinc.com">phenschk@arinc.com</a>					<b>Email:</b> <a href="mailto:nycradio@arinc.com">nycradio@arinc.com</a>				
<b>AFTN/SITA Address:</b> KNYCXGXA					<b>AFTN/SITA Address:</b> KNYCXGXA				
<b>Remarks:</b> The communications control point is located at Bohemia, New York, and the transmitters are located at Riverhead, New York, on the east end of Long Island. The receivers are located at South Hampton, New York, also located on the east end of Long Island. New York radio is located less than 1 mile from New York ACC. Backup receiver located at New York radio; backup transmitters located less than 2 miles away at Islip Long Island Airport.									



# ***New York Radio Transmit Site, Riverview Long Island***

---



**No seawater**

# ***New York Radio Transmit Site***

---



# ***New York Radio Transmit Site***

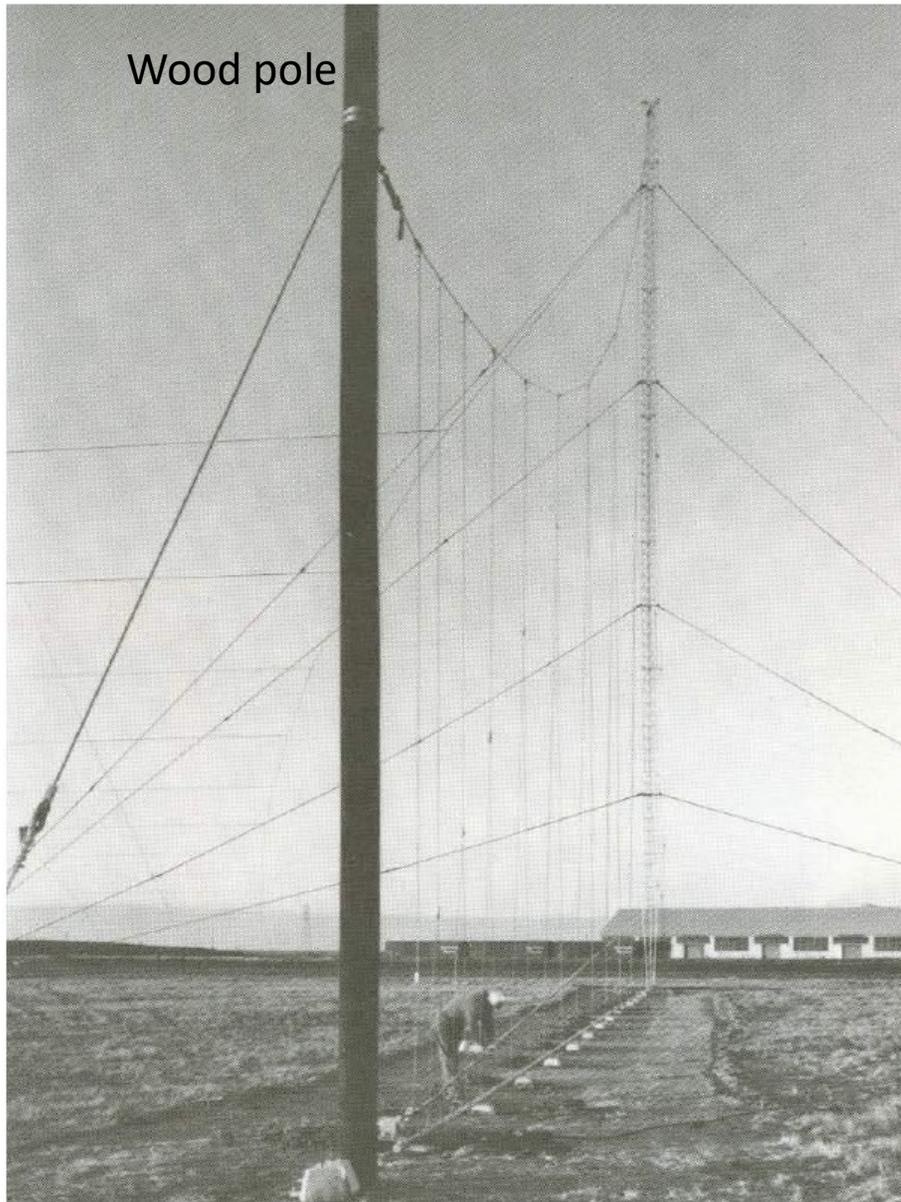
---



---

# ***Antennas***

# Grainger Monopole Log Periodic



## Type 2726 Series GRANGER™ Vertically Polarized, Log-Periodic HF Antennas



- 2.5-30 MHz Frequency Range
- Up to 10 kW Average, 20 kW Peak Power Rating
- Vertical Polarization
- 2.0:1 Maximum VSWR
- Long-Range HF Communications
- Minimum Tower Height
- Minimum Space Required

### General Description

The 2726 Series is a family of monopole, log-periodic arrays, the most economic configuration which can efficiently radiate at broadband HF frequencies as low as 2.5 MHz. The antennas are intended for either point-to-point communications or sector broadcast.

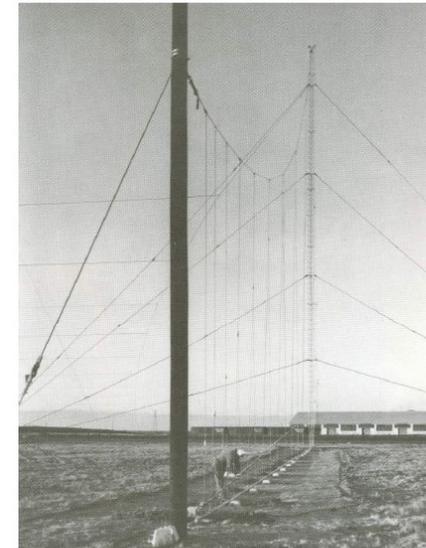
Radiation patterns, characterized by a high-gain lobe directed close to the horizon, are nearly constant at all operating frequencies. The vertical beamwidth is sufficiently narrow to provide high directive gain, yet broad enough to encompass the range of take-off angles required by diverse ionospheric conditions. Side and back lobes are virtually absent, thereby minimizing off-path interference.

### Features

**Strength and Durability.** The 2726 Series antennas have been carefully designed to create a light, strong, resilient structure and will operate for long periods in harsh environments. Radiators are high-strength bronze wire. The supporting catenary is fiberglass rod bonded to manganese-bronze end fittings. All materials have been selected for maximum resistance to corrosive environments, such as salt spray, tropical locations and industrial regions.

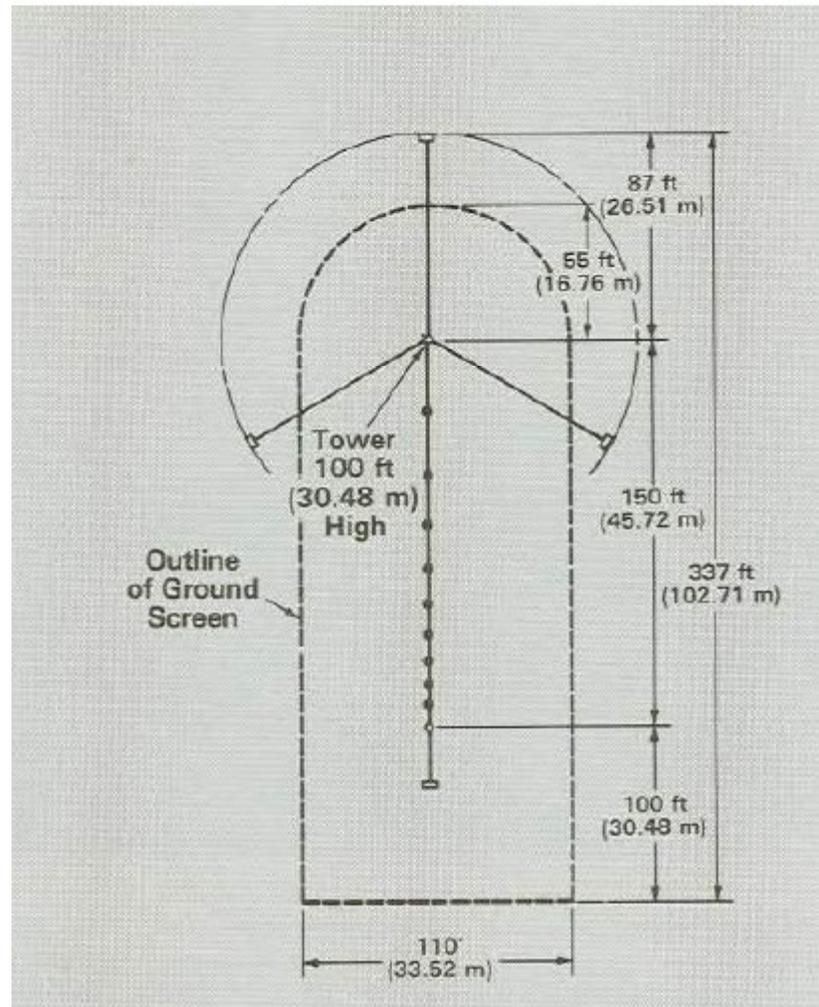
**Ease of Assembly and Installation.** Towers are shipped unassembled and are easily assembled in the field through interconnection of three vertical rails. All parts are supplied. Antennas can be erected without a crane, using an erection fixture available as an option.

ASC Signal offers field engineering services, including propagation analysis, antenna specification, manufacturing, installation and field tests, to facilitate siting and installation of antennas.



# ***Grainger Log Periodic***

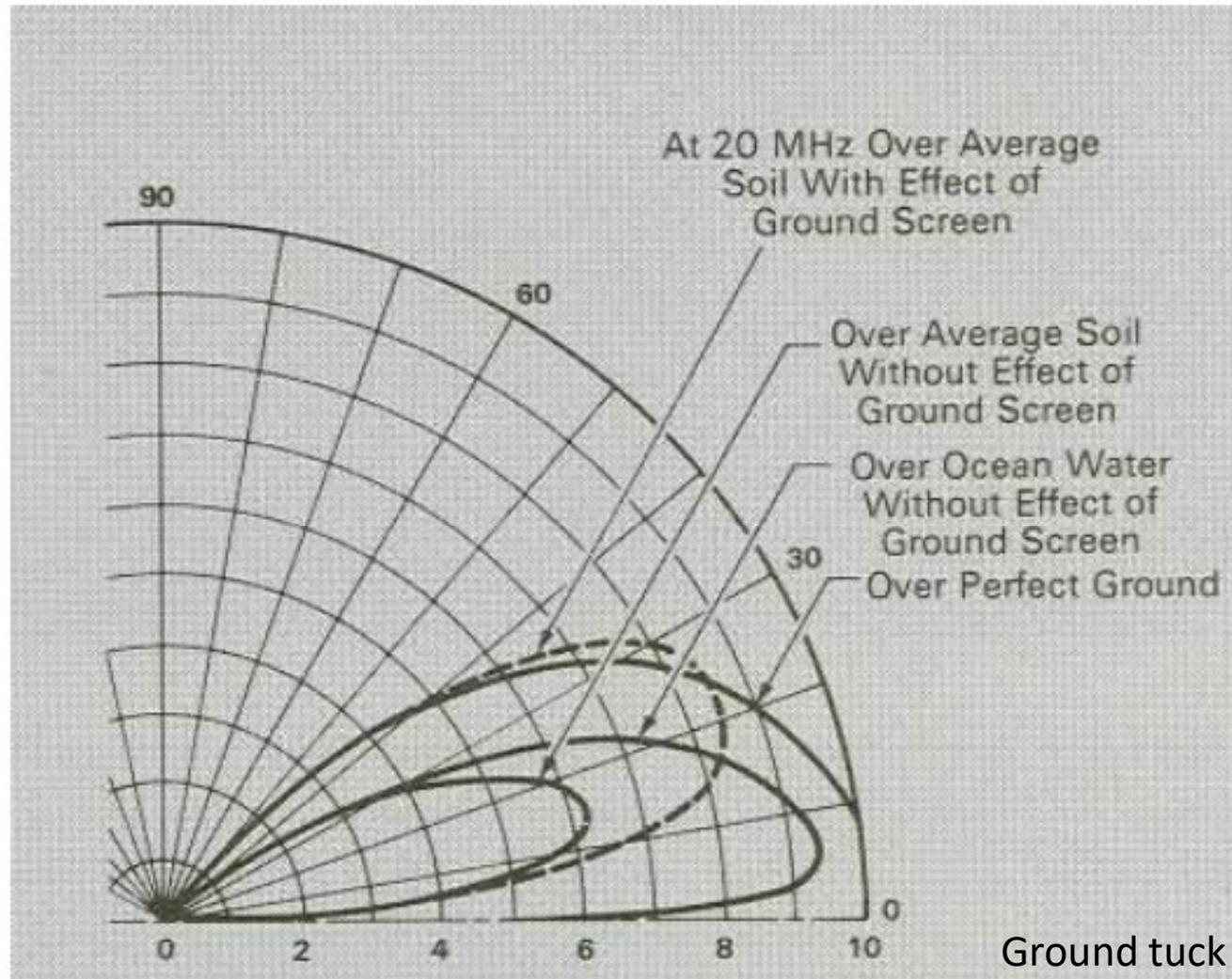
Antenna Dimensions 3.5 to 32 MHz  
Models 2726-3 and 2726-4



**100 foot tower at rear**  
**Wood pole up front**  
**100 x 337 foot ground pad**

# ***Grainger Log Periodic***

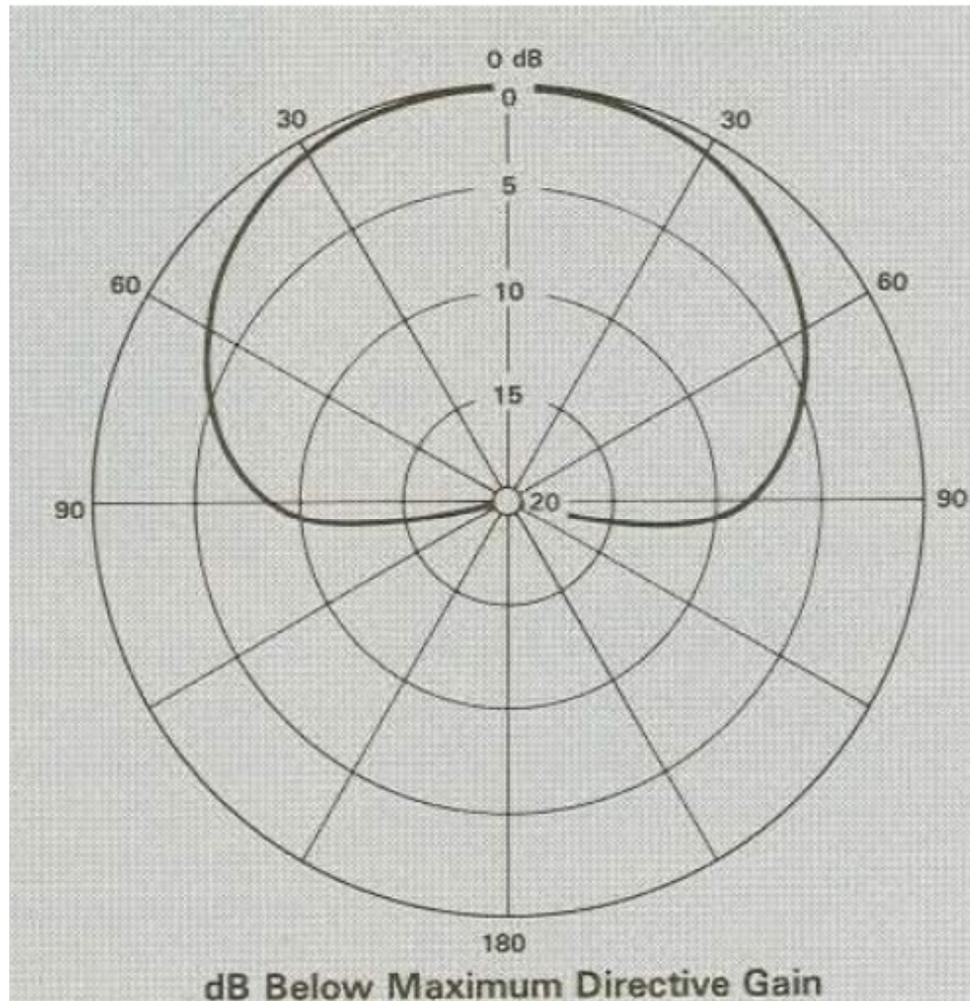
EL Cut



20° takeoff angle of Riverhead NY xmit site.  
1200 mile target zone.  
NHIS only, no NVIS.

# ***Grainger Log Periodic***

AZ Cut



**1-cos<sup>n</sup> cardioid, no backlobes.  
The beam walks back and forth in AZ, not shown.**

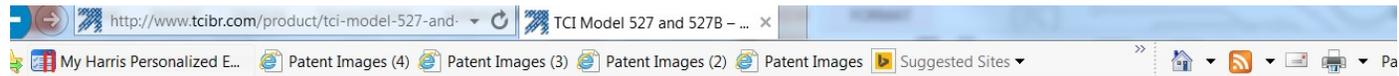
# ***Grainger Log Periodic***

---

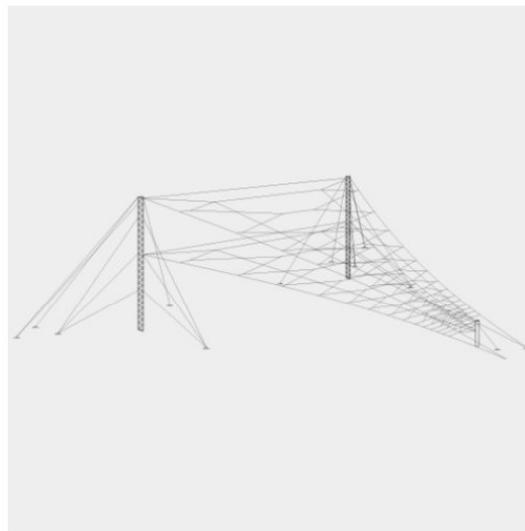
## **Characteristics**

Type	HF Monopole log-periodic
Frequency Range, MHz	2.5-32
Power Rating, kW	Up to 10 average, 20 peak
Polarization	Vertical
VSWR	2.0:1 maximum
Gain, dBi	Greater than 10 over perfect ground
Wind Survival Rating, mph (km/h)	120 (190)
Without Ice	100 (160)
With 0.5 in (12mm) Radial Ice	

# Ground Antennas, Pyramidal Log Periodic



HOME ABOUT US SOLUTIONS PRODUCTS NEWS CONTACT



## TCI MODEL 527 AND 527B Super High Gain Log-Periodic Antennas

### PRODUCT DESCRIPTION

Highly reliable communications on long-range circuits require antennas with high power gain at low take-off angles. Techniques developed at TCI now achieve this with smaller structures than previously possible.

The Model 527 consists of two Model 524 curtains stacked vertically, delivering performance on long-range point-to-point circuits exceeding that of a rhombic antenna more than twice the size.

The [Model 527B](#) consists of two standard transposed dipole arrays. With an azimuth beamwidth of 64°, this antenna is extremely useful in applications where high gain, low take-off angles are required over a broad azimuth.

For long point-to-point circuits where wide-azimuth coverage is not required, see the single-curtain [TCI Model 524](#).

### KEY FEATURES

- Reliable Communications on Long Range Circuits
- High Power Gain – Over 18 dBi
- Wide Frequency Bandwidth – 4 to 30 MHz
- Small Land Area – Replaces Rhombic Twice the Size
- Low Take-Off Angle

## ***“Notch” Conformal Antennas***



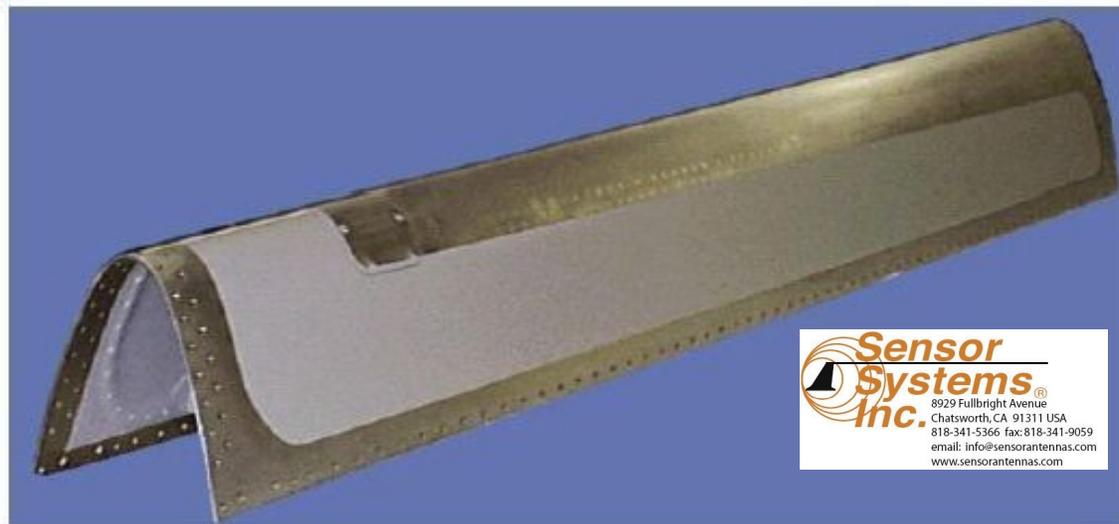
Airbus A380

## ***“Notch” Conformal Antennas***



# “Notch” Conformal Antennas

## ▼ HF S98-5000



### DESCRIPTION

#### S98-5000: HF Shunt Antenna

The HF Shunt antenna is incorporated in the leading edge of the vertical fin and provides optimum performance for HF data link and HF voice operations. This antenna is approved for installation on all models of the Boeing 757-200. The antenna installation meets all the airworthiness requirements of Part 25 of the Federal Aviation Regulations and is covered under Supplemental Type Certificate Number ST01997AT.

The same type of antenna can be incorporated on other aircraft models such as the Boeing 737 and 747.

### SPECIFICATIONS

#### ELECTRICAL

Frequency .....2-30 MHz  
VSWR .....1.3:1  
Impedance .....50 ohms  
Power Handling .....400 Watts  
Lightning Protection ...D.C. Grounded

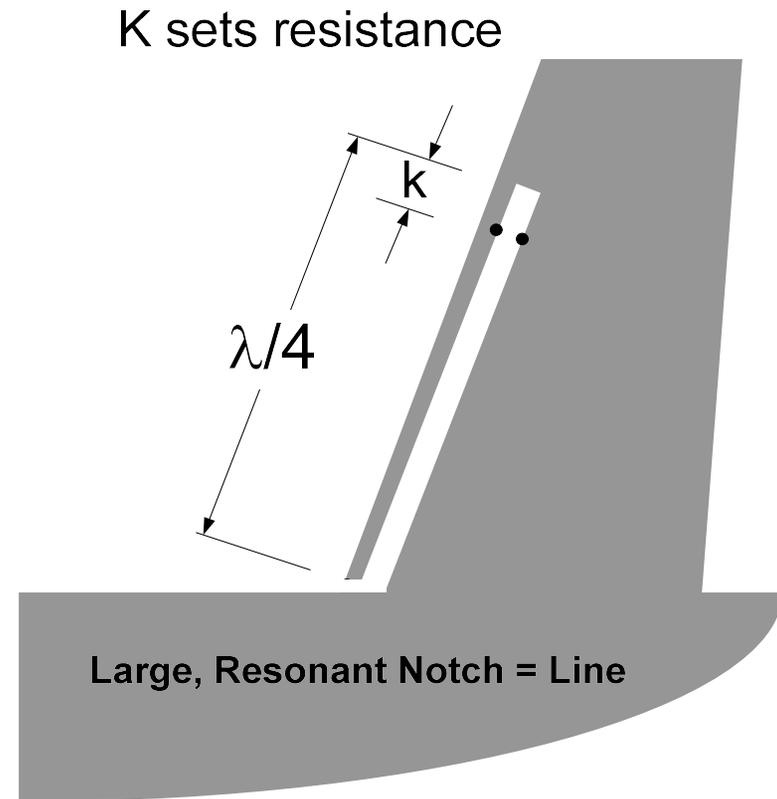
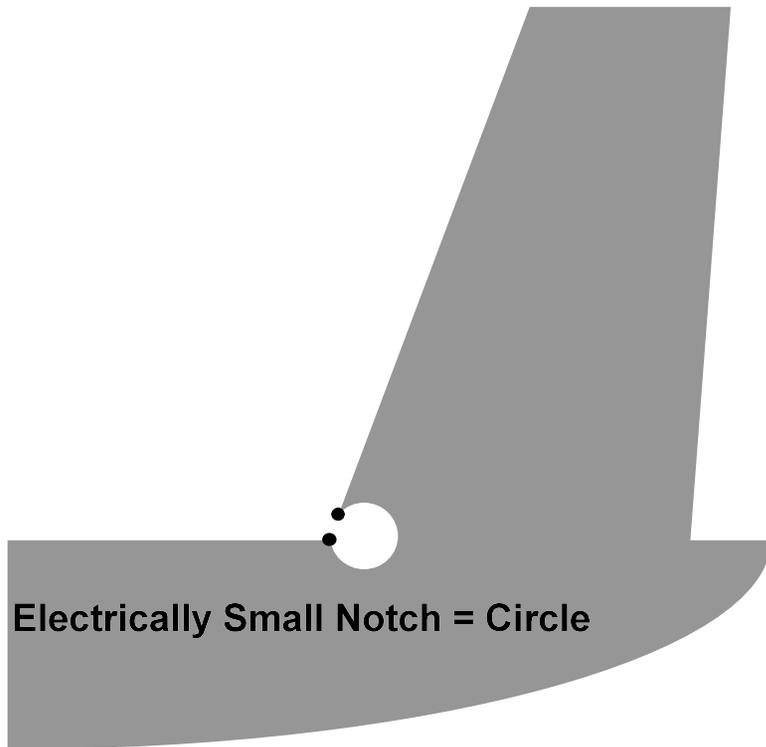
#### MECHANICAL

Material.....Aluminum, Epoxy Glass  
Finish.....Polished Aluminum  
Connector .....Feedline

#### ENVIRONMENTAL

Temperature..... -40°F to +185°F  
Vibration..... 10 G's  
Altitude.....55,000 ft

# ***“Notch” Conformal Antennas***



Euclidian Geometries Preferential

# ***“Notch” Conformal Antennas, Conductor Proximity Effect***

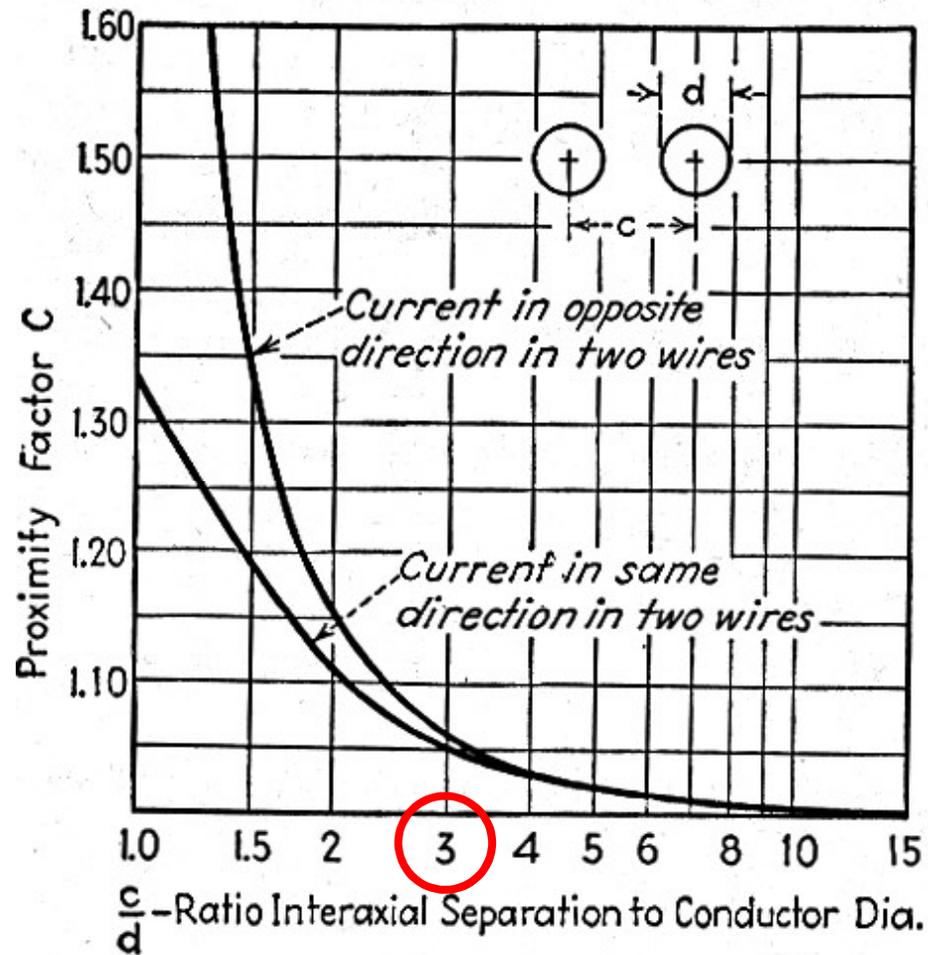
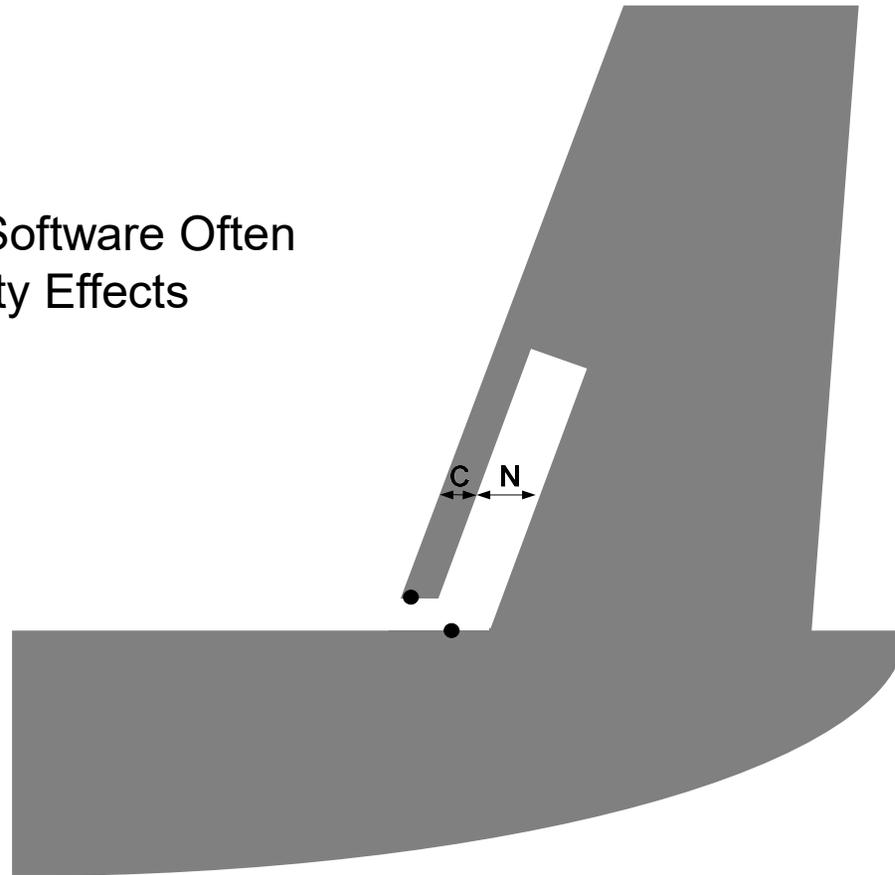


FIG. 6.—Proximity factor in parallel cylinders or tubes for very high frequencies.

# ***“Notch” Conformal Antennas, Conductor Proximity Effect***

Note: Modeling Software Often Fails On Proximity Effects

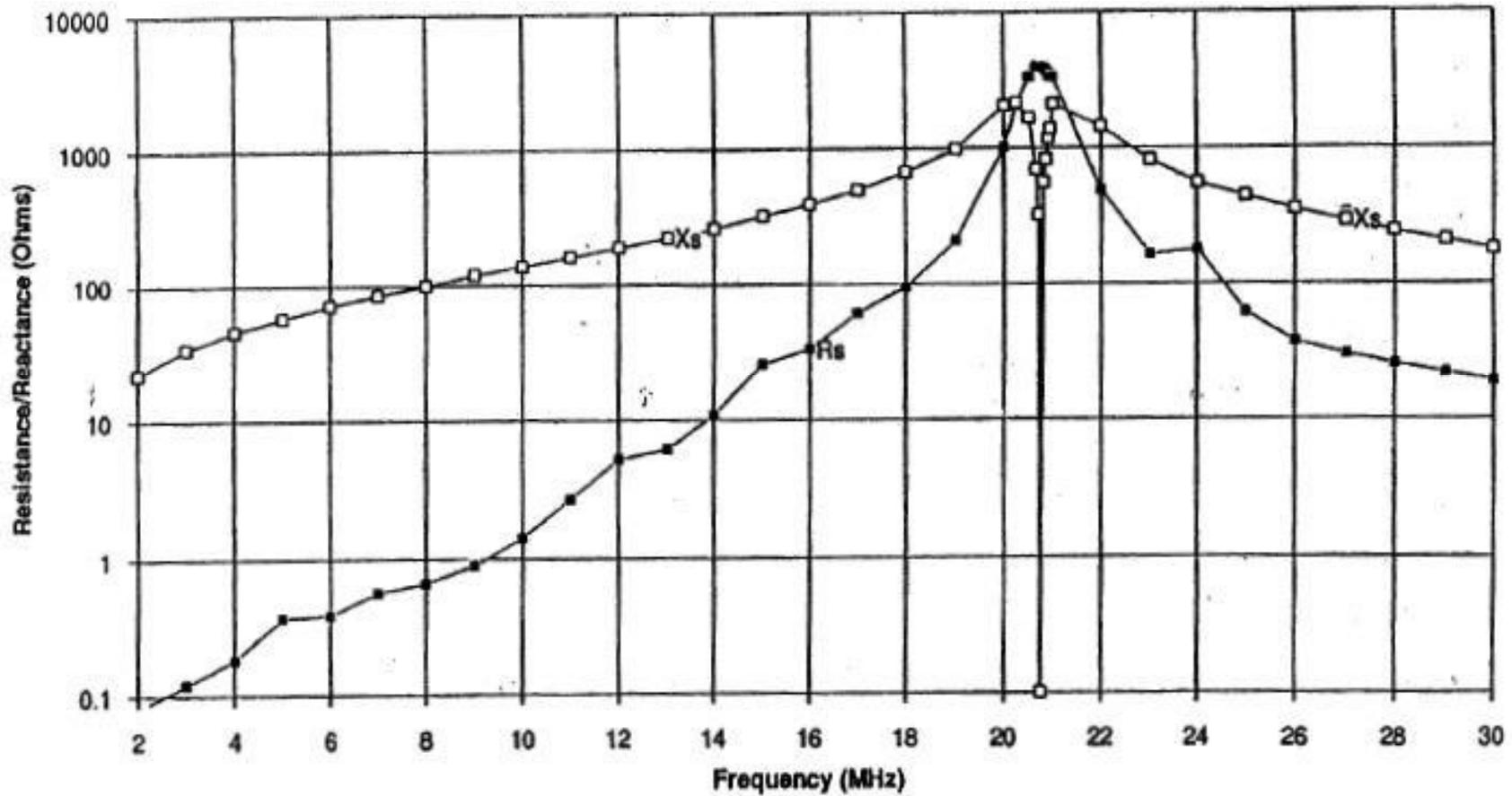


Notch Width  $\sim 3X$  Conductor Width: Slotline

## ***HF / Electrically Small Notch***

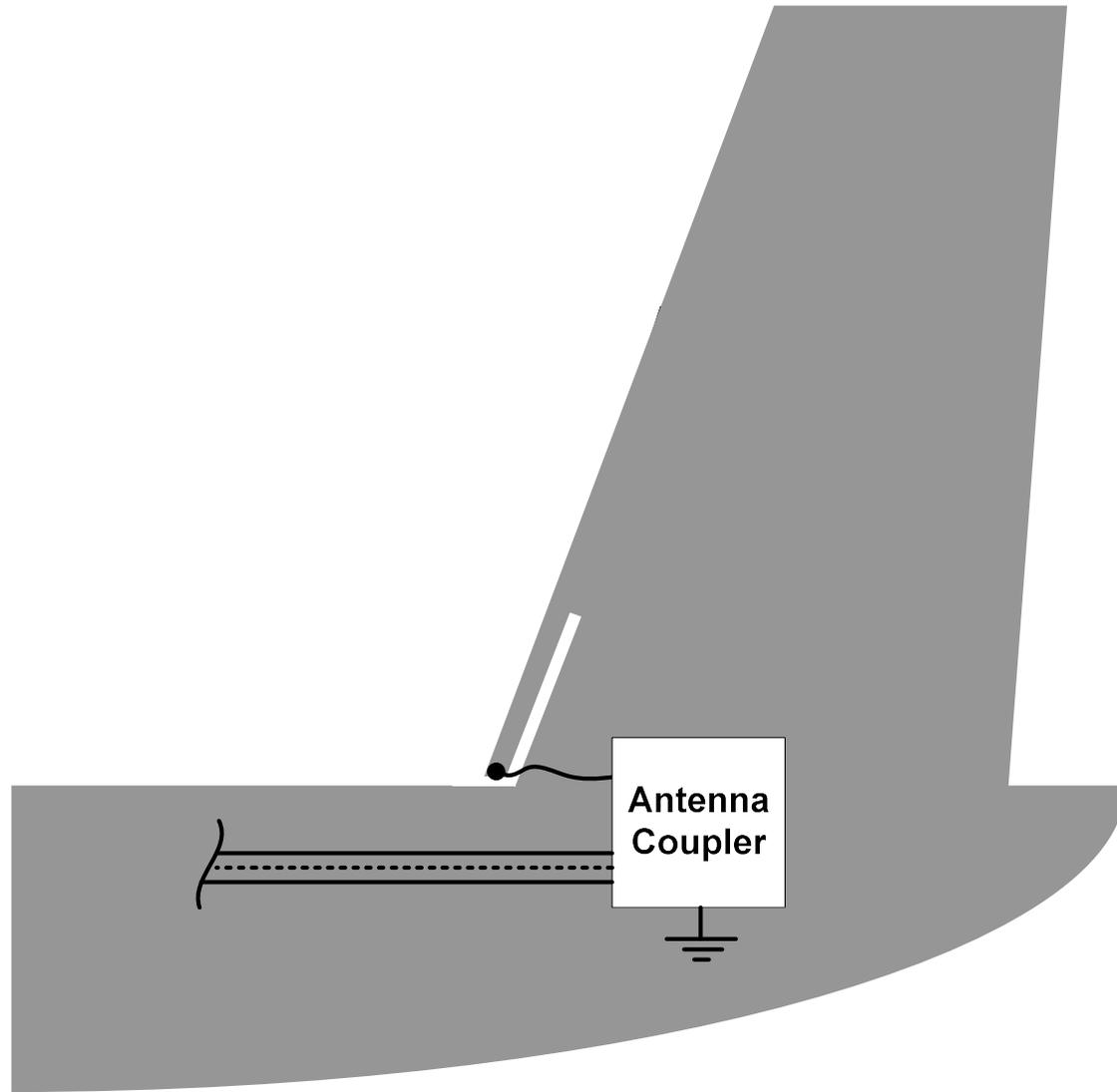
- Small Notches Typical
- Low Resistances Obtained
- Special Techniques:
  - 1<sup>st</sup> Reactor: Capacitor, Vacuum Type
  - Solid State Switches, Even Relay Contacts To Lossy
  - HF Notch airbus A380 and solid state antenna coupler

# ***“Notch” Conformal Antennas***

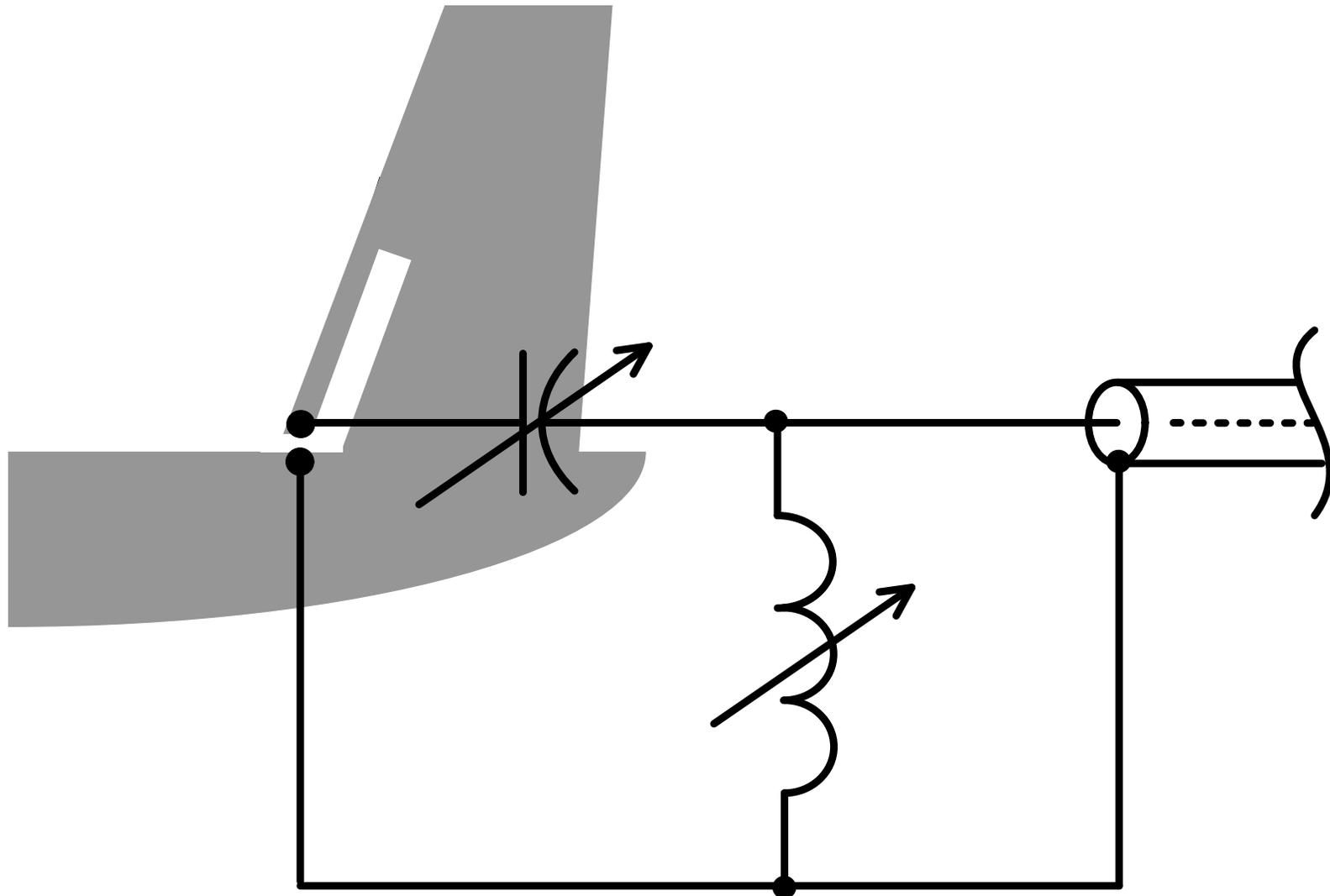


**Driving Point Impedance, A380 / HFS985000 Notch**

# ***“Notch” Conformal Antennas***



# ***“Notch” Conformal Antennas***



## ***Vacuum Variable Capacitor***



**Q ~ 100,000**

## ***1<sup>st</sup> Loading Reactor Loss***

Equivalent Series Resistance =  $X_c / Q$

At 3 Mhz, Airbus 380 Notch  $X_L = 30 \Omega$

Resonance  $X_c = X_L$

Equivalent Series Resistance =  $X_c / Q = 30/50,000$

Loading Reactor ESR = 0.0006 ohms

Driving Point Resistance =  $R_r = 0.1 \text{ Ohms}$

$\eta = R_r / (R_r + \underline{\text{ESR}}) = 0.1 / (0.1 + 0.0006) = 0.99 \text{ or } 99\%$

# US Patent 2,614,219

Oct. 14, 1952

R. H. J. CARY  
AERIAL SYSTEM

2,614,219

Filed March 14, 1949

2 SHEETS--SHEET 1

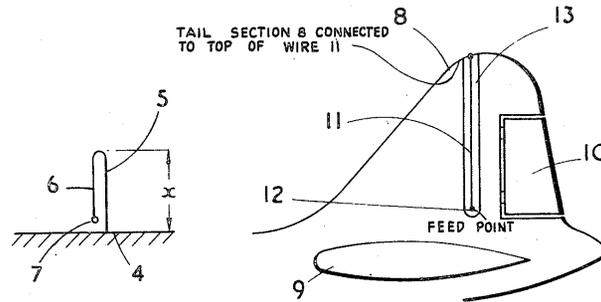


FIG. 1.

FIG. 2.

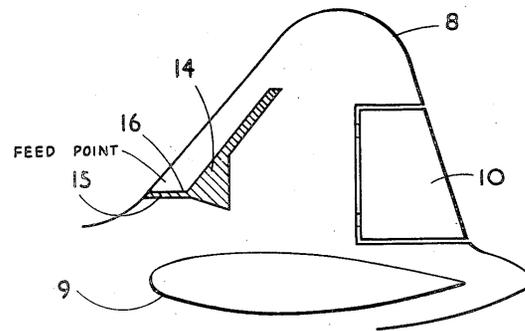
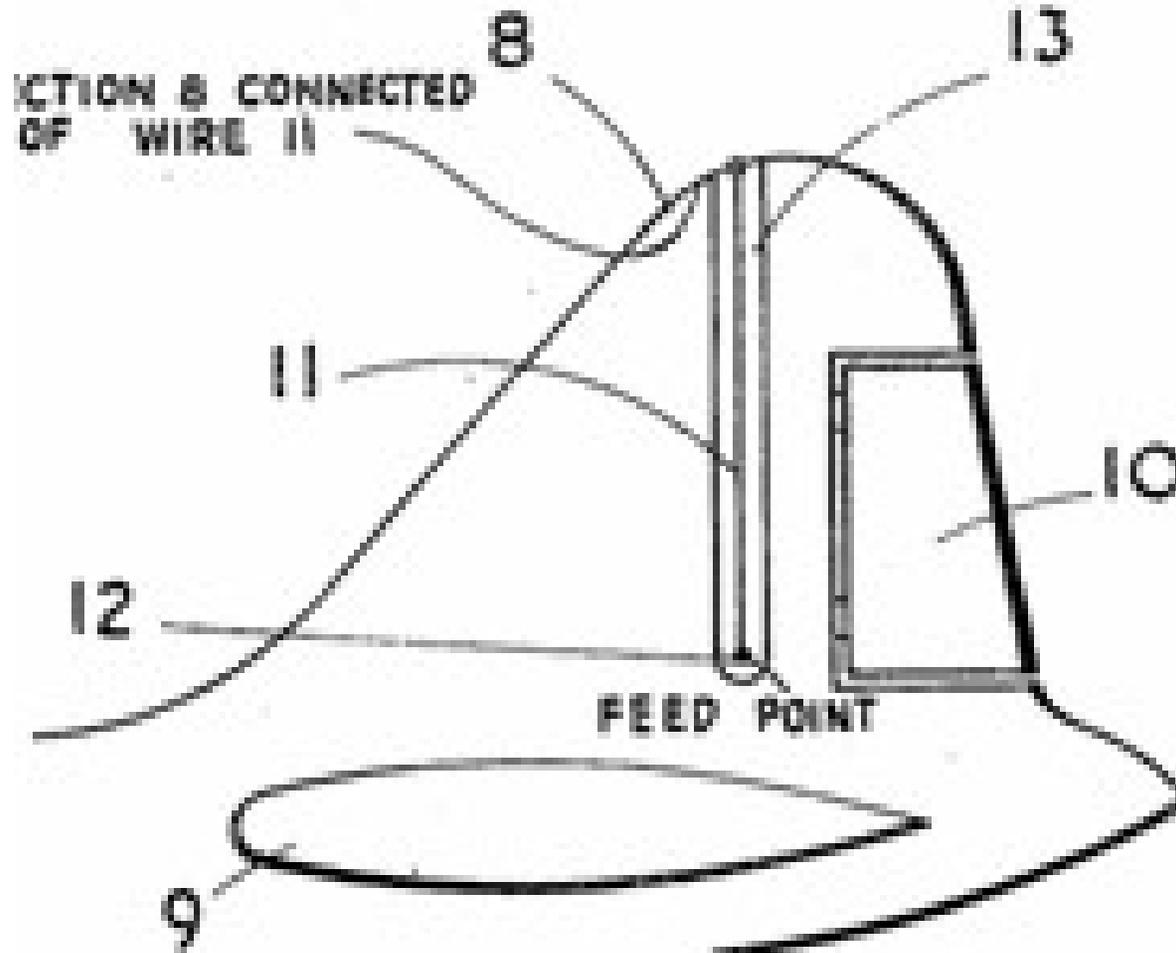


FIG. 3.

# ***Coplanar Waveguide Notch***



# ***Probe Antenna, C141 Tailcap***



# ***HF Probe Antenna***

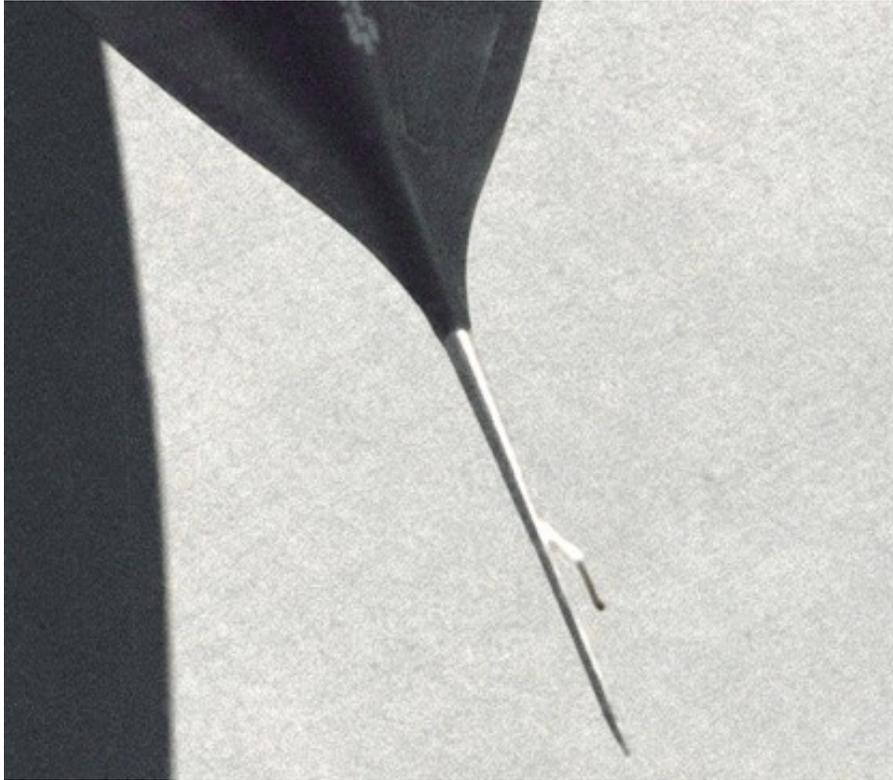


NASA Dryden Flight Research Center Photo Collection  
<http://www.dfrc.nasa.gov/gallery/photo/index.html>  
NASA Photo: EC94-42531-6 Date: 1994 Photo by: NASA

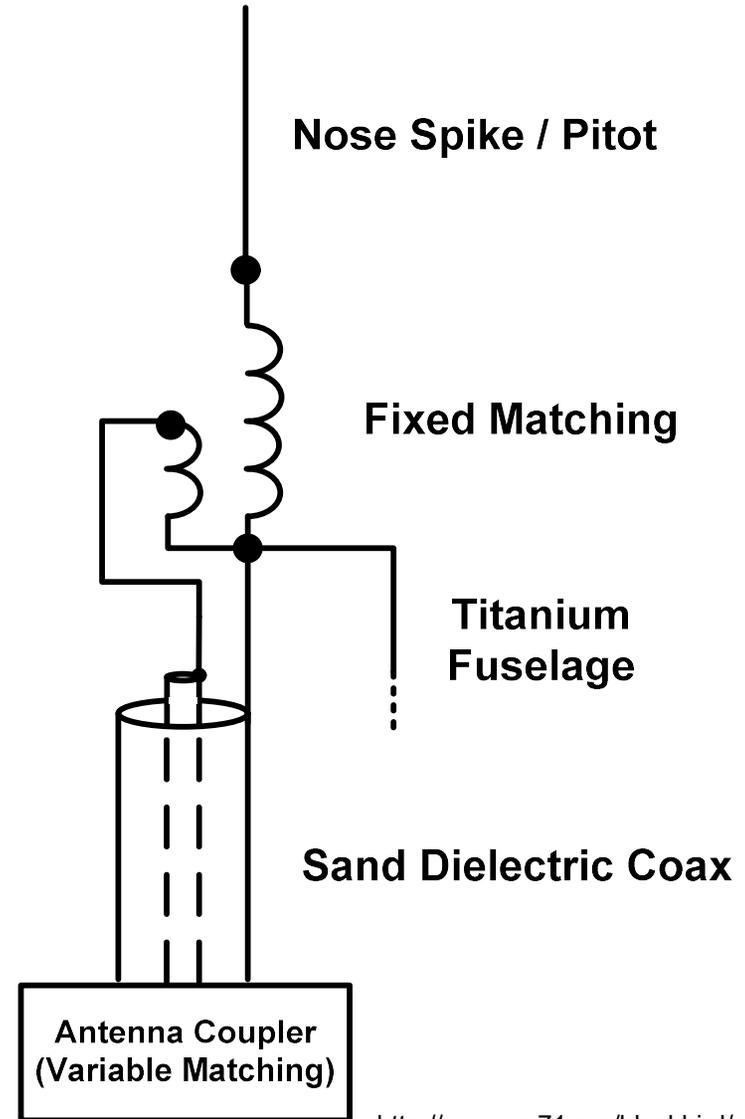
SR-71 Ship #1 on Ramp

<http://www.sr-71.org/blackbird/manual/>

# ***Historical HF Probe Antenna***



**Collins 618C and ARC/190 HF Radios  
8 to 12 Mhz Best  
Operation Below 4 Mhz Not Permitted**



<http://www.sr-71.org/blackbird/manual/>

---

***Good listening between the bands***