



The Search for Amelia Earhart's L-10E Electra:

An HF System Engineering Approach

By Tom Vinson, NYOV



Presenter Biograph

- Tom Vinson, NY0V
- Licensed since 1967
 - Novice WN9YZN/ WA9YZN in Champaign, IL; Extra 1985 Cedar Rapids, IA
 - DX Calls: T30CXX (2), T32CXX, VP5S, G0WVI
- 35 Year Ops Engineering, Prog Mgmt Career @ Rockwell Collins
 - Airborne HF, SHF/EHF SATCOM, L Band Data Links
- Enjoy DXing, CW, Some Contesting, Tinkering w/ Antennas
- 20 Years Working on the Earhart Discovery Project
 - Nauticos Corp. (Nauticos.com)
 - HF Systems Engineering Approach
 - 3 Deep Water SONAR Expeditions







Amelia Earhart 1897-1937







Courtesy Purdue University Libraries, Archives and Special Collections

Outfitting the "Flying Laboratory"

NR 16020

William.



-4.0





The Fateful Flight of July 1/2, 1937

- Take Off at 1000 Local Lae Time = 0000 Greenwich
- Fuel Load: 1,100 US Gallons
- 5,000 Pounds Over Gross Weight
- In Radio Contact on 6210kHz with Lae, New Guinea
- Transmissions Heard by Nauru Island Residents on 3105kHz
- Numerous Transmissions Heard by USCG Itasca at Howland
- 20 Hours 13 Minutes Until Last Transmission Occurred
- Amelia Earhart, Fred Noonan Never Heard from Again

The Search Continues 83 Years Later!



Methods Utilized to Predict Search Area

Today

 Radio Signal Analysis to predict the <u>distance</u> between Itasca and the Electra

- Navigational Analysis to predict the <u>direction</u> from Itasca to the Electra
 - Other Factors Contribute
 - Weather
 - Visibility
 - What she said in her radio transmissions
 - Fred Noonan's techniques & habits
- Monte Carlo Analysis predict crash scenario areas
- Statistical Mapping to predict highest likelihood areas
- Decision Tree Mapping to determine most likely decisions made during flight

All to Predict an Economically Feasible Search Area







The Signal Level Diagram













WOLTL (SK)









WE13C Pout to Load Modeled

WE 13A Transmitter Performance into NR16020 Antenna Load

Pwrdel. To Load Watts	Network Loss dB	l ant RMS	l coil RMS	LB uH	LT uH	ZL Ohms	Plt Pwr Watts	Plt Eff %	Zin Ohms
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Beech 18 Antenna Measurements – Ankeny, IA

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1/12 Scale Model of the L-10E Electra

A COLONY



Antenna Pattern Measurement 1/12 Scale L-10E

FRACILE

Some Chang



WEOF KA0YSQ WB9OMY NY0V NQ0V











Tom Vinson, Barry Brown, Rod Blocksome Melbourne, FL

Barry Down - Rockwell Collins Flight hist Pilot Volunteer



Contraction of the



Cocoa Beach Pier Receive Site from 1,000 feet

Overhead Pass Trailing Wire Antenna is Deployed

Test 3a, 3516 kHz



Excellent Correlation to GR Wave Software Prediction!







Result: A Series of Overlapping Range "Donuts" for Signal Strength vs Distance from Howland

Rhetorical Question for Low Band DXers

Given:

- 1. WE-13C Xmtr: <50w Poutput AM Voice (50w Pinput)
- 2. Antenna: 6ft Wire with "V" Capacitive Top Hat
- 3. Altitude 1000Ft
- 4. 2.5 Hours After Sunrise (0843 IST)
- 5. QSA S-5 (1-5 System) on Sloper Rx Antenna
- 6. Chief Radio Officer: Looked Outside Expecting to See Her "Fly Through the Rigging"



From your own 80m DX experience: How Far was the L10-E from Howland (KH1)? Email: ny0v@arrl.net





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