



Solutions at the Speed of Change



**Defense Information Systems Agency**  
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# ***High Frequency Test Facility (HFTF) and HF Network Modeling Brief (January to July 2007)***

*Presented By: Mr. Dan Hurd  
HFTF Action Officer, JITC  
19 July 2007*

# STATEMENT



## DISCLAIMER

*The information provided in this briefing is for general information purposes only. It does not constitute a commitment on behalf of the United States Government to provide any of the capabilities, systems, or equipment presented and in no way obligates the United States Government to enter into any future agreements with regard to the same. The information presented is for the purposes of briefing the High Frequency Industry Association participants and may not be disseminated further without the express consent of the United States Government.*

# AGENDA



- ***JITC Vision and Mission***
- ***JITC Facility Locations***
- ***High Frequency Test Facility (HFTF)***
  - *HFTF Mission*
  - *HFTF History*
  - *HFTF Facilities*
  - *HFTF Test Capabilities*
  - *HFTF Certification History*

# ***AGENDA (continued)***



## ➤ ***HFTF (continued)***

- *HFTF Current Test Support (CY 07)*
- *HFTF Projected Test Support (CY 07)*
- *Test Activity Summary (CY 07)*
- *Certifications Issued (CY 07)*
- *Interop Assessment Letters Issued (CY 07)*
- *HF Test Procedures*

## ➤ ***HF Modeling and Simulation***



# ***JITC VISION AND MISSION***



***Vision:*** *A world-class test and evaluation organization that advances global net-centric testing in support of war-fighting capabilities*

***Mission:*** *JITC provides a full-range of agile and cost-effective test, evaluation, and certification services to support rapid acquisition and fielding of global net-centric war-fighting capabilities*

# JITC FACILITY LOCATIONS



**FORT  
HUACHUCA, AZ**

**INDIAN HEAD, MD**



# ***HIGH FREQUENCY TEST FACILITY (HFTF)***



- ***Co-Located with JITC at Fort Huachuca, Arizona***
- ***Contractor Operated and Maintained***
- ***“Split” Test Sites***
  - *Transmitter Site is Located 33 Miles Away and Connected By a Microwave Link*
  - *Receiver Site is Located 1 Mile Away and Connected By a Fiber Optic Link*





# ***HFTF MISSION***



*Established in 1989, the HFTF provides both a testing laboratory and an operational facility, supporting Conformance and Interoperability Testing*

# ***HFTF HISTORY***



- ***HF Test Support Began in 1989***
- ***Historical HF Requirements***
  - *MIL-STD 188-110A (30 Sep 1991)*
  - *MIL-STD 188-141A Notice 2 (10 Sep 1993)*
- ***Present Emphasis on HF Requirements***
  - *MIL-STD-188-203-1A (8 January 1988)*
  - *MIL-STD 188-110B (29 Mar 2000)*
  - *MIL-STD 188-141B (01 Mar 1999)*
  - *STANAG 5066 (04 Jul 2000)*

# ***HFTF FACILITIES***



## **➤ *Conformance and Interoperability Test Laboratory***

- *MIL-STD and STANAG Testing*
- *Automated and Manual Testing*

## **➤ *Operational Facility***

- *3 Level SCOPE Command Node*
- *Shared Resources (SHARES) Program Participant*
- *DICE Exercise Support*

# ***HFTF FACILITIES (cont'd)***



## **➤ *Legends Test Network***

- *14 Test Management Systems*
- *Automated Testing*
- *Central Data Management*
- *Channel Simulation (HF and Audio)*
- *Network Simulation*
  - *INTERNET*
  - *NIPRNet*
  - *SIPRNet*
- *Computer Modeling and Analysis*
  - *ICEPAC*
  - *GenetScope*



## ➤ ***MILITARY STANDARD TEST CAPABILITIES***

- ***MIL-STD-188-110B***
  - *Serial Mode*
  - *39-Tone*
  - *Data Rates Above 2400 bps*
- ***MIL-STD-188-141B***
  - *Basic Radio*
  - *ALE*
  - *Linking Protection*
- ***MIL-STD-188-148B***
- ***MIL-STD-188-203-1A***



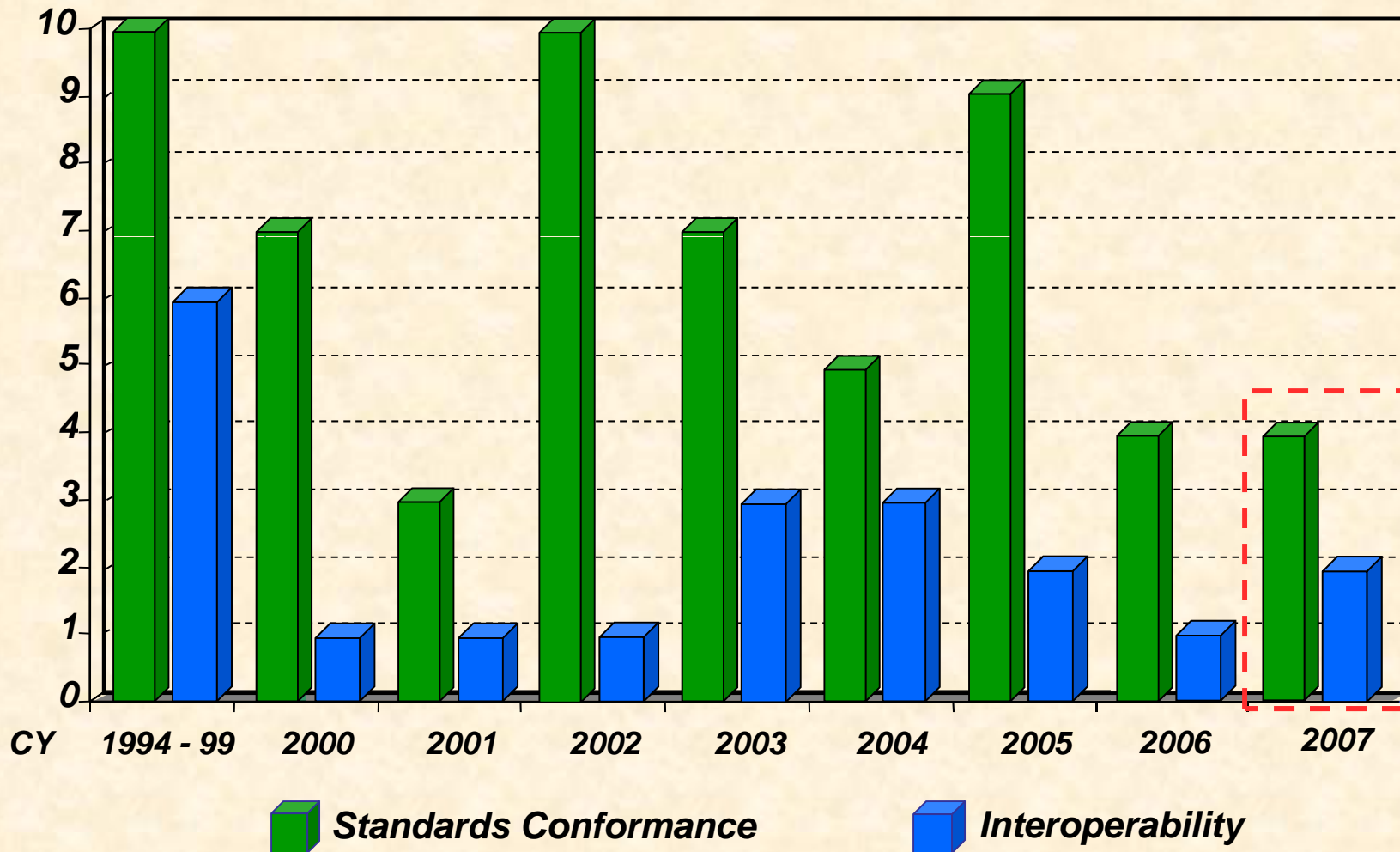
# ***HFTF TEST CAPABILITIES (cont'd)***



## **➤ *STANAG TEST CAPABILITIES***

- *STANAG 4203*
- *STANAG 5511*
- *STANAG 5066*
- *STANAG 4529*
- *STANAG 4285*
- *STANAG 4539*

# HFTF CERTIFICATION HISTORY



# ***HFTF CURRENT TEST SUPPORT (CY 07)***



## **➤ *Current Test Support***

- *SCOPE Command*
  - *Spiral 2, Type 3*
  - *GenetScope/DEVS*
- *Harris AN/URC-131(V) (SPAWAR)*
  - *Interoperability Assessment*

# **HFTF PROJECTED TEST SUPPORT (CY 07)**



- **Rockwell Collins Q9604 Modem (July-Aug 07)\***
  - *MIL-STD-188-110B Certification, Including Appendix C and Appendix F*
- **Datron RT-7700 Radio (June 07)\***
  - *MIL-STD-188-141B Certification, Including Appendix A*
  - *Interoperability Assessment*
- **Barrett Communications 2050 Radio (Aug 07)\***
  - *MIL-STD-188-141B Certification, Including Appendix A*
  - *Interoperability Assessment*

\* *Tentative Dates*

# ***HFTF PROJECTED TEST SUPPORT (CY 07) (cont'd)***



## **➤ *SCOPE Command Q9604 Modem (July-Aug 07)\****

- *MIL-STD-188-110B Certification, Including Appendix C*
- *STANAG 5066*
- *Q9604-to-S9600 Modem Functionality Testing*

## **➤ *RapidM RM6 Modem (SUNAIR) (July-Aug 07)\****

- *STANAG 5066*

## **➤ *JTRS***

- *HF Test Procedures Validation and Verification*

*\* Tentative Dates*



# **TEST ACTIVITY SUMMARY (CY 07)**



## ➤ **MIL-STD-188-110B**

- *None*

## ➤ **MIL-STD-188-141B**

- *Rockwell Collins AN/ARC-243(V) (Appendix B)*

## ➤ **STANAG 5066**

- *None*

# **TEST ACTIVITY SUMMARY (CY 07) (cont'd)**



## ➤ ***Interoperability Testing***

- *Harris AN/URC-131(V) Assessment (SPAWAR)*

## ➤ ***Responsible Test Organization for SCOPE Command***

- *Developing Updated NetSim Model*
- *Simulation Model for Ship-to-Shore HF Communications (Spawar)*
- *Test Plan Development for Spiral 2 Test*
- *Acceptance Test Support for Spiral 2 at Andrews Air Force Base*

# **CERTIFICATIONS ISSUED (CY 07)**



➤ **MIL-STD-188-110B**

- *RapidM RM6 Modem and ALE Controller*

➤ **MIL-STD-188-141B**

- *Rockwell Collins AN/ARC-243(V)1 and (V)2*
- *Harris AN/URC-131(V) HF Radio Group (SPAWAR)*

➤ **MIL-STD-188-203-1A**

- *AN/ACQ-8 (MX-512PA) (Part of AN/ARC-243(V)1)*

# ***INTEROP ASSESSMENT LETTERS ISSUED (CY 07)***



## **➤ *Rockwell Collins AN/ARC-243(V)1 and (V)2***

- *Non-Secure Voice*
- *Secure Voice*
- *Data*
- *Link-11*

## **➤ *Harris AN/URC-131(V) HF Radio Group***

- *Non-Secure Voice*
- *Secure Voice*
- *FSK Data*
- *Link-11*

# ***HFTF TEST PROCEDURES***



## ***➤ Test Procedures Under Development/Revision***

- *MIL-STD 188-141B*
- *MIL-STD 188-203-1A*
- *MIL-STD 188-148B*
- *STANAG 5066*





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# ***HF MODELING AND SIMULATION***



*Presented By: Mr. Dan Hurd  
HFTF Modeling and Simulation Government Action Officer  
19 July 2007*



## ***HF Radio Simulation on a Worldwide Basis***

- *Background*
- *Simulation Requirements*
- *GenetScope and NETSIM2*
- *How Do You Model the World?*
- *Scenario Based Simulation*
- *Data Analysis*

# BACKGROUND



*The JITC HFTF is responsible for developing the second-generation network model for the HF Global Communications System (HFGCS). JITC tasked Northrop Grumman Information Technology (NGIT) to develop NETSIM 2. Subsequently, NGIT partner, the University of Arizona, and the Arizona Center for Integrative Modeling & Simulation (ACIMS) have developed the model. Working from the original NETSIM-SC model, the ACIMS team transferred the code to JAVA and integrated it into a Discrete Event System Specification (DEVS).*

## ➤ **The High Frequency Global Communications System Supports:**

- *VIP Fleet - MYSTIC STAR*
- *U.S. Air Force Global HF System*
- *Defense Communications System (DCS) HF Entry*
- *Systema de Informatica y Telecomunicaciones de las Fuerzas Aereas Americanas (SITFAA) - Information and Telecommunications System of the American Air Forces*

## ➤ **Communications Support:**

- *Foreign Dignitaries*
- *State Department*
- *White House*
- *Joint Chiefs of Staff (JCS)*
- *Defense Information Systems Agency (DISA)*
- *Air Mobility Command (AMC)*
- *Air Combat Command (ACC)*
- *Air Force Space Command (AFSPC)*
- *U.S. Air Forces Europe (USAFE)*
- *Pacific Air Forces (PACAF)*
- *Air Weather Service (AWS)*
- *United States Navy*
- *North Atlantic Treaty Organization (NATO)*
- *Civil Air Patrol*
- *Department of Homeland Defense*





## ➤ **Simulation Requirements**

- *The HFGCS is Offering Expanded Capabilities to Users*
  - *Voice Connection to the DISN*
  - *NIPRNET/SIPRNET E-Mail*
  - *Ground-Based in Addition to Aircraft*
- *Analysis of Coverage*
- *Analysis of Location of New Stations*
- *Analysis of Assets*
  - *Equipment*
  - *Antennas*
  - *Channels*
- *Analysis of New Capabilities*
  - *Data Protocols*
  - *MELP*
  - *Terrestrial Network*
  - *VOIP*





## ➤ **DEVS**

- *Discrete Event System Specification*

## ➤ **GenetScope (Generic Network Model for Systems Capable of Planned Expansion)**

- *Architecture to Simulate Complex Radio and Protocol Systems*

## ➤ **NETSIM 2 (Second Generation HFGCS Model)**

- *Overlay of HFGCS on GenetScope*
- *The Model Provides Automatic Link Establishment, Propagation, Mobile Users, and Traffic Capabilities*



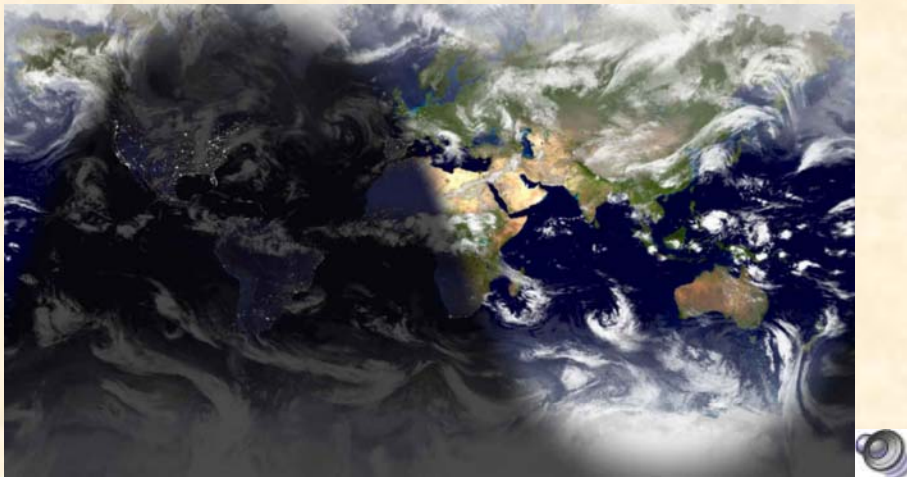
## ➤ ***How Do You Model the World?***

- *Location*
- *Equipment Specifics*
  - *Power*
  - *Antenna*
- *Date*
- *Time*
- *Sunspot Number*

## ➤ ***Propagation?***

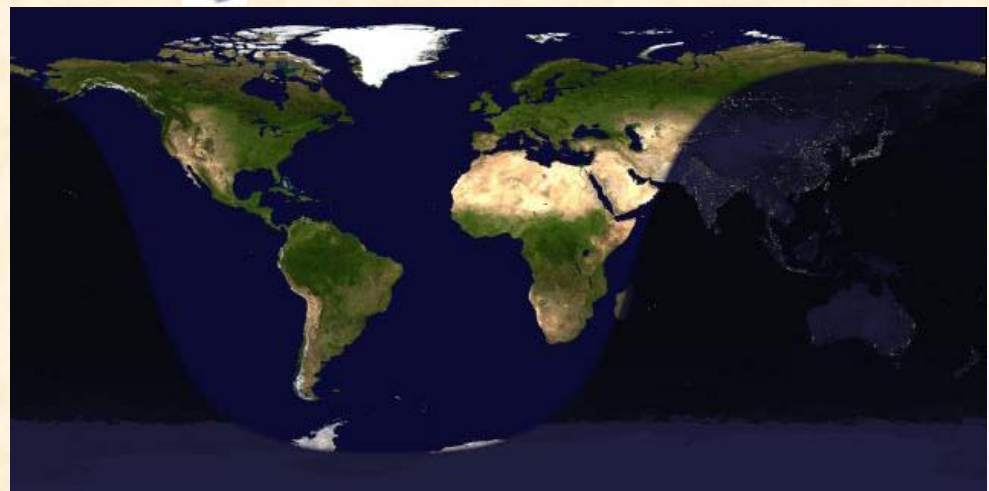
- *Predictable Using Industry Standard Programs*

## *Factors Affecting Propagation*



- *Location*
- *Date*
- *Time*
- *Solar Activity*
- *Solar Cycle*

- *Transmit Power*
- *Receive Noise*
- *Bandwidth*
- *Signal to Noise*





# HFGCS Worldwide Network



## HFGCS Worldwide Network



### Summary

1600-2400Z  
33 flight hours  
151 voice links  
76 links on first attempt  
10 of 14 stations used  
6 of 9 channels



## Experimental Frame - Scenario Plan

GENETSCOPE - NetSim2

About Help

Start Experimental Frame

Make New Configuration

**Configuration File Repository**  
base.cfg  
CONUS with traffic.cfg  
Global with traffic.cfg

**Description**  
Select from above to see information

Simulate Configuration  
Load / Update Configuration  
Refresh Repository

**Experimental Frame Default Settings**

Level in Fixed Station	<input type="range" value="1"/>	1 6 11 16	1
Fixed Stations	<input type="range" value="14"/>	0 5 10 15 20	14
Mobile Stations	<input type="range" value="10"/>	0 50 100 150 200 250 300	10
Msg/Hr	<input type="range" value="2"/>	0 10 20 30 40 50 60 70 80 90 100	2
<input type="radio"/> Data Msg	<input type="range" value="10"/>	0 50 100	10
<input checked="" type="radio"/> Voice Duration	<input type="range" value="60"/>	0 10 20 30 40 50 60 70 80 90 100	60
Ground Stations Sound Interval	<input type="range" value="90"/>	0 50 100 150 200 250 300	90



## Fixed Station Configuration Pane

**GENETSCOPE - NetSim2**

startTab Options Experimental Frame **System Configuration**

Fixed Station Mobiles Traffic Frequencies Location Set Up

☒ ADW  
☒ GUA  
☒ HAW  
☒ CRO  
☐ JDG  
☐ AED  
☐ HIK  
☐ PLA  
☐ MCC  
☐ OFF  
☐ JWR  
☐ JTY  
☐ ICZ

Station Call: **CRO** ALE Activity: **Active**  
 Latitude: **51 58 N** Longitude: **1 11 W**  
 Location: **Croughton station#4** **1 Lookup**

**IMPORTANT:**  
Press Update to add station to Scenario configuration  
**3 UPDATE**

**Station Database :**  
**Add** **Delete**

Preset Radio Levels Ale Parameters Scan List Gnd InfraStructure

☒ AFALE  
☒ AFALE1  
☐ AFC  
☐ BROADCAST  
☒ CAPNET  
☐ DATA  
☐ DATA\_S  
☐ DATA\_S

Max No. of Levels : **10**  
 Default No. of Presets : **3**  
 Selected No. of Presets : **3**

**2 Configure**

**Instruction:**  
 1. Configure each fixed station by following through the numbered buttons.  
 2. Each station must go through the buttons labeled 1, 2, 3 to be saved in the scenario configurations.

## Mobile Station Selection Pane

GENETSCOPE - NetSim2

About
Help

startTab
Options
Experimental Frame
System Configuration

Fixed Station
**Mobiles**
Frequencies
Location
Traffic
Set Up

Air Mobility Command (AMC)

Cargo

C5
1
C17
0
C130
2
C-130E
0
C-130H
0
C-130J
0
C-130J-j30
0

Tanker

KC135
0
KC10
0

Special Air Mission (SAM)

AWACS E3
0
VC 25 Air Force 1
0
E4B
0
C32
0
C37
0

Air Combat Command (ACC)

B52
0
B2
0
B1
0
Fighter
0

Ground Based Radio System (GBRS)

TALCE
0
CAP
0
Tactical
0
Other Aircraft
0
Navy
0
FEMA /SHARES
0
State Depart...
0

Attention: The total number of aircraft must be 3      The current number of aircraft is 3

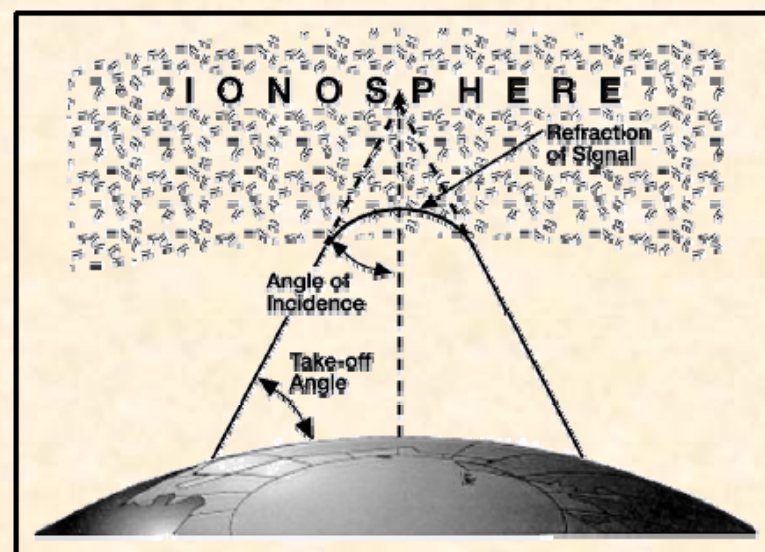
**CAUTION:**  
If loading from previous configuration file, changing the plane Type might result in loss of flight-detail information. You may have to enter the flight details again. Adding new planes in current loaded configuration (if loading an old file) will not result in losing any information.

Enter Details

# GenetScope / NETSIM 2



- *Automated Scenario Management*
- *Traffic Generation*
- *Movement of Mobiles Between Waypoints*
- *Propagation for Any Communications Requirement Anywhere in the World*
- *Just Like the Old Days*

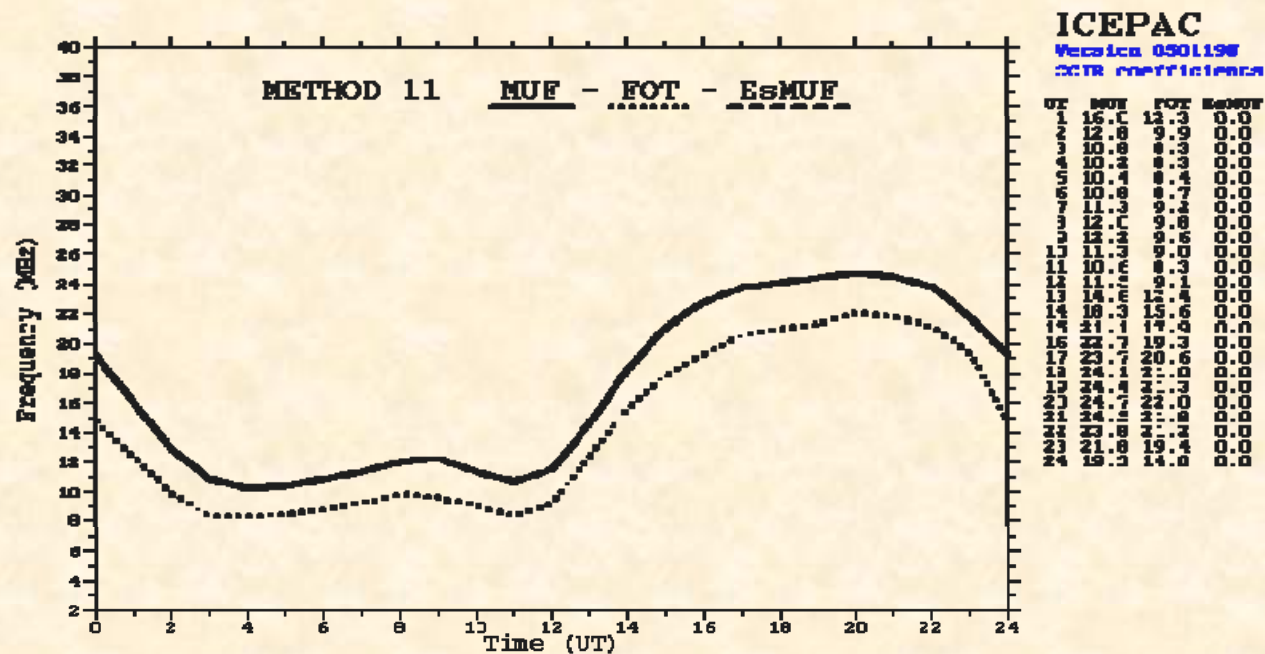


# GenetScope / NETSIM 2



- *Pick Two Locations*
- *Select Date, Time, Sun Spot Number*

FEB 2016 SSN = 10. Qeff= 0.0 Minimum Angle 0.10 deg  
ANDREWS AFB FT. HIA-HUA ARTHUR N. MT. KM  
38.80 N 76.68 W - 31.55 N 110.33 W 265.40 65.72 1687.9 3125.8  
XMR 2-3) 2-D Table (DEFAULT) CONST17.YOA | Az= 0.0 OFaz=265.4 4.000kW



- ***What if You Have 14 Fixed Stations and Several Dozen Aircraft Worldwide?***
- ***Repeat the Process Over and Over***
- ***The IONCAP Prediction Program is 30 Years Old***

*IONCAP*

[illegible]

(30 years ago)

# DEVSJAVA

```
public void InsertSelfEvent(EventStruct theEvent_) {
    EventStruct theEvent = NewEvent().clone(theEvent_);
    theEvent = theEvent_;
    int entity = theEvent.EventEntity;
    double eventTime = doubleFormat.niceDouble(theEvent.EventTime);
    theEvent.srcEntity = entity; //by saurabh
    arrived.put(new doubleEnt(eventTime), theEvent);

    holdUntilNextJob();
}
```

*(Today)*



## *Propagation Program Output for Each Communications Attempt*

- FEB 2006 SSN = 10. Qeff= 0.0 Minimum Angle 0.10 deg
- ANDREWS AFB FT. HUACHUCA AZIMUTHS N. MI. KM
- 38.80 N 76.88 W - 31.55 N 110.33 W 265.40 65.72 1687.9 3125.8
- XMTR 2-30 2-D Table [DEFAULT\CONST17.VOA] Az= 0.0 OFFaz=265.4 4.000kW
- RCVR 2-30 2-D Table [DEFAULT\SWWHIP.VOA] Az= 0.0 OFFaz= 65.7
- 3 MHZ NOISE = -114.0 DBW REQ. REL = .90 REQ. SNR = 25.0 DB
- MULTIPATH POWER TOLERANCE = 3.0 DB MULTIPATH DELAY TOLERANCE = 0.100 MS
- 
- 1.0 16.0 6.1 7.2 9.7 11.9 13.7 15.4 17.7 21.6 25.9 0.0 0.0 FREQ
- 1F2 2F2 2F2 2F2 1F2 1F2 1F2 1F2 1F2 1F2 - - MODE
- 4.1 12.7 13.1 14.1 1.8 2.3 3.1 4.1 4.1 4.1 - - ANGLE
- 10.9 11.1 11.1 11.1 10.7 10.8 10.8 10.9 10.9 10.9 - - DELAY
- -101 -87 -87 -90 -103 -102 -99 -111 -150 -214 - - S DBW
- -139 -127 -129 -133 -135 -137 -138 -140 -143 -145 - - N DBW
- 38 40 42 43 32 35 40 29 -8 -70 - - SNR
- 14 -2 -2 5 10 13 12 23 60 121 - - RPWRG
- 0.74 0.92 0.93 0.84 0.70 0.71 0.76 0.58 0.05 0.00 - - REL
- 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 - - MPROB





## ***Scenario Based Simulation (Small)***

### ➤ ***A Small Scenario***

- 6 Stations
- 2 Aircraft
- 9 Channels
- 1 Hour

### ➤ ***Results***

- 217 ALE Activities (Sound, Listen, Call)
- 54 Transmissions (Sound, Link)
- 723 Calls to the Propagation Program
- 2 ALE Links

### ➤ ***2 Hours to Run***



## ***Scenario Based Simulation (Large)***

### ➤ ***A Large Scenario***

- 14 Stations
- 100+ Aircraft
- 9 Channels
- 24 Hours

### ➤ ***Results***

- 10,000+ ALE Activities (Sound, Listen, Call)
- 5,000 Transmissions (Sound, Link)
- 100,000 Calls to the Propagation Program
- 500 ALE Links

### ➤ ***72 + Hours to Run***



## Fixed Stations and Mobiles

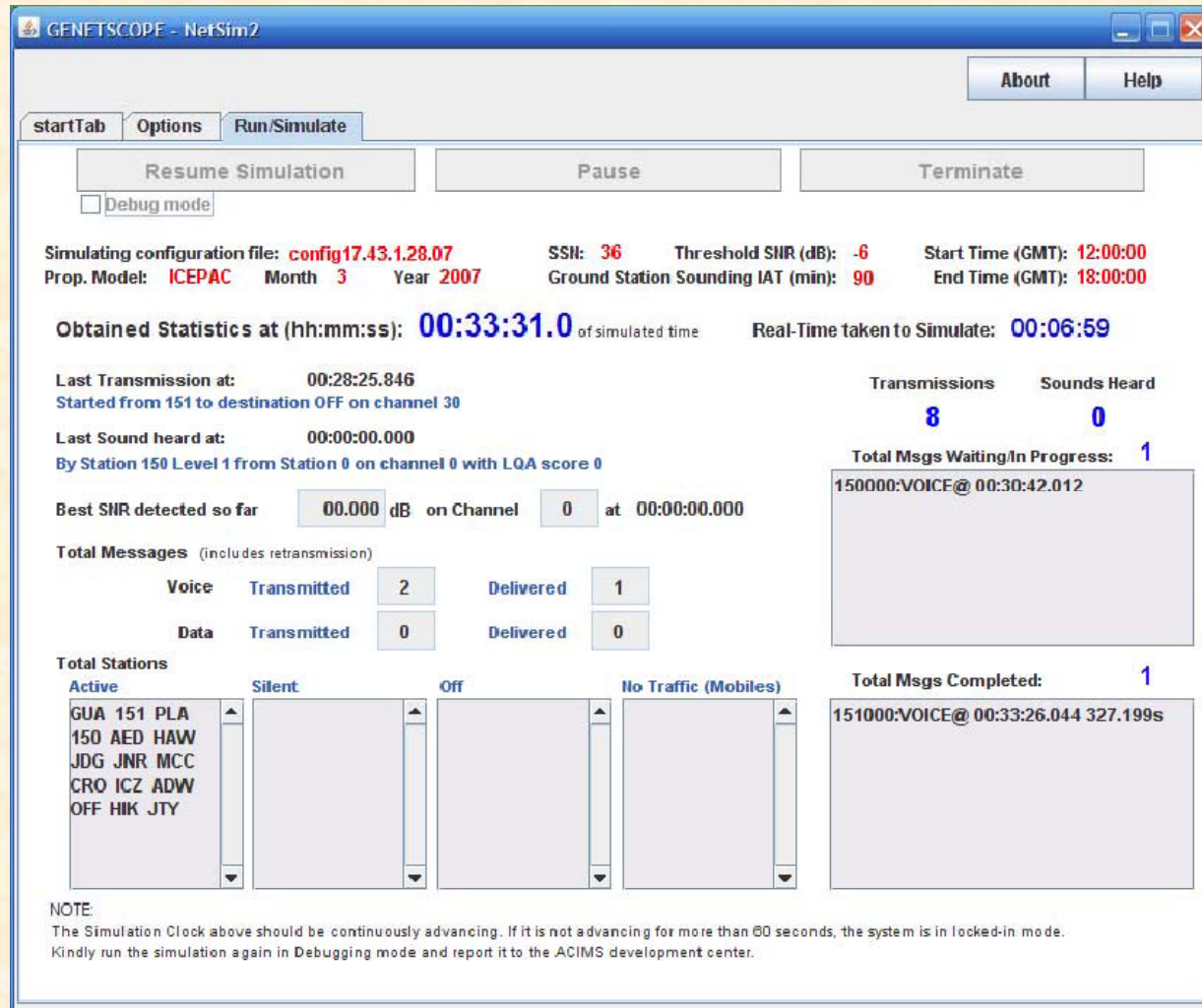
## Fixed Station

F ADW	38.817	-76.867	-114	A	Andrews
ALE1					
RT 1					
PA 1					
ANT1					
Bcast					
#T 0	2	60	10	V	~2 msg/hr to gnd ~1.0 minutes ea
C 2	4	8	10	11	14 17 AFALE

Mobile

M	150	35.466	-97.533	S	C5	455684			
T	0	3	60	10	V				
T	0	1	20	250	D				
L	ADW	OFF	MCC	HIK	AED				
W	0.1	35.466	-97.533	A	CITY	OK	USA	TINKER AFB	USAF
W	4	39.166	-75.533	S	DOVER	DE	USA	DOVER AFB	USAF
C	2	4	8	10	11	14	17	AFALE	

## Real-Time Simulation Visualization Pane



**GENETSCOPE - NetSim2**

startTab Options Run/Simulate

Resume Simulation Pause Terminate

☐ Debug mode

Simulating configuration file: **config17.43.1.28.07** SSN: **36** Threshold SNR (dB): **-6** Start Time (GMT): **12:00:00**  
 Prop. Model: **ICEPAC** Month **3** Year **2007** Ground Station Sounding IAT (min): **90** End Time (GMT): **18:00:00**

Obtained Statistics at (hh:mm:ss): **00:33:31.0** of simulated time Real-Time taken to Simulate: **00:06:59**

Last Transmission at: **00:28:25.846** Transmissions **8** Sounds Heard **0**  
 Started from **151 to destination OFF on channel 30**

Last Sound heard at: **00:00:00.000** Total Msgs Waiting/In Progress: **1**  
 By Station **150 Level 1 from Station 0 on channel 0 with LQA score 0**

Best SNR detected so far **00.000** dB on Channel **0** at **00:00:00.000**

Total Messages (includes retransmission)

	Voice	Transmitted	Delivered
		<b>2</b>	<b>1</b>
	Data	Transmitted	Delivered
		<b>0</b>	<b>0</b>

Total Stations

Active	Silent	Off	No Traffic (Mobiles)
GUA 151 PLA 150 AED HAW JDG JNR MCC CRO ICZ ADW OFF HIK JTY			

Total Msgs Completed: **1**

150000:VOICE@ 00:30:42.012

151000:VOICE@ 00:33:26.044 327.199s

**NOTE:**  
 The Simulation Clock above should be continuously advancing. If it is not advancing for more than 60 seconds, the system is in locked-in mode.  
 Kindly run the simulation again in Debugging mode and report it to the ACIMS development center.

## Data Analysis

- 5 User Logs
- Importable into Excel

### ALE Log

Sta	Level	At Time	on	Sta	Status			
1	1	00:00:33.133	Ch:6	to:0	Listening			
1	1	00:00:35.332	Ch:6	to:0	Sounding			
150	1	00:00:36.283	Ch:6	to:0	Reading Snd	SNR (dB):	19.0	Score: 36
11	1	00:00:36.783	Ch:6	to:0	Reading Snd	SNR (dB):	23.0	Score: 44
10	1	00:00:39.783	Ch:6	to:0	Reading Snd	SNR (dB):	28.0	Score: 50
150	1	00:00:41.067	Ch:6	to:0	Reading Snd	SNR (dB):	19.0	Score: 36
11	1	00:00:41.567	Ch:6	to:0	Reading Snd	SNR (dB):	23.0	





## Channel Log

Chnl	Start time	End time	Src	Dest	Power
6	00:00:35.332	00:00:41.793	1	0	36.0
9	00:01:24.418	00:01:30.879	6	0	36.0
4	00:02:24.845	00:02:31.306	11	0	36.0
6	00:03:57.252	00:04:03.713	11	0	36.0
3	00:05:21.99	00:05:28.45	10	0	36.0
9	00:07:31.685	00:07:38.146	7	0	36.0
5	00:07:41.791	00:07:48.252	150	0	26.0

## Linking Log

Src	Dest	Chnl	Qual	Start Time	End Time	Time taken
150	10	4	50	00:26:00.20	00:26:13.191	12.99
150	10	4	48	00:46:00.199	00:46:13.19	12.99





## LQA Log

*(Link Quality Analysis – Used for Channel Selection)*

LQA Table from ALE 190 level 1 at station 150 at hour1

Sta	Ch	1,	2,	3,	4,	5,	6,	7,	8,	9,
ADW		0,	0,	0,	33,	0,	26,	0,	0,	0,
AED		0,	0,	0,	0,	0,	0,	0,	0,	0,
HIK		0,	0,	0,	0,	0,	0,	0,	0,	0,
MCC		0,	0,	0,	0,	0,	25,	0,	0,	0,
OFF		0,	45,	41,	46,	0,	0,	0,	0,	0,
JNR		0,	0,	0,	0,	0,	0,	0,	0,	0,

=

LQA Table from ALE 182 level 1 at station JNR at hour1

Sta	Ch	1,	2,	3,	4,	5,	6,	7,	8,	9,
ADW		,	,	,	29,	,	33,	,	,	,
AED		,	,	,	,	,	,	,	,	,
HIK		,	,	,	,	,	,	,	,	,
MCC		,	,	,	,	,	,	,	,	,
OFF		,	,	,	,	,	,	,	,	,



## Message Log

Msg ID	Dest	Src	Pri	Len(s)	Time Req	Established	Done at	If Failed(Reason)
150000	10	150	10	60	00:26:00.098	00:26:13.289	00:27:13.486	VOICE
150001	10	150	10	60	00:46:00.099	00:46:13.289	00:47:13.487	VOICE

## Propagation Log

*(Used for Propagation Validation)*

Listening at station: ADW                      to: 152                      at: 00:00:35.499

Running PropString: DynPropString: 16 4 2006 32114                      ADW 38.81N 76.86W 152 47.61N 117.3W

4.7 5.7 6.7 9.0 11.2 13.2 15.0 18.0 23.3 0.0 0.0 FREQ

-96 -58 -28 -2 2 -10 -1 -37 - - SNR

Frequency 15.04 MHz                      index: 6                      SNR value for Freq[6]= -10.0

# GenetScope / NETSIM 2



## ➤ **GenetScope / NETSIM2**

- *Completed Phase 1 of Development 16 April 2006*
- *Beta Provided to the Air Force for Review*

## ➤ **Phase II (Delivered March 2007)**

- *Modeling of Entire Station*
  - *Up to 16 Radios*
  - *Different Antennas*
  - *Connection to DISN*
- *Multiple Missions*
- *Traffic Generation*
- *E-Mail and Data Protocols*

## ➤ **Phase III**

- *Distributed Processing*

# ***HFGCS SIMULATION POC***



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# CONCLUSION



- ***Closing Comments***
- ***Questions***
- ***Points of Contact***



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